Import Tariffs and Export Subsidies in the WTO: A Small-Country Approach*

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Abstract

We develop a simple small-country model to explain why the WTO prohibits export subsidies but allows import tariffs. In this model, governments choose protection rates (import tariffs/export subsidies) to maximize a weighted sum of social welfare and lobbying contributions. While transportation costs decrease due to the progress of trade liberalization, import-competing industries shrink but export industries grow. In the growing export industries, new entrants erode the surplus generated by the protection. Therefore, the rents that the government gains from protecting the export industries by using export subsidies are small. On the other hand, in the import-competing industries, no new entrants erode the protection rents from tariffs. Therefore, the government can get large political contributions from protecting these import-competing industries. We show that under fast capital mobility, the governments with a high bargaining power are better off with a trade agreement that allows import tariffs but prohibits export subsidies.

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

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1 Introduction

Since 1948, GATT Article XVI has called for contracting parties to avoid export subsidies on primary products and to abolish export subsidies on other goods. The WTO Agreement on Subsidies and Countervailing measures built on the Tokyo Round subsidies code (issued in 1979) defines export subsidies and prohibits them on non-primary products. As pointed out by Bagwell and Staiger (2001), the prohibition of export subsidies presents a puzzle to trade economists; it contradicts predictions made by the standard theories of trade agreements which find that the role of a trade agreement is to solve the prisoner’s dilemma problem driven by terms-of-trade externalities. In the non-cooperative equilibrium, large countries exploit their market power to maximize their welfare by using import tariffs and export taxes to decrease the prices of imports and increase the prices of exports. 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. These countries can improve their welfare if they agree to decrease import tariffs and export taxes, thereby promoting trade.

The standard theories fail to account for why governments use export subsidies policies in the absence of a trade agreement. According to the standard theories, the governments lose their terms of trade and national income by employing export subsidies. The standard terms-of-trade theories thus fail to even rationalize the use of export subsidies. A way to solve this puzzle is to allow governments to be motivated by both national income and distributional concerns. If a government is highly concerned with the welfare of its exporting sectors, the government will choose export subsidies. This approach has the following implications: 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, the WTO should encourage export subsidies. However, this result contradicts the WTO rule prohibiting export subsidies.

The objective of this paper is to propose an explanation why the WTO’s member countries have agreed to prohibit export subsidies but yet allow import tariffs. Following the commitment theory in the literature, we argue that 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 that the asymmetric treatment between export subsidies and import tariffs arises because of a free-rider problem in expanding export sectors. When a government has high bargaining power and a free-rider problem is severe, the government would sign an agreement that prohibits export subsidies but allow import tariffs.

To illustrate the mechanism, we develop a simple small-country model based on Maggi and Rodriguez-Clare (1998). In the initial stage, the government of a small country chooses whether to sign an agreement that prohibits trade policy (import tariffs or export subsidies). After the government’s decision has been made and announced publicly, capitalists allocate their capitals between a manufacturing sector and a numeraire sector.

1Some representatives of the standard theories are Johnson (1954), Grossman and Helpman (1995), Levy (1999), and Bagwell and Staiger (1999).
In the next stage, if the government has signed the agreement, then the government commits to free trade and the lobby group is not created. However, if the government did 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’ returns on capital net of lobbying contributions paid to the governments, while the government maximizes a weighted sum of social welfare and lobbying contributions. After a trade protection is chosen and contributions are paid, production and international trade occur.

The last stage begins with a reduction in transportation costs which results in an expansion in the export sector and a contraction in the import-competing sector. Capitalists have an opportunity to reallocate their capital to seek a higher return. However, capital in the manufacturing sector is sunk. Capitalists in the contracting import-competing sector are unable to leave the sector, while new capitalists can freely enter the export sector. Without the last stage when the transportation costs decrease, our model is reduced to the model of Maggi and Rodriguez-Clare (1998).

In the lobby game, the government gains from political contributions at the expense of social welfare through capital misallocation and reduced consumer surplus. Trade protections generate economic rents to the lobby group. Depending on the government’s bargaining power, the government can extract part of the rents through contributions. The welfare costs of trade protections arise through two channels. First, without an agreement prohibiting trade policy, capitalists anticipate lobbying in the second stage and expect higher returns on capital from trade policy. As a result, additional capitalists enter the manufacturing sector in the first stage. Capital is misallocated in the sense that the level of capital in the lobby game is different from the level of capital under an agreement that the government commits to free trade. The magnitude of welfare loss from capital misallocation depends on the slope of the marginal product of capital. Second, trade protections raise the domestic prices of goods, thus consumer surplus decreases.

The first part of the analysis considers the lobby game between the government and the lobby group in the import-competing sector. In the last stage, after the transportation cost decreases, the domestic price of import goods 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 a government chooses to commit to an agreement that prohibits import tariffs when the government’s bargaining power is sufficiently small. The result is consistent with Maggi and Rodriguez-Clare (1998). With a small bargaining power, the government receives small political contributions that do not cover welfare costs of trade protections. In this case, the government is better off by committing to an agreement 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 subsidy in an exchange for political contributions. In the last stage when transportation costs decrease, the returns on capital in the export sector increase and thus new capitalists move their capital into the export sector. Because the government cannot discriminate against the new capitalists, they receive gains from export subsidy without
paying political contributions and the economic rents from export subsidy within the lobby group decrease. As the duration of the second stage becomes shorter, capitalists want to initially allocate their capital in the numeraire sector and re-allocate their capital to the manufacturing sector later. This behavior causes under-investment in the manufacturing sector. Therefore, political contributions fall because fewer capitalists initially invest in the manufacturing sector and each capitalist is willing to pay smaller contributions. In this situation, the government is better off by committing to an agreement prohibiting export subsidies.

Our main goal is to explain the asymmetric treatment between export subsidies and import tariffs. To do so, we compare the parameter space in the previous analyses. Our main conclusion is that when a government’s bargaining power is high and a free-rider problem is dreadful, the government would sign an agreement that prohibits export subsidies but allow import tariffs.

To the best of our knowledge, our paper is the first paper that provides an explanation for the asymmetric treatment between export subsidies and import tariffs in the WTO. A body of studies propose various economic rationales for export subsidies but these works cannot explain the asymmetric treatment. In Brander and Spencer (1985), export sectors compete in a Cournot fashion within a model with two large exporting countries and one importing country. In the non-cooperative equilibrium, export subsidies are optimal for the governments of the exporting countries, and the welfare of the two exporting countries improves when both agree to limit export subsidies. Bagwell and Staiger (2001) study a model similar to that in Brander and Spencer (1985)’s in a standard partial-equilibrium setting, and find the same result under the condition that the exporting governments’ political concerns weigh heavily on producer surplus. 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. DeReme (2013) shows that in a model with imperfectly competitive markets entry subsidies and export subsidies are optimal if (i) political economy weight on profits is high, (ii) domestic share of consumption is high, and (iii) the substitutability between differentiated goods relative to the outside good is high.

