

Potipiti, Tanapong

Working Paper

Import tariffs and export subsidies in the World Trade Organization: A small-country approach

ARTNeT Working Paper Series, No. 119

Provided in Cooperation with:

Asia-Pacific Research and Training Network on Trade (ARTNeT), Bangkok

Suggested Citation: Potipiti, Tanapong (2012) : Import tariffs and export subsidies in the World Trade Organization: A small-country approach, ARTNeT Working Paper Series, No. 119, Asia-Pacific Research and Training Network on Trade (ARTNeT), Bangkok

This Version is available at:

<https://hdl.handle.net/10419/64316>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Asia-Pacific Research and Training Network on Trade

Import tariffs and export subsidies in the World Trade Organization: A small-country approach

By Tanapong Potipiti

No. 119/September 2012

ARTNeT Working Paper Series

The ARTNeT Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about trade issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. ARTNeT working papers are available online at www.artnetontrade.org. All material in the working papers may be freely quoted or reprinted, but acknowledgment is requested, together with a copy of the publication containing the quotation or reprint. The use of the working papers for any commercial purpose, including resale, is prohibited.

Asia-Pacific Research and Training Network on Trade (ARTNeT) is an open regional network of research and academic institutions specializing in international trade policy and facilitation issues. IDRC, UNCTAD, UNDP, ESCAP and the WTO, as core network partners, provide substantive and/or financial support to the network. The Trade and Investment Division of ESCAP, the regional branch of the United Nations for Asia and the Pacific, provides the Secretariat of the network and a direct regional link to trade policymakers and other international organizations.

Disclaimer:

The opinion, figures and estimates are the responsibility of the authors and should not be considered as reflecting the views or carrying the approval of the United Nations, ARTNeT members, partners or authors' employers.

ARTNeT Working Paper Series
No. 119/September 2012

**Import tariffs and export subsidies
in the World Trade Organization:
A small-country approach**

*By Tanapong Potipiti**

Please cite this paper as:

Potipiti, Tanapong, 2012. Import tariffs and export subsidies in the World Trade Organization: A small – country approach. ARTNeT Working Paper No. 119, September, Bangkok, ESCAP. Available from www.artnetontrade.org.

* Tanapong Potipiti, is a Lecturer in Economics at Chulalongkorn University, Bangkok, Thailand. The author is grateful to Robert Staiger, Yeon-Cho Che, John Kennan, Bijit Bora, Kiriya Kulkolkarn and the participants in the WTO seminar for their helpful comments. The author also thanks WTO for its financial support. The opinion, figures, and estimates are the responsibility of the authors and should not be considered as reflecting the views or carrying the approval of the United Nations. Any remaining errors are the responsibility of the author, who can be contacted by e-mail at Tanapong.P@chula.ac.th.

Contents

1. Introduction.....	6
2. Basic story	8
3. Basic model.....	9
4. Import tariffs, export subsidies and trade agreements	15
5. Conclusion.....	27
References	28

Import tariffs and export subsidies in the World Trade Organization: A small-country approach

Tanapong Potipiti

Abstract

This paper develops a simple small-country model to explain why the World Trade Organization (WTO) prohibits export subsidies but allows import tariffs. 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 and lower transportation costs, import-competing sectors decline but export industries grow. In the growing export industries, the surplus generated by protection is eroded by new entrants. Therefore, the rent that governments gain from protecting the export sectors by using export subsidies is small. On the other hand, in the import-competing sectors, capital is sunk and no new entrants erode the protection rent. Therefore, governments can get large political contributions from protecting these import-competing sectors. This paper shows that under fast capital mobility, governments with a high bargaining power are better off than with a trade agreement that allows import tariffs but prohibits export subsidies.

JEL code: F13, F53

Key words: Export subsidy agreement, import tariff, WTO

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.¹ 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 explain why governments use export subsidies policies in the absence of a trade agreement. According to the standard theories, 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, that government will choose export subsidies. This approach has the following implication: 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, this positive externality is internalized, encouraging export subsidies. However, this result contradicts the WTO rule prohibiting export subsidies.