The studies discussed above are based on large-country models. Trade agreements are instruments that solve externality problems among the governments of large countries. Another strand of 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 (see, for example, Staiger and Tabellini (1987), Tomell (1991), Maggi and Rodriguez-Clare (1998), and Mitra (2002)). 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. Suwanprasert (2017a, 2017b, 2017c) show that a small country may use export subsidies to promote employment when its unemployment is inefficiently high. However, these works cannot explain why the WTO prohibits export subsidies.

Maggi and Rodriguez-Clare (2005a and 2005b) have developed a model in which trade agree-
ments are motivated by both terms-of-trade and domestic commitment problems. Their model is novel in the following aspects: (i) they allow the agreement to be incomplete and may specify only tariff and export subsidy ceilings rather than the exact levels of tariffs and export subsidies\(^2\) and (ii) lobbying occurs in two stages - when the agreement is designed \(^3\) (ex-ante lobbying) and when tariff and export subsidy rates are selected by each government subject to the restrictions imposed by the agreement (ex-post lobbying). In this model, they show that 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.

The existing models have succeeded in explaining various aspects of trade agreements. However, they fail to account for the following asymmetric treatment of import tariffs and export subsidies in the WTO. In the WTO, a country may choose their own tariff binding level in exchange for concessions. On the contrary, export subsidies are completely prohibited with few exceptions. In this paper, we propose a simple small-country model using the commitment approach to explain this asymmetry.

The remainder of the paper is organized as follows. Section 2 describes the basic story. Section 3 describes the basic model. In Section 4, we study how a government values a tariff prohibition agreement and an export subsidy prohibition agreement differently, and under what conditions it is optimal for the government to join an agreement that prohibits only export subsidies. Section 5 concludes.

### 2 The Basic Story

In order to explain the asymmetric treatment of export subsidies and import tariffs in the WTO, we incorporate dynamics into the model. The main dynamic force in our model is decreasing transportation costs which have asymmetric effects on export and import-competing sectors. As a result, countries trade more and become more specialized in the goods in which they have comparative advantage. Export sectors expand; new firms enter these sectors. On the other hand, import-competing sectors decline, and there is no entry.

Empirical studies on international trade and growth in each industry (see Baldwin and Gu (2004) and Bernard and Jensen (2002) for example) show that given that other things equal, decreasing transportation costs and foreign competition has a negative impact on import-competing industries, and decreasing transportation costs promote export-oriented industries. Although these studies are supportive, it is not directly relevant to our story. Our story is that generally, as transportation costs decrease over time, export industries grow but import-competing industries shrink. Table 1 shows the growth rates in the number of U.S. manufacturing plants. Table 2 reports a simple regression of the growth rate in the number of plants by industry with the exports/shipments \((x/s)\) and imports/shipments \((m/s)\) ratios. While the regression shows a positive

\(^2\)An agreement is considered complete if it specifies the exact levels of tariffs and export subsidies.

\(^3\)For example, if the agreement is incomplete, in this stage, special interest groups might lobby for the values of the tariff and export subsidy ceilings.
Table 1: U.S. Import-Competing and Export Manufacturing Industries: 1992 - 1997

<table>
<thead>
<tr>
<th>Industries (Ind.)</th>
<th>Annual Growth Rates of # of Plants (%)</th>
<th># of Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import-competing Industries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ind. with ( m/s &gt; 15% )</td>
<td>−0.63</td>
<td>176</td>
</tr>
<tr>
<td>Ind. with ( m/s &gt; 15% )</td>
<td>−0.45</td>
<td>145</td>
</tr>
<tr>
<td>Ind. with ( m/s &gt; 25% )</td>
<td>−0.01</td>
<td>120</td>
</tr>
<tr>
<td>Export Industries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ind. with ( x/s &gt; 15% )</td>
<td>0.37</td>
<td>155</td>
</tr>
<tr>
<td>Ind. with ( x/s &gt; 20% )</td>
<td>0.41</td>
<td>105</td>
</tr>
<tr>
<td>Ind. with ( x/s &gt; 25% )</td>
<td>0.32</td>
<td>77</td>
</tr>
<tr>
<td>All manufacturing</td>
<td>0.37</td>
<td>387</td>
</tr>
</tbody>
</table>

Note: The variables \( x, m, s \) denote the volumes of exports, imports and shipments, respectively. Shipment and number of plant data are from 1997 U.S. economic census. Manufacturing industries are classified according to the 1987 4-digit SIC. Import and export data are from Feenstra, Romalis and Schott (2002).

relationship between entry and \( x/s \), it finds a negative relationship between entry and \( m/s \). The data and regression shown in tables 1 and 2 are consistent with the story that export sectors grow and import-competing sectors shrink.

Now turning to the theoretical model, government welfare is the weighted sum of social welfare and political contributions. The government employs import tariffs and export subsidies to extract rent in the form of political contributions from the lobbies in the protected sectors. To clarify, consider the case where the government has all the bargaining power and extracts all the protection rent. When export subsidies are used to protect these sectors, more new entrants are attracted. These new entrants free ride on the protection and erode the protection rent. When the free-rider problem becomes severe, the benefit to the government from protecting exporting sectors is small. If this benefit is less than the social welfare loss from distorted investment caused by anticipation for the protection, an agreement to prohibit export subsidies is desirable for the government as a commitment device to restore investment to its efficient level. On the contrary, import-competing sectors are declining and capital in these sectors is sunk.\(^4\) Protection can raise the rates of return in these sectors without attracting new capital, as long as the rates of return in these sectors are lower than the normal rate of return. Therefore, there is no free-rider problem in these sectors. The government can receive high rent from protecting these import-competing sectors. Consequently, an agreement that prohibits tariffs and precludes lobbying is not desirable.

\(^4\)A similar idea is employed in Grossman and Helpman (1996) and Baldwin and Robert-Nicoud (2002) to explain why declining industries get more protection than growing industries.
Table 2: The OLS Estimates of $g_{p,i} = \beta_0 + \beta_1 x_i/s_i + \beta_2 m_i/s_i$

<table>
<thead>
<tr>
<th>$g_{p,i}$</th>
<th>0.38</th>
<th>0.017</th>
<th>-0.005</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p$-value</td>
<td>0.91</td>
<td>0.08</td>
<td>0.05</td>
</tr>
</tbody>
</table>

$R^2 = 0.02$  Number of observations = 258

Note: The variables $g_{p,i}$, $x_i$, $m_i$, $s_i$ denote the growth rates of number of plants, volumes of exports, imports and shipments in industry $i$, respectively. To exclude non-tradable industries, only industries with $x_i/s_i \geq 0.1$ or $m_i/s_i \geq 0.1$ are included in the regression. Data source: see the note below Table 1.

3 The Model

The model is based on Maggi and Rodriguez-Clare (1998). The main difference is that our model introduces a reduction in transportation costs into the lobby game in Maggi and Rodriguez-Clare (1998). In this section, we describe the model, the timeline of the lobby game, and the role of transportation costs.

3.1 The Economic Environment

For the simplicity and clarity, our model consists of two small open countries: Home (H) and Foreign (F). Unlike the standard two-country models, in our model, the two countries are completely separable. Home has a lobbying game in its import-competing sector. On the other hand, Foreign has a lobbying game in its export sector. The two countries produce and consume two goods: numeriare ($N$) and manufacturing ($M$). The parameters of the model are specified such that Home imports $M$ from the world but Foreign exports $M$ to the world.

The two countries have identical production structure. Land and capital are the factors used in production. Land is specific to the production of $N$. Capital is used for both the production of $N$ and $M$. Each country is endowed with $\bar{k}$ units of capital and $\bar{l}$ units of land. The marginal product of capital in the production of $N$ is:

$$f \big( k_N; l_N = \bar{l} \big) = \alpha - \gamma k_N,$$

where $k_N$ and $l_N$ are, respectively, the levels of capital and land employed in the production of $N$. The term $\gamma$ is the slope of the demand for capital in sector $N$.

The total rent on land is

$$R_l = \int_0^{k_N} f \big( t \big) dt - f \big( k_N \big) k_N = \frac{\gamma k_N^2}{2}.$$

Manufacturing production uses only capital. One unit of capital is required to produce one unit of $M$. The demand for the manufacturing good, $d^i$, and the consumer surplus, $cs^i$, of country $i \in \{H,F\}$ from consuming the manufacturing good are
\[
d^i \left( p^i \right) = v^i - p^i \text{ and } cs^i \left( p^i \right) = \frac{\left( v^i - p^i \right)^2}{2},
\]
where \( p_i \) is the local price of \( M \) in country \( i \), and \( v^i \) is the willingness to pay. We assume that \( v^H \) is sufficiently high and \( v^F \) is sufficiently low so that in equilibrium Home imports \( M \) and Foreign exports \( M \). The local price \( p^i \) is defined as
\[
p^H \equiv \bar{p}^H + \tau^H = (\bar{p} + \zeta) + \tau^H, \tag{1}
\]
\[
p^F \equiv \bar{p}^F + \tau^F = (\bar{p} + \zeta) + \tau^F, \tag{2}
\]
where \( p^i \) is the price of \( M \) in country \( i \) under free trade, \( \tau^H \) is the import tariff in Home, \( \tau^F \) is the export subsidy in Foreign, \( \bar{p} \) is the price of \( M \) in the world market, and \( \zeta \) is the cost of transporting \( M \) between the world market and the two countries. As in standard economic geography models, we assume that the numeriare is traded freely and is transported costlessly. The role of the transportation cost \( \zeta \) is crucial in our model and will be discussed in section 3.3. The amount of \( M \) imported by country \( i \) is the difference between its domestic demand and supply:
\[
im^i \left( p^i \right) = d^i \left( p^i \right) - x^i,
\]
where \( x^i \) is the amount of capital employed in sector \( M \) in country \( i \).

The social welfare of country \( i \), denoted by \( \omega^i \), is defined as
\[
\omega^i \equiv R^i_l + k^i_N f \left( k^i_N \right) + p^i x^i + cs^i \left( p^i \right) + \im^i \left( p^i \right) \tau^i, \tag{3}
\]
where \( y^i \) is the value of \( y \) in country \( i \). The right hand side of equation (3) is the sum of the return on land, the producer surplus, the consumer surplus and the tariff revenue. Using the capital market clearing condition, \( x^i + k^i_N = \bar{k} \), and equations (1) and (2), we can express \( \omega^i \) in terms of a function of \( x^i \) and \( p^i \) as \( \omega^i = \omega^i \left( x^i, p^i \right) \).

### 3.2 The Lobbying Game

#### The Structure of the Game

In each country, capitalists in sector \( M \) form a lobby group. The lobby group and the government play a lobbying game. The structures of the games in the two countries are identical.

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: Stages 0, 1, and 2. 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 to sign an agreement prohibiting trade policy or not. After the government has made a decision and announced publicly, capitalists learn the state and then allocate their capital between the numeraire sector and the manufacturing sector to maximize their returns on capital. In equilibrium, the capitalists will allocate their capital such that the expected net returns on capital
in both sectors are equalized.

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, in Stage 1 a lobby is formed in sector $M$. No lobby is formed in sector $N$. In country $i$, the lobby and the government negotiate for protection rate $\tau_i$ and political contribution $c_i$. The protection rate $\tau_i$ is set and remain 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, the government commits 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 $\zeta$ decreases permanently from $\zeta_1$ to $\zeta_2$. While the world price $\bar{p}$ is constant for the whole game, the local price ($p_i$) may change due to the change in the transportation cost $\zeta$, as shown in equations (1) and (2).

Stage 2 starts at time $t = 1 - \theta$ and lasts until the game ends at $t = 1$. At the beginning of period 2, capital may move from sector $N$ to sector $M$ to seek a higher rate of return, but capital used in sector $M$ is sunk and stays there forever. In other words, capital cannot move from sector $M$ to sector $N$. 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 overtime.\footnote{We can easily allow for discounting. Note that we can also choose the parameter $\theta$ such that the equilibrium allocation without discounting under the chosen $\theta$ and the equilibrium allocation with discounting are equivalent.}

The lengths of Stages 1 and 2 are $1 - \theta$ and $\theta$, respectively. The term $\theta \in (0, 1)$ can be interpreted as the exogenous speed of capital movement. This capital movement is the main difference between our model and Maggi and Rodriguez-Clare (1998)’s. In Maggi and Rodriguez-Clare (1998), capital cannot move across sectors after the protection rate is announced. Several empirical studies show that there exists a strong relationship between the dynamic of a sector and its protection level.\footnote{Hufbauer and Rosen (1986), Hufbauer, Bediner and Elliot (1986), and Ray (1991) document that declining US industries receive more protections than the other industries. Glismann and Weiss (1980) find that the growth rates of industry income are negatively correlated with the level of protection in Germany between 1880 and 1978.} 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 in the population. Each capitalist can allocate his capital in one sector. Because each capitalist is so rich, his utility from consuming non-numeriare goods and the government transfer is negligible. A capitalist, therefore, maximizes his utility by allocating all his capital in the sector with the highest rate of return.