Another relevant strand of literature concerns strategic trade policy. In the seminal paper by Brander and Spencer (1985), export sectors compete in a Cournot fashion within a model with two large exporting countries and one importing country. Export sectors compete in a Cournot fashion. They show that in the non-cooperative equilibrium export subsidies are optimal for governments of the exporting countries. However, the welfare of the two exporting countries improves when both agree to limit export subsidies. Bagwell and Staiger (2001) studied a model similar to that given in Brander and Spencer (1985) in a standard partial-equilibrium setting; they found the same result under the condition that exporting governments' political concerns weighed heavily on producer surplus. Furthermore, they showed that although an exporting government gained when limiting export subsidies, the

¹ Among the representatives of the standard theories are: Johnson, 1954; Grossman and Helpman, 1995; Levy, 1999; and Bagwell and Staiger, 1999.

outcome was 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.

The studies discussed above are based on large-country models. Trade agreements are instruments to 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, Tornell, 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 to eliminate tariffs and export subsidies.

Maggi and Rodriguez-Clare (2005a and 2005b) developed a model in which trade agreements were motivated both by terms-of-trade and domestic commitment problems. Their model is novel in the following aspects: (a) 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 (b) lobbying occurs in two stages - when the agreement is designed³ (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 WTO. In WTO, a country may choose its own tariff binding level in exchange for concessions. On the contrary, export subsidies are completely prohibited with few exceptions. In this paper, a simple small-country model is proposed, using the commitment approach to explain this asymmetry.

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 at this stage, special interest groups might lobby for the values of the tariff and export subsidy ceilings.

The paper is organized as follows. Sections 1 and 2 describe the basic story and the basic model, respectively. Section 3 studies how a government values a tariff prohibition agreement and an export subsidy prohibition agreement differently, and under what conditions it is optimal for a government to join an agreement that prohibits only export subsidies. Section 4 provides the conclusion.

Table 1. United States import-competing and export manufacturing industries, 1992-1997

Industries (Ind.)	Annual growth rates of no. of plants (%)	Number of industries
Import-competing industries		
Ind. with $m/s > 15\%$	-0.63	176
Ind. with $m/s > 20\%$	-0.45	15
Ind. with $m/s > 25\%$	-0.01	120
Export industries		
Ind. with $x/s > 15\%$	0.37	155
Ind. with $x/s > 20\%$	0.41	105
Ind. with $x/s > 25\%$	0.32	77
All manufacturing	0.37	387

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

2. Basic story

In order to explain the asymmetric treatment of export subsidies and import tariffs in WTO, this paper incorporates dynamics into the model. The main dynamic force in the model is decreasing transportation costs that 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 and 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, for example, Baldwin and Gu, 2004, and Bernard and Jensen, 2002) show that given that other things being 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 this paper, which finds that, in general, as transportation costs decrease over time, export industries grow but import-competing industries shrink. Table 1 shows the growth rates in the number of United States 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 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.

Table 2. OLS estimates

$g_{p,i}$	=	0.38	+	$0.017x_i/s_i$	-	$0.005m_i/s_i$
		(p-value=0.91)		(p-value=0.08)		(p-value=0.05)
$R^2 = 0.02$		Number of Observations = 258				

Data source: See the note in table 1.

Note: $R^2 = 0.02$ Number of observations = 258 ; $g_{p,i}$, 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 $x/s > 0.1$ or $m/s > 0.1$ are included in the regression.

Turning to the theoretical model, government welfare is the weighted sum of social welfare and political contributions. A 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 this, consider the case where a 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 a 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 that 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. A government can receive high rent from protecting these import-competing sectors. Consequently, an agreement that prohibits tariffs and precludes lobbying is not desirable.

3. Basic model

3.1. Economic environment

For simplicity and clarity, this paper's model consists of two small open countries: Home (H) and Foreign (F). Unlike the standard two-country models, in this model, the two countries are completely separable. Home has a lobbying game in its import-competing sector.

⁴ A similar idea was employed by Grossman and Helpman (1996), and Baldwin and Robert-Nicoud (2002) to explain why declining industries got more protection than growing industries.

On the other hand, Foreign has a lobbying game in its export sector. Note that another way to think about this paper's model is to think of a small country with an import-competing sector and an export sector that are completely separable.

The two countries produce and consume two goods: Numeraire (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 both for the production of N and of 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:

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

where k_N and l_N are, respectively, the levels of capital and land employed in the production of N . The term γ is the slope of the demand for capital in sector N . The total rent on land is:

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

Manufacturing production uses only capital. One unit of capital is required to produce one unit of M .