The payoff of the lobby in country $i$, formed by the capitalists in sector $M$ in period 1, is its net return on its sunk capital and is denoted by $\Lambda^i$:

$$\Lambda^i \equiv (1 - \theta) p_1^i x_1^i + \theta p_2^i x_1^i - c^i x_1^i. \quad (4)$$

The government of country $i$ maximizes the weighted sum of social welfare and political contributions; its payoff is

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

The first and the last terms on the right hand side are the social welfare in period 1 and period 2, respectively. The term $c^i$ is the political contribution per unit of capital and the term $c^i x_1^i$ is the total contribution that the government gets from the lobby in sector $M$. The term $a \geq 0$ is the weight that the government puts on the political contribution relative to the social welfare.7

3.3 Transportation Costs, Growth of Import-competing and Export Sectors, and Free Riders

In this section, we discuss the crucial role of the transportation cost $\zeta$. As mentioned above, the main difference between the export sector (in $F$) and the import-competing sector (in $H$) is that the export sector is expanding but the import-competing sector is not. To have such an outcome, we assume a decrease in the transportation cost in period 2, i.e., $\zeta_2 < \zeta_1$. The decrease in transportation cost has asymmetric effects on the growth rates of the import-competing and export sectors.8

The change in the transportation cost affects the rate of return on capital in the manufacturing according to the following equations:

$$r_1^H = \overline{p} + \zeta_1 + \tau^H - c^H \quad r_1^F = \overline{p} - \zeta_1 + \tau^F - c^F$$
$$r_2^H = \overline{p} + \zeta_2 + \tau^H \quad r_2^F = \overline{p} - \zeta_2 + \tau^F$$

where $r_1^i$ is the rate of return of capital in sector $M$ of country $i$ in period $t$. The terms $\overline{p}$ and $\zeta_t$ are exogenous. The political contribution $c^i$ and the protection rate $\tau^i$ are determined endogenously. In period 1, the rate of return of capital is equal to the local price minus the political contribution.

7For simplicity, we assume that the two governments put the same weight on political contributions.
8Other potential exogenous forces that can drive similar outcomes are technological improvement in the export sector and the progress of tariff reductions that decreases the prices of imports relative to the prices of exports.
In period 2, the rate of return is equal to the local price because there is no political contribution paid in this period.

The changes in the rates of return in sector M in Home and Foreign between periods 1 and 2 are

\[ \triangle r^H = c^H (\cdot) + \Delta \zeta \quad \text{and} \quad \triangle r^F = c^F (\cdot) - \Delta \zeta, \]

where \( \Delta y = y_2 - y_1 \). Capital moves from sector M to sector N if and only if \( \triangle r^i > 0 \). Because the political contribution is always positive (\( c^i > 0 \)), \( \Delta \zeta < 0 \) implies that \( \triangle r^F > 0 \) and the growth in this sector is positive; there is always new capital moving to this sector in period 2. It is worth emphasizing that the capital owners who move capital from sector N to sector M in period 2 free ride on the protection without participating in the lobbying.

On the other hand, whether the import-competing sector in \( H \) grows or not depends on whether \( c^H (\cdot) + \Delta \zeta \) is greater or less than 0. We focus on the case where \( \Delta \zeta < - c^H (\cdot) \) and \( \triangle r^H < 0 \). Under these conditions, there is no incentive for new capital to move in and free ride on the protection in period 2. Moreover, capital cannot move out because it is sunk. All capitalists that benefit from the protection invest their capital in this sector in period 1 and pay for the protection.

Figure 2 shows the growth of capital in the import-competing sector in \( H \) and that in the export sector in \( F \). The solid line shows the growth of the import-competing sector in \( F \), measured by \( \Delta x^F \), as a function of \( \Delta \zeta \). Similarly, the dotted line shows the growth of the export sector in \( H \). For \( \Delta \zeta < \Delta_2 \), in period 2 capital moves to the export sector in \( F \) but no capital moves to the import-competing sector in \( H \). This is the case of our main interest and will be thoroughly discussed in the subsequent sections. For \( \Delta \zeta \in (\Delta_1, \Delta_2) \), there does not exist a subgame perfect equilibrium.\(^9\) For \( \Delta \zeta \in (\Delta_1, 0) \), both the import-competing and export sectors expand and the equilibria of the lobbying games in \( H \) and \( F \) are qualitatively the same.

\(^9\)The non-existence occurs because our model possesses a discontinuity resulted from the assumption that capital in sector \( M \) cannot move to sector \( N \). The assumption causes a big jump in \( c^i (\cdot) \) and non-existence of equilibrium, for some \( \Delta \zeta \).
4 Import Tariffs, Export Subsidies and Trade Agreements

In this section, we solve the lobbying games in Home and Foreign. Section 4.1 analyzes the game in the import-competing sector in Home and studies how committing to a tariff prohibition agreement might help the Home government. Similarly, Section 4.2 analyzes the game in the export sector in Foreign and studies how committing to an export-subsidy prohibition agreement might help the Foreign government. In this paper, for simplicity and tractability, we restrict our attentions to the simple agreements in which tariffs and export subsidies are freely used or completely prohibited. In Section 4.3, we study the conditions under which, it is optimal for the two governments to join an agreement that prohibits export subsides but allows import tariffs.

4.1 Import Tariffs and Import-Tariff Prohibition Agreements

In this section, we study how the Home government might gain from an agreement to prohibit tariffs. We first solve the lobbying game 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.

Import Tariffs in the Absence of Tariff Agreements

Now we are ready to solve the lobbying game in the import-competing sector of Home in the absence of tariff agreements. Throughout the paper, we restrict our attention to interior equilibria in which the levels of capital in all sectors are always positive. To have such interior equilibria, we assume that the marginal productivity of capital in the numeriare sector is not too high or too low and the weight that the government puts on political contributions is not too high:

\[ f(0) > \bar{p} + \zeta_1, \quad \bar{p} - \zeta_1 \geq f(\bar{k}) \geq 0, \quad \text{and} \quad \gamma > a > 0. \] (6)

Because good \( M \) is imported, its local price in period \( i \) is:

\[ p_{1i}^H = p_{1i}^H + \tau^H = \bar{p} + \zeta_i + \tau^H \quad \text{and} \quad p_{1i}^H > p_{2i}^H. \]

As mention in the previous section, we assume a sufficiently large decrease in the transportation cost \( \zeta \) such that the rate of return on capital in sector \( M \) declines and no capital moves from sector \( N \) to sector \( M \) in period 2. The parameter restriction is that

\[ \zeta_2 - \zeta_1 \leq \Delta_2 \leq 0, \] (7)

where

\[ \Delta_2 \leq 0 \]

The WTO bans export subsidies as a membership condition, while tariff levels are negotiated among the WTO members. To focus on the first order distinction between tariffs and export subsidies, this paper abstracts from the negotiation issues.
\[ \bar{p} + \zeta_1 - \Delta_2 = \frac{2 (\bar{p} + \zeta_1) (\gamma - a) (1 - \theta) + a (1 + \sigma) f (\bar{k})}{2\gamma (1 - \sigma) - a (1 - \sigma - 2\theta)}. \]

The lobbying game is solved by backward induction. In period 2, we suppose (and will verify) that \( x_2^H = x_1^H \) in equilibrium; no capital moves from the numeriare sector to the manufacturing sector in period 2.

In period 1, after capital is allocated, the lobby bargains with the government for the tariff rate \( \tau^H \) and political contribution \( c^H \). The bargaining subgame is modeled as a Nash bargaining game in which the status quo is that the government chooses free trade and the lobby pays no contributions. The government’s and the lobby’s bargaining powers are \( \sigma \) and \( 1 - \tau \), respectively. They choose the tariff rate to maximize their joint surplus and then the surplus is divided with respect to their bargaining powers.

In equilibrium, the government and the lobby pick the optimal protection rate \( \bar{\tau}^H (x_1^H) \) that satisfies

\[
\bar{\tau}^H (x_1^H) = \arg\max_{\tau^H} (1 - \theta) \omega^H \left( x_1^H, p_1^H + \tau^H \right) + \theta \omega^H \left( x_2^H, p_2^H + \tau^H \right) + a \left[ (1 - \theta) \left( \bar{p}_1^H + \tau^H \right) + \theta \left( \bar{p}_2^H + \tau^H \right) \right] x_1^H, \tag{8}
\]

where the variable \( \bar{y} \) denotes the value of \( y \) in the subgame perfect equilibrium. The term being maximized is the joint surplus of the two bargaining parties given by equations (4) and (5).

Solving the optimization in equation (8) and using \( \bar{x}_1^H = \bar{x}_2^H \), we obtain

\[
\bar{\tau}^H (\bar{x}_1^H) = a \bar{x}_1^H. \tag{9}
\]

The optimal tariff rate is increasing in \( \bar{x}_1^H \) and \( a \). The larger the values of \( \bar{x}_1^H \) and \( a \), the higher the marginal gain from the tariff. Under Nash bargaining, the contribution \( c^H \) that the government receives from the protection is

\[
c^H (\bar{x}_1^H) = (1 - \sigma) \frac{\Delta^H (\bar{x}_1^H, \bar{\tau}^H^*)}{a \bar{x}_1^H} + \sigma \bar{\tau}^H^*, \tag{10}
\]

where \( \bar{\tau}^H^* = \bar{\tau}^H (\bar{x}_1^H) \). The term \( \Delta^H (.) / a \bar{x}_1^H \) is the adjusted welfare loss per unit of capital generated by the tariff \( \bar{\tau}^H^* \). The last \( \bar{\tau}^H^* \) in this equation is the lobby’s willingness to pay for the protection.

The welfare loss from the protection \( \Delta^H (\bar{x}_1^H, \bar{\tau}^H^*) \) is the difference between the free trade welfare and the welfare under the protection:

\[
\Delta^H (\bar{x}_1^H, \bar{\tau}^H^*) = (1 - \theta) \left[ \omega^H (\bar{x}_1^H, \bar{p}_1^H) - \omega^H (\bar{x}_1^H, \bar{p}_1^H + \bar{\tau}^H^*) \right] + \theta \left[ \omega^H (\bar{x}_2^H (\bar{x}_1^H, 0), \bar{p}_2^H) - \omega^H (\bar{x}_2^H (\bar{x}_1^H, \bar{\tau}^H^*), \bar{p}_2^H + \bar{\tau}^H^*) \right], \tag{11}
\]

13
where \( \bar{x}_2^H (x_1^H, \tau^H) \) is the level of capital in sector M in period 2 as a function of \( x_1^H \) and \( \tau^H \) in the subgame perfect equilibrium. Simplifying and using the supposition that no capital moves to sector M in period 2, \( \bar{x}_2^H (\bar{x}_1^H, \bar{\tau}^H) = \bar{x}_2^H (\bar{x}_1^H, 0) = \bar{x}_1^H \), we have

\[
\triangle^H \left( \bar{x}_1^H, \bar{\tau}^H \right) = \frac{1}{2} \left( \bar{\tau}^H \right)^2 \tag{12}
\]

Substituting equations (9) and (12) into equation (10), we obtain

\[
c^H \left( \bar{x}_1^H \right) = \frac{a \left( 1 + \sigma \right)}{2} \bar{x}_1^H. \tag{13}
\]

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

\[
\Omega^H \left( \bar{x}_1^H \right) \equiv \left( c^H \left( \bar{x}_1^H \right) - \triangle^H \left( \bar{x}_1^H, \bar{\tau}^H \right) \right) \bar{x}_1^H = \frac{a \sigma}{2} \left( \bar{x}_1^H \right)^2. \tag{14}
\]

In period 0, capital is allocated in sectors N and M such that the rates of return in the two sectors are equal. Under the supposition that \( \bar{x}_2^H (\bar{x}_1^H, \bar{\tau}^H) = \bar{x}_1^H \), the levels of capital in the two sectors are determined by

\[
(1 - \theta) f \left( \bar{k} - \bar{x}_1^H \right) + \theta f \left( \bar{p}_1^H + \theta \bar{p}_2^H + \bar{\tau}^H \left( \bar{x}_1^H \right) - c^H \left( \bar{x}_1^H \right) \right) = (1 - \theta) f \left( \bar{k} - \bar{x}_1^H \right) + \theta f \left( \bar{p}_1^H + \theta \bar{p}_2^H + \bar{\tau}^H \left( \bar{x}_1^H \right) - c^H \left( \bar{x}_1^H \right) \right). \tag{15}
\]

The left hand side and the right hand side are the total (periods 1 and 2) return on capital in sectors N and M, respectively. Solving equation (15) for \( \bar{x}_1^H \), we have

\[
\bar{x}_1^H = \frac{(1 - \theta) \bar{p}_1^H + \theta \bar{p}_2^H - f \left( \bar{k} \right)}{2 \gamma - a (1 - \sigma)}. \tag{16}
\]

The government’s welfare under the lobbying game is

\[
\Omega^H = (1 - \theta) \omega^H \left( \bar{x}_1^H, \bar{p}_1^H + \bar{\tau}^H \right) + \theta \omega^H \left( \bar{x}_1^H, \bar{p}_2^H + \bar{\tau}^H \right) + ac^H \left( \bar{x}_1^H \right) \bar{x}_1^H. \tag{17}
\]

Finally, we have to verify the supposition that \( \bar{x}_2^H (\bar{x}_1^H, \bar{\tau}^H) = \bar{x}_2^H (\bar{x}_1^H, 0) = \bar{x}_1^H \). There is no incentive for capital in sector N to move to sector M in period 2 if

\[
f \left( \bar{k} - \bar{x}_1^H \right) \geq \bar{p}_2^H + \bar{\tau}^H. \tag{18}
\]

This condition can be verified by using equations (7), (9), and (16). Because capital in sector M is sunk, the capital in sector M cannot move to seek higher return in sector N and the rates of return on capital in both sectors cannot be equalized. Therefore, in equilibrium the rate of return in sector N is higher than that in sector M. Importantly, the protection raises only the rate of return in sector M. The rate of return on capital in sector N is unaffected by the protection.
Import Tariff Prohibition Agreements

Now, we allow the Home government to have an opportunity to precommit to an agreement that prohibits import tariffs before the lobbying game begins. Under the agreement, no lobbies are formed and the tariff rate is zero. In this section, we solve for the government welfare under the agreement. Then we show the condition under which the government is better off given the agreement.

Under the agreement, the expectation for protection is eliminated and no lobbies are formed; \( c^H = 0 \) and \( \tau^H = 0 \). Because the local price of \( M \) decreases but the capital in sector \( M \) is sunk and cannot move to sector \( N \), the level of capital in sector \( M \) in period 2 \( (x_2^H) \) is equal to that in period 1: \( x_2^H = x_1^H \).