The demand for M (d^i) and the consumer surplus (cs^i) of country $i \in \{H, F\}$ from consuming M are:

$$d^i(p^i) = v^i - p^i \quad \text{and} \quad cs^i(p^i) = \frac{(v^i - p^i)^2}{2}$$

where p^i is the local price of M in country i . It is assumed that v^H is sufficiently high and v^F is sufficiently low that Home imports M and Foreign exports M . The local price p^i is defined as:

$$p^H \equiv \bar{p}^H + \tau^H = (\bar{p} + \zeta) + \tau^H \quad (1)$$

$$p^F \equiv \bar{p}^F + \tau^F = (\bar{p} - \zeta) + \tau^F \quad (2)$$

where \bar{p}^i is the price of M in country i under free trade, τ^H and τ^F are, respectively, the import tariff in Home and export subsidy in Foreign, \bar{p} is the price of M in the world market, and ζ is the cost of transporting M between the world market and the two countries. As in standard

economic geography models, it is assumed that the numeraire is traded freely and is transported without cost. The role of the transportation cost ζ is crucial in this model and is discussed in subsection 2.3. The amount of M imported by country i is the difference between its domestic demand and supply:

$$im^i(p^i) = d^i(p^i) - x^i$$

where x^i is the amount of capital employed in sector M in country i . The social welfare of country i (w^i) is defined as:

$$\omega^i \equiv R_l^i + k_N^i f(k_N^i) + p^i x^i + cs^i(p^i) + im^i(p^i)\tau^i \quad (3)$$

where y^i is the value of y in country i . The RHS of (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: $x^i + k_N^i = \bar{k}$, (1) and (2), w^i can be expressed as a function of x^i and p^i ; $w^i = w^i(x^i, p^i; v^i, \bar{p}, \zeta)$.

3.2. The lobbying game

3.2.1. Structure of the game

In each country $i \in \{H, F\}$, a lobbying game is played by the government, the capitalists and the lobbies formed by capitalists in sector M . The structure of the games in the two countries is identical.

As a normalization, the length of the game is 1. Let $t \in [0,1]$ be the time index of the game. For simplicity, no payoff discounting overtime is assumed. The world price \bar{p} is constant for the whole game. However, the local price under free trade (p^i) may change due to the change in the transportation cost ζ , as shown in equations (1) and (2).

At time $t = 0$, each capitalist allocates all his capital in a sector. After capital is allocated, 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 τ^i and political contribution c^i . The protection rate τ^i is set and unchanged for the whole game. Then the lobby pays the political contribution and no more contributions will be paid in the game.

In period $t \in (0, 1 - \theta)$, goods are produced and traded. At time $t = 1 - \theta$, capital can be moved from sector N to sector M in order to seek a higher rate of return. On the other hand, once capital is employed in sector M , it is sunk and stays there forever. Therefore, capital cannot move from sector M to sector N . The term $\theta \in (0,1]$ can be interpreted as the speed of capital movement; it is negatively related to adjustment costs of capital. This capital movement

is the main difference between the model in this paper and that of Maggi and Rodriguez-Clare (1998). In Maggi and Rodriguez-Clare (1998), capital cannot move across sectors after the protection rate is announced. Several empirical studies show that a strong relationship exists between the dynamic of a sector and its protection level.⁵

In period $t \in (1-\theta, 1]$, goods are produced and traded. There is no capital movement in this period. The game ends at $t = 1$.

For notational convenience, period 0 is defined as the period where $t = 0$, period 1 as the period where $t \in (0, 1 - \theta)$ and period 2 as the period where $t \in [1 - \theta, 1]$.⁶ With this notation, the game can be summarized as:

(a) Timing

- In period 0, capital is allocated in each sector.
- In period 1, a lobby is formed in sector M of each country. The government and the lobby bargain over the protection rate and political contributions. The protection rate is set and unchanged until the end of the game. The lobby pays the political contribution. Trade and production start.
- In period 2, capital may move from sector N to sector M to seek a higher rate of return.

(b) Other assumptions

- The lengths of periods 0, 1 and 2 are 0, 0 and $1 - \theta$, respectively.
- Capital in sector M is sunk: $x_1^i \geq x_2^i$. Note that a subscript denotes a time period.

3.2.2. Payoffs

In this subsection, the payoff of each player is defined starting with the capitalists, who 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 (Λ^i):

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

⁵ Hufbauer and Rosen (1986), Hufbauer, Berliner and Elliot (1986), and Ray (1991) documented the fact that declining United States industries received more protection than the other industries. Glismann and Weiss (1980) found that the growth rates of industry income were negatively correlated with the level of protection in Germany between 1880 and 1978.

⁶ As $\theta \rightarrow 0$, period 2 disappears and the model becomes a special case in Maggi and Rodriguez-Clare, 1998.

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

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

The first and the last terms on the RHS are the social welfare in periods 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*

This subsection discusses the crucial role of the transportation cost ζ . 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, a drop is assumed in the transportation cost in period 2: $\zeta_2 < \zeta_1$. The drop 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 of capital in the manufacturing according to the following equations:

$$r_1^H = \bar{p} + \zeta_1 + \tau^H(\cdot) - c^H(\cdot) \quad \text{and} \quad r_1^F = \bar{p} - \zeta_1 + \tau^F(\cdot) - c^F(\cdot) \quad (6)$$

$$r_2^H = \bar{p} + \zeta_2 + \tau^H(\cdot) \quad \text{and} \quad r_2^F = \bar{p} - \zeta_2 + \tau^F(\cdot). \quad (7)$$

where r_t^i is the rate of return of capital in sector M, in country i and in period t . The terms \bar{p} and ζ_t are exogenous. The political contribution c^i and the protection rate τ^i are determined endogenously. In period 1, the rate of return of capital is the local price ($\bar{p} + \zeta_1 + \tau^i$) minus the political contribution (c^i). In period 2, the rate of return is just the local price because there is no political contribution paid in this period.

The change in the rate of return in sector M in country $i \in \{H, F\}$ between periods 1 and 2 is:

$$\Delta r^H = c^H(\cdot) + \Delta\zeta \quad \text{and} \quad \Delta r^F = c^F(\cdot) - \Delta\zeta \quad (8)$$

⁷ For simplicity, it is assumed that the two governments put the same weight on political contributions.

⁸ Other 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.

where $\Delta y = y_2 - y_1$. Capital moves from sector M to sector N if, and only if, $\Delta r^j > 0$. Because the political contribution is always positive ($c^i > 0$), $\Delta \zeta < 0$ implies that $\Delta r^F > 0$ 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 owners of capital moved 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. This paper focuses on the case where $\Delta \zeta < -c^H(\cdot)$ and $\Delta r^H < 0$. 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 1 shows the growth of capital in the import-competing sector in H as well as in the export sector in F . The solid line shows the growth of the import-competing sector in F , measured by Δx^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 main area of interest of this paper and is thoroughly discussed in the subsequent sections. For $\Delta \zeta \in (\Delta_1, \Delta_2)$, a sub-game perfect equilibrium does not exist.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.

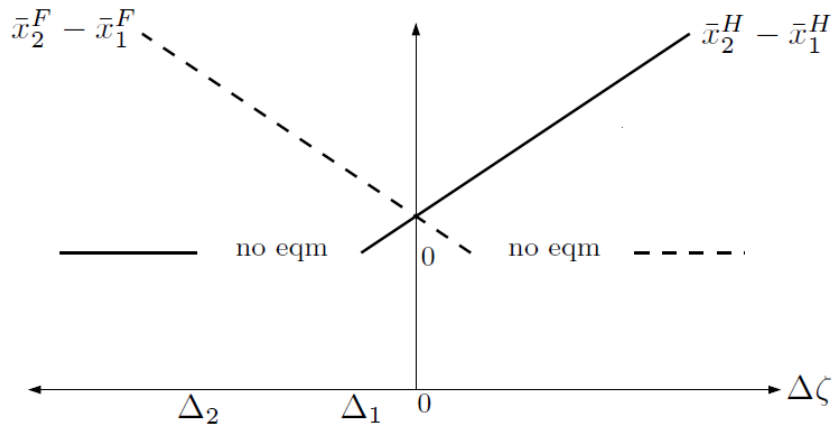


Figure 1. Growth of import-competing and export sectors and transportation cost

⁹ The non-existence occurs because the model used in this paper possesses a discontinuity resulting 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

This section solves the lobbying games in Home and Foreign. Subsection 4.1 analyses the game in the import-competing sector in Home and studies how committing to a tariff prohibition agreement might help the Home government. Similarly, subsection 4.2 analyses the game in the export sector in Foreign and studies how committing to an export-subsidy prohibition agreement might help the Foreign government.

For simplicity and tractability, in this paper attention is restricted to the simple agreements in which tariffs and export subsidies are freely used or completely prohibited.¹⁰

Subsection 4.3 studies the conditions under which it is optimal for the two governments to join an agreement that prohibits export subsidies but allows import tariffs.