The level of capital sector \( M \) in period 1 \( (x_1^H) \) is determined by

\[
f \left( \bar{k} - \bar{x}_1^H \right) = (1 - \theta) p_1^H + \theta p_2^H.
\]

(19)

Therefore, the equilibrium allocation of capital is

\[
\bar{x}_1^H = \frac{(1 - \theta) p_1^H + \theta p_2^H - (1 + \theta) f(\bar{k})}{\gamma (1 + \theta)},
\]

(20)

where \( y \) denotes the value of \( y \) under the agreement.

Equations (16) and (20) implies that

\[
\bar{x}_1^H - x_1^H = \frac{\bar{\tau}^H (\bar{x}_1^H) - c^H (\bar{x}_1^H)}{\gamma} = \frac{1 - \sigma}{2\gamma} a \bar{x}_1^H > 0.
\]

(21)

This shows that the lobbying creates over-investment in sector \( M \), i.e., \( \bar{x}_1^H > x_1^H \). This result is intuitive. The tariff protection, which raises the return on capital in sector \( M \) in both periods, attracts more capital in sector \( M \).

Under the tariff prohibition agreement, the government welfare is

\[
\Omega^H = (1 - \theta) \omega^H (x_1^H, p_1^H) + \theta \omega^H (\bar{x}_2^H, \bar{p}_2^H).
\]

(22)

The government gains from committing to the agreement if

\[
\Omega^H - \bar{\Omega}^H = \frac{a^2 \left( (1 - \theta) p_1^H + \theta p_2^H - (1 + \theta) f(\bar{k}) \right)^2 \left( 4\gamma \sigma - (1 - \sigma)^2 \right)}{2\gamma (2\gamma - a (1 - \sigma))^2} > 0
\]

This statement holds if and only if \( \sigma < \bar{\sigma} (\gamma) = 1 - 2 \left( \sqrt{\gamma^2 + \gamma} - \gamma \right) \).\footnote{Note that for \( \bar{\sigma} \in (0, 1) \), \( \bar{\sigma} (\gamma) \) is decreasing in \( \gamma \) (the marginal product of capital in the numeriare sector), \( \lim_{\gamma \to 0^+} \bar{\sigma} (\gamma) = 1 \), and \( \lim_{\gamma \to \infty} \bar{\sigma} (\gamma) = 0 \).} Proposition 1 summarizes the above result.
**Proposition 1.** The government gains from the tariff prohibition agreement if and only if \( \sigma < \bar{\sigma} (\gamma) \), where \( \bar{\sigma} (\gamma) = 1 - 2 \left( \sqrt{\gamma^2 + \gamma} - \gamma \right) \).

According to equation 21, when the government commits to the tariff prohibition agreement, the over-investment in the import-competing sector in period 1 is eliminated. The government with a low bargaining power \( \sigma < \bar{\sigma} (\gamma) \) gains from the agreement because the political contribution loss is smaller than the welfare loss from the tariff protection.\(^{12}\) Figure 3 illustrates this result. The horizontal and vertical axes show the values of \( \sigma \) and \( \theta \), respectively. The \( G^\mu \) and \( L^\mu \) regions are the regions in which the government gains and loses from the agreement, respectively.

As \( \gamma \to \infty \), the over-investment \( (\bar{x}_1^H - \bar{x}_1^H) \) in sector \( M \) approaches zero. This is because the marginal product of capital in sector \( N \) largely responds to a change in capital. While the tariff protection incentivizes capital to move toward sector \( M \), a large increase in the return on capital in sector \( N \) discourages the capital movement. As a result, when \( \gamma \) increases, the over-investment inefficiency is reduced. Since the welfare loss from over-investment is smaller, the benefit from the tariff prohibition agreement disappears.

With the same intuition, the over-investment becomes larger as \( \gamma \to 0 \), committing to the trade agreement becomes more beneficial and the \( G^\mu \) region is larger. Figure 4 shows an example of the relationship between the deadweight loss (the gray triangle) and \( \gamma \) in an environment where \( \sigma = 0 \). The larger the slope of the marginal product of capital, the smaller the deadweight loss.

### 4.2 Export Subsidies and Export Subsidy Agreements

In this section, we consider the lobbying game in the export sector of Foreign. Unlike that in Section 4.1, \( M \) is exported and the lobby group lobbies for an export subsidy rather than a tariff. In addition, because \( M \) is exported, its local price is in period \( i = \{1, 2\} \) is

\[
p_i^F = p_i^F + \tau^F = \bar{p} - \zeta_i + \tau^F \quad \text{and} \quad p_1^F < p_2^F.
\]

\(^{12}\)A similar result is found in Maggi and Rodriguez-Clare (1998).
Figure 4: The relationship between $\gamma$ and the deadweight loss

A reduction in the transportation cost raises the local price $p^F_{i}$. As a result, sector $M$ grows and capital moves to the sector in period 2, i.e., $x^F_2 > x^F_1$.

Export Subsidies

Similar to Section 4.1, the lobbying game in the absence of agreements on export subsidies is solved backward. In period 2, after the increase in the local price ($p^F_{i}$), capital moves from sector $N$ to sector $M$ until the rates of return in the two sectors are equalized. In equilibrium, capital allocation is determined by $f\left(\bar{k} - \bar{x}^F_2\right) = p^F_2 + \tau^F$. This implies that

$$\bar{x}^F_2 \left(\bar{x}^F_1, \tau^F\right) = \bar{x}^F_2 \left(\frac{p^F_2 + \tau^F - f\left(\bar{k}\right)}{\gamma}\right).$$ (23)

The rate of return on capital is raised to $p^F_2 + \tau^F$ in sectors $N$ and $M$; this is contrary to that in the tariff case in which the protection $\tau^H$ raises only the return on the sunk capital in sector $M$. In the export case, not only do the capitalists in the lobby group benefit from the protection, but the other capitalists also get a positive externality and free ride on the protection.

When negotiating in period 1, the government and the lobby foresee the last period outcome, and they choose the optimal subsidy rate that maximizes their joint welfare. The optimal subsidy rate satisfies

$$\bar{\tau}^F \left(x^F_1\right) = \arg\max_{\tau^F} \left((1 - \theta)\omega^F \left(x^F_1, p^F_{1} + \tau^F\right) + \theta\omega^F \left(x^F_2, p^F_{2} + \tau^F\right)
+ a \left[(1 - \theta) \left(p^F_1 + \tau^F\right) + \theta \left(p^F_2 + \tau^F\right)\right] x^F_1\right).$$

Solving the optimization problem using equation (23), we obtain

$$\bar{\tau}^F \left(x^F_1\right) = \frac{\gamma}{\gamma + \theta a \bar{x}^F_1}. \quad (24)$$
Comparing this $\tilde{\tau}^F (\tilde{x}_1^F)$ in equation (24) with the $\tilde{\tau}^H (\tilde{x}_1^H)$ in equation (9), we observe that $\tilde{\tau}^F (x) \leq \tilde{\tau}^H (x)$ for all $x > 0$. In other words, given the same 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. We show that the subsidy rate is lower because the marginal benefit that the government and the lobby receive from the protection is eroded and free ridden by the capital owners who move their capital from sector $N$ to sector $M$ in period 2.