4.1. Import tariffs and import-tariff prohibition agreements

This subsection studies how the Home government might gain from an agreement to prohibit tariffs. First, the lobbying game is solved in the absence of tariff agreements. Then the game is solved under a tariff prohibition agreement and the conditions found under which the government gains by committing to the agreement.

4.1.1. Import tariffs in the absence of tariff agreements

Now the lobbying game in the import-competing sector of Home can be solved in the absence of tariff agreements. Throughout this paper, attention is restricted to interior equilibria in which the levels of capital in all sectors are always positive. To achieve such interior equilibria, it is assumed that the marginal productivity of capital in the numeraire sector is not too high or too low, and the weight that a government puts on political contributions is not too high:

$$f(0) > \bar{p} + \zeta_1, \quad \bar{p} - \zeta_1 \geq f(\bar{k}) \geq 0 \quad \text{and} \quad \gamma \geq a > 0. \quad (\text{A1})$$

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

$$p_i^F = \bar{p}_i^F + \tau^F = \bar{p} + \zeta_i + \tau^F \quad \text{and} \quad p_1^F > p_2^F.$$

¹⁰ WTO bans export subsidies as a membership condition, while tariff levels are negotiated among WTO members. To focus on the first order distinction between tariffs and export subsidies, this paper abstracts from the negotiation issues.

As mentioned above, it is assumed that the transportation cost ζ drops sufficiently fast that the rate of return on capital in sector M declines and no capital moves to sector M in period 2. In particular:

$$\zeta_2 - \zeta_1 \leq \Delta_2 \leq 0 \quad (\text{A2})$$

where

$$\bar{p} + \zeta_1 - \Delta_2 = \frac{2(\bar{p} + \zeta_1)(\gamma - a)(1 - \theta) + a(1 + \sigma)f(\bar{k})}{2\gamma(1 - \theta) - a(1 - \sigma - 2\theta)}$$

This assumption ensures that no capital moves to sector M in period 2.

The lobbying game is solved by backward induction. In period 2, it is assumed (and verified) 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, x_1^H is known. The lobby bargains with the government for the tariff rate τ^H and political contribution c^H . The bargaining subgame is modelled 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 σ and $1 - \sigma$, respectively. They choose the tariff rate to maximize their joint surplus. The surplus is then split with respect to their bargaining powers.

The government and the lobby pick the optimal protection rate $\tilde{\tau}^H(x_1^H)$ such that:

$$\begin{aligned} \tilde{\tau}^H(x_1^H) = & \arg \max_{\tau^H} (1 - \theta)\omega^H(x_1^H, \bar{p}_1^H + \tau^H) + \\ & \theta\omega^H(x_2^H, \bar{p}_2^H + \tau^H) + a[(1 - \theta)(\bar{p}_1^H + \tau^H) + \theta(\bar{p}_2^H + \tau^H)]x_1^H. \end{aligned} \quad (10)$$

Note that \tilde{y} denotes the value of y in the subgame perfect equilibrium. From equations(4) and (5), the term being maximized is the joint surplus of the two bargaining parties. Solving the optimization by using $\tilde{x}_1^H = \tilde{x}_2^H$, we obtain:

$$\tilde{\tau}^H(\tilde{x}_1^H) = a\tilde{x}_1^H. \quad (11)$$

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

$$c^H(\tilde{x}_1^H) = (1 - \sigma) \frac{\Delta^H(\tilde{x}_1^H, \tilde{\tau}^{H*})}{a\tilde{x}_1^H} + \sigma\tilde{\tau}^{H*} \quad (12)$$

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

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

$$\Delta^H(\tilde{x}_1^H, \tilde{\tau}^{H*}) \equiv (1 - \theta)[\omega^H(\tilde{x}_1^H, \bar{p}_1^H) - \omega^H(\tilde{x}_1, \bar{p}_1^H + \tilde{\tau}^{H*})] + \theta[\omega^H(\tilde{x}_2^H(\tilde{x}_1^H, 0), \bar{p}_1^H) - \omega^H(\tilde{x}_2^H(\tilde{x}_1^H, \tilde{\tau}^{H*}), \bar{p}_2^H + \tilde{\tau}^{H*})], \quad (13)$$