The social welfare loss from the subsidy is

$$\Delta^F (\tilde{x}_1^F, \tilde{\tau}^F) \equiv (1 - \theta) \left[ \omega^F (\tilde{x}_1^F, \tilde{p}_1^F) - \omega^H (\tilde{x}_1^F, \tilde{p}_1^F + \tilde{\tau}^F) \right] \theta \left[ \omega^F (\tilde{x}_2^F (0), \tilde{p}_2^F) - \omega^F (\tilde{x}_2^F (\tilde{\tau}^F), \tilde{p}_2^F + \tilde{\tau}^F) \right].$$

This welfare loss can be simplified to

$$\Delta^F (\tilde{x}_1^F, \tilde{\tau}^F) = \gamma + \theta \frac{a}{2(\gamma + \theta)} \tilde{x}_1^F. \quad (25)$$

where $\tilde{\tau}^F = \tilde{\tau}^F (\tilde{x}_1^F)$. Comparing this equation with equation (12), we observe that the export subsidy in Foreign generates more welfare loss than the tariff in Home with the same level. Substituting equations (25) and (24) into equation (10) gives the equilibrium contribution in this lobby game:

$$c^F (\tilde{x}_1^F) = \frac{\gamma a (1 + \sigma)}{2(\gamma + \theta)} \tilde{x}_1^F. \quad (26)$$

The net benefit to the Government from the protection is

$$g^F (\tilde{x}_1^F) \equiv \left( c^F (\tilde{x}_1^F) - \frac{\Delta^F (\tilde{x}_1^F, \tilde{\tau}^F)}{a} \right) \tilde{x}_1^F = \frac{\gamma a \sigma}{2(\gamma + \theta)} \left( \tilde{x}_1^F \right)^2. \quad (27)$$

The total protection surplus to the two bargaining parties receive is:

$$g^F (x_1^F; \sigma = 1) = \frac{\gamma a}{2(\gamma + \theta)} \left( \tilde{x}_1^F \right)^2. \quad (27)$$

The higher the value of $\theta$ is, the faster the new capital moves to sector $M$ in period 2 and erodes the protection surplus. The entrance of new capital amplifies the deadweight loss through over-investment in period 2.

In period 0, capital is allocated such that the rates of return in the two sectors are equal:

$$(1 - \theta) f \left( \tilde{k} - \tilde{x}_1^F \right) + \theta f \left( \tilde{k} - \tilde{x}_2^F (\tilde{\tau}^F) \right) = (1 - \theta) \tilde{p}_1^F + \theta \tilde{p}_2^F + \tilde{\tau}^F - c^F (\tilde{x}_1^F). \quad (28)$$

The left hand side and the right hand side are the total (periods 1 and 2) returns on capital allocated in sector $N$ and sector $M$, respectively. Simplifying equation (28) by using equations (24)

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13This asymmetry was discussed by Rodrik(1995).
and (26), we have

\[ f\left(\bar{k} - \tilde{x}_1^F\right) = \bar{p}_1^F + \tilde{\tau}^F \left(\tilde{x}_1^F\right) - \frac{1}{1 - \theta} c^F \left(\tilde{x}_1^F\right) = \bar{p}_1^F + \frac{(1 - 2\theta - \sigma) a^F}{2(1 - \theta)(\gamma + \theta)} \tilde{x}_1^F. \]  

(29)

Substituting equation (24) and (26) into equation (29) leads to

\[ \tilde{x}_1^F = \frac{2(1 - \theta)(\gamma + \theta)}{\gamma h(\theta)} \left(\bar{p}_1^F - f\left(\bar{k}\right)\right). \]  

(30)

where \( h(\theta) = 2\gamma - a (1 - \sigma) + 2\theta (a + 1 - \theta - \gamma) \).

According to equation (30), the derivative of \( \tilde{x}_1^F \) with respect to \( \theta \) is

\[ \frac{\partial \tilde{x}_1^F}{\partial \theta} = -\frac{2aJ(\sigma) \left(\bar{p}_1^F - f\left(\bar{k}\right)\right)}{\gamma h(\theta)} < 0, \]  

(31)

where \( J(\theta) = \sigma (\gamma + 2\theta - 1) + \gamma - 1 - 2\theta (1 - \theta) \).

From equations (27) and (31), we obtain

\[ \frac{dS}{d\theta} = \frac{\partial S}{\partial \theta} + \frac{\partial S}{\partial \tilde{x}_1^F} \frac{\partial \tilde{x}_1^F}{\partial \theta} < 0 \]  

(32)

Intuitively, when \( \theta \) increases, the free-rider problem is more severe and the incentive to invest capital in sector \( M \) in period 1 decreases, as demonstrated by equation (31). Therefore, as shown by equation (32), the rent that the government receives from protection is decreasing in \( \theta \).

Under this game, the government welfare is

\[ \tilde{\Omega}^F = (1 - \theta) \omega^F \left(\tilde{x}_1^F, \bar{p}_1^F + \tilde{\tau}^F\right) + \theta \omega^F \left(\tilde{x}_1^F, \bar{p}_2^F + \tilde{\tau}^F\right) + ac^F \left(\tilde{x}_1^F\right) \tilde{x}_1^F. \]  

(33)

Export Subsidy Prohibition Agreements

Now suppose that the Foreign government commits to an export subsidy prohibition agreement before the lobbying game begins. Under this agreement, there is no lobbying and \( \tau^F = 0 \). In period 2, after the local price of \( M \) increases due to the decrease in the transportation cost, capital moves from sector \( N \) to sector \( M \). In equilibrium, the sunk capital constraint \( (x_1^E \geq x_2^E) \) is not binding. Therefore, the equilibrium capital allocations in periods 1 and 2 satisfy

\[ f\left(\bar{k} - \tilde{x}_1^E\right) = \bar{p}_1^E \]  

and

\[ f\left(\bar{k} - \tilde{x}_2^E\right) = \bar{p}_2^E. \]  

(34)

The equilibrium capital allocations can be solved explicitly as

\[ \tilde{x}_1^E = \frac{\bar{p}_1^E - f\left(\bar{k}\right)}{\gamma} \]  

and

\[ \tilde{x}_2^E = \frac{\bar{p}_2^E - f\left(\bar{k}\right)}{\gamma}. \]  

(35)
Under the agreement, the government welfare is

$$\Omega^F = (1 - \theta) \omega^F \left( x^F_1, p^F_1 \right) + \theta \omega^F \left( x^F_2, p^F_2 \right).$$

(36)

Combining equations (29) and (34), we have

$$\tilde{x}^F_1 - x^F_1 \begin{cases} > 0 & \text{if } 1 - \sigma > 2\theta \\ = 0 & \text{if } 1 - \sigma = 2\theta \\ < 0 & \text{if } 1 - \sigma < 2\theta \end{cases}$$

Figure 5 shows the over-investment and under-investment regions. In the northeast region of Figure 5, where $\theta$ and $\sigma$ are sufficiently high such that $1 - \sigma < 2\theta$, lobbying creates under-investment in period 1 because of two reasons. First, the rate of return from investing capital in sector $M$ in period 1 is small because the lobby’s bargaining power $(1 - \sigma)$ is small. Second, high $\theta$ results in a high incentive for capitalists to invest in sector $N$ in period 1 and to wait to free ride on the positive externality from the protection. These two effects together result in under-investment in period 1. On the other hand, in the southwest region of Figure 5, the lobbying creates over-investment in period 1.

Using equations (33) and (36), the government’s gain from committing to the export subsidy prohibition agreement is

$$\Omega^F - \tilde{\Omega}^F = \frac{a^2 \left( \frac{p^F_1}{f} - \left( \frac{1}{k} \right) \right)^2 (1 - \theta)}{2\gamma [a (1 - \sigma) - 2 (1 - \theta) (\gamma + \theta - a) - 2a]^2} Q (\sigma, \theta),$$

(37)

where $Q (\sigma, \theta) \equiv 4\theta (\theta (1 + \sigma) - 1) - 4\gamma \sigma (1 - \theta) + (1 - \sigma)^2$. The government gains from committing to the agreement for $Q (\sigma, \theta) > 0$ and loses for $Q (\sigma, \theta) < 0$. Figure 6 shows the $G^\chi$ and $L^\chi$ regions in which the government gains and loses from the subsidy agreement, respectively. The shapes of these two regions depend only on the values of $\theta$ and $\sigma$.

From the property of $Q (\sigma, \theta)$, the government gains if $\theta$ is sufficiently high or $\theta$ and $\sigma$ are sufficiently low. The intuition is as follows. In the first case, the government gains from the agreement, if the political contribution loss is less than the welfare loss caused by the anticipation for protection in period 1. As $\theta$ approaches one, period 1 gets shorter and the welfare loss and the political contribution drop to zero (from equations (26) and (31)). However, the political contribution drops at a faster rate; the increase in $\theta$ has two negative effects on the total contribution: the size of the protected sector, $\tilde{x}^F_1$, and the political contribution per unit of capital, $c^F \left( \tilde{x}^F_1 \right)$, decrease. Therefore, for $\theta$ 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 $\sigma$ and $\theta$ are low, the government also gains from committing to the agreement because the agreement helps the government eliminate over-investment in period 1.

Proposition 2 summarizes this finding.
Proposition 2. The government gains from the agreement to prohibit export subsidies if and only if (i) \( \theta \) is sufficiently high or (ii) \( \theta \) and \( \sigma \) are sufficiently low.

Now, we study the comparative statistics of the \( G^X \) and \( L^X \) regions in Figure 6. Because the function \( Q \) has only one parameter (\( \gamma \)), the shapes of the \( G^X \) and \( L^X \) regions depend only on \( \gamma \). To study how these regions change as \( \gamma \) changes, we consider the two extreme cases: \( \gamma \to 0 \) and \( \gamma \to \infty \). Figures 7 shows the \( G^X \) and \( L^X \) regions, generated numerically for \( \gamma \to 0 \). Comparing Figure 6 with Figure 7, we see that the \( L^X \) region shrinks and the \( G^X \) region grows as \( \gamma \) drops to zero. The term \( \gamma \) is the slope of the demand for capital in the each numeriare sector; it is positively related to the elasticity of the demand for capital in this sector. The higher the value of \( \gamma \) is, the more responsive is the demand for capital to the change in the rate of return in the numeriare sector. As discussed in Section 4.1, for \( \gamma \to 0 \), investment is highly responsive to the protection. The over-investment or under-investment in period 1 caused by lobbying is high and the agreement brings more benefit to the government. Therefore, the \( G^X \) region gets larger as \( \gamma \to 0 \). On the other hand, in Figure 8, for \( \gamma \to \infty \), investment in period 1 is irresponsive to protection, the agreement has no benefit to the government and the \( G^X \) region disappears.

4.3 Optimal (Simple) Agreements

In this section, we suppose that Home and Foreign are under an international trade agreement on tariffs and subsidies. We find the condition in which it is optimal for the agreement to ban export subsidies but allow import tariffs.

Figure 9 combines figures 3 and 6. Consider the most interesting region of Figure 9 – the northeast region. In this region, the agreement that prohibits only export subsidies is optimal compared to the following simple agreements: (i) the agreement that prohibits both tariffs and export subsidies, (ii) the agreement that prohibits only tariffs, (iii) the agreement that prohibits only export subsidies, and (iv) the agreement that prohibits nothing. Proposition 3 concludes the
Figure 6: Gain ($G^\chi$) and Loss ($L^\chi$) from the Subsidy Prohibition

Figure 7: Gain ($G^\chi$) and Loss ($L^\chi$) from the Subsidy Prohibition ($\gamma \to 0$)

Figure 8: Gain ($G^\chi$) and Loss ($L^\chi$) from the Subsidy Prohibition ($\gamma \to \infty$)
main result of this paper.

**Proposition 3.** *For sufficiently high* $\sigma$ *and* $\theta$, *the agreement that prohibits only export subsidies is optimal among the simple agreements.*

As mentioned above, whether the Home government gains or loses from an agreement to prohibit tariffs depends only on its bargaining power ($\sigma$). With a sufficiently high bargaining power, the Home government receives large political contributions from using tariffs and an agreement to prohibit tariffs is not desirable. On the other hand, whether an agreement to prohibit export subsidies is desirable to the Foreign government or not depends on $\theta$ and $\sigma$. For a sufficiently high $\theta$, the political contribution that the Foreign government receives from export subsidies are highly eroded by free riders and the government would be better off when committing to prohibit export subsidies. Therefore, for sufficiently high $\sigma$ and $\theta$, the optimal agreement is the one that prohibits only export subsidies.

## 5 Conclusion

In this paper, we propose a simple small-country model to explain the asymmetric treatment between import tariffs and export subsidies in the WTO. In our model, the anticipation for protection creates inefficient investment. A government may choose to commit to a tariff prohibition agreement and/or export subsidy prohibition agreement to eliminate this anticipation and to have a social welfare gain. However, when committing to these agreements, the government loses the political contributions collected from protection. Therefore, the government commits to a trade agreement, if the social welfare gain is greater than the loss in political contributions.

In an environment where transportation costs are decreasing, export sectors grow and import-competing sectors decline. In export sectors, export subsidies attract new entrants and investment.
These entrants erode the protection rent. The rent that the government can get from protecting these sectors is, therefore, small. On the other hand, import-competing sectors decline. In these sectors, the return on capital drops. Capital is sunk and cannot move out. This sunk capital allows protection to raise the rate of return in these sectors without attracting entry as long as the rate of return on the sunk capital is lower than the normal rate of return. The protection rent in import-competing sectors is not eroded by new entrants and the government may extract large political rent. In this environment, we find that under the condition in which the government has a high bargaining power and capital moves fast, the optimal agreement prohibits only export subsidies and allows the use of tariffs.

References