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

$$\Delta^H(\tilde{x}_1^H, \tau^{H*}) = \frac{\tau^{H*2}}{2}. \quad (14)$$

Substituting (11) and (14) into (12), we obtain:

$$c^H(\tilde{x}_1^H) = \frac{a(1 + \sigma)\tilde{x}_1^H}{2}. \quad (15)$$

The total gain for the government from protecting the import-competing sector is:

$$g^H(\tilde{x}_1^H) \equiv (c^H(\tilde{x}_1^H) - \frac{\Delta^H(\tilde{x}_1^H, \tilde{\tau}^{H*})}{a\tilde{x}_1^H})\tilde{x}_1^H = \frac{\sigma a\tilde{x}_1^{H2}}{2}. \quad (16)$$

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 $\tilde{x}_2^H(\tilde{x}_1^H, \tilde{\tau}^{H*}) = \tilde{x}_1^H$, the levels of capital in the two sectors are determined by:

$$(1 - \theta)f(\bar{k} - \tilde{x}_1^H) + \theta f(\bar{k} - \tilde{x}_1^H) = (1 - \theta)\bar{p}_1^H + \theta\bar{p}_2^H + \tilde{\tau}^H(\tilde{x}_1^H) - c^H(\tilde{x}_1^H) \quad (17)$$

The LHS and the RHS are the total (periods 1 and 2) return on capital in sectors N and M , respectively. Solving (4.10) for \tilde{x}_1^H , we have:

$$\tilde{x}_1^H = \frac{(1 - \theta)\bar{p}_1^H + \theta\bar{p}_2^H - f(\bar{k})}{2\gamma - a(1 - \sigma)}. \quad (18)$$

The government welfare under the lobbying game is:

$$\tilde{\Omega}^H = (1 - \theta)\omega^H(\tilde{x}_1^H, \bar{p}_1^H + \tilde{\tau}^{H*}) + \theta\omega^H(\tilde{x}_1^H, \bar{p}_2^H + \tilde{\tau}^{H*}) + ac^H(\tilde{x}_1^H)\tilde{x}_1^H. \quad (19)$$

Finally, the supposition that $\tilde{x}_2^H(\tilde{x}_1^H, \tilde{\tau}^{H*}) = \tilde{x}_2^H(\tilde{x}_1^H, 0) = \tilde{x}_1^H$ must be verified. It must be shown that there is no incentive for capital in sector N to move to sector M in period 2:

$$f(\bar{k} - \tilde{x}_1^H) \geq \bar{p}_2^H + \tilde{\tau}^{H*}. \quad (20)$$

This condition can be verified by using equations (4), (18) and (A2). Because of sunk capital in sector N , the rates of return on capital in sectors N and M are not equalized; 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.

4.1.2. Import tariff prohibition agreements

Now the Home government is allowed an opportunity to pre-commit 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. This subsection solves the government welfare under the agreement and then shows 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 $\tau^H = 0$. The level of capital in sector M in period 1 (\underline{x}_1^H) is determined by:

$$f(\bar{k} - \underline{x}_1^H) = (1 - \theta)\bar{p}_1^H + \theta\bar{p}_2^H \quad (21)$$

$$\underline{x}_1^H = \frac{\bar{p}_1^H + \theta\bar{p}_2^H - (1 + \theta)f(\bar{k})}{\gamma(1 + \theta)} \quad (22)$$

where \underline{y} denotes the value of y under the agreement. Equation (21) is derived from (17) using $c^H = 0$ and $\tilde{\tau}^H = 0$. By inspecting (21) and (17), and using $\tilde{\tau}^{H*} \geq c^H(x_1^H)$, we can verify that $\underline{x}_1^H > x_1^H$; the lobbying creates over-investment. In sector M , because capital is sunk and the local price decreases, the level of capital in period 2 (\underline{x}_2^H) is equal to that in period 1: $\underline{x}_2^H = \underline{x}_1^H$.

Under the agreement, the government welfare is:

$$\underline{\Omega}^H = (1 - \theta)\omega^H(\underline{x}_1^H, \bar{p}_1^H) + \theta\omega^H(\underline{x}_2^H, \bar{p}_2^H). \quad (23)$$

The government gains from committing to the agreement if:

$$\underline{\Omega}^H - \tilde{\Omega}^H = \frac{a^2((1 - \theta)\bar{p}_1^H + \theta\bar{p}_2^H - f(\bar{k}))^2(4\gamma\sigma - (1 - \sigma)^2)}{2\gamma(2\gamma - a(1 - \sigma))^2} > 0.$$

This statement holds if and only if $\sigma < \bar{\sigma}(\gamma) = 1 - 2(\sqrt{\gamma^2 + \gamma} - \gamma)$. The above result is summarized in proposition 1:

Proposition 1: The government gains from the tariff prohibition agreement if, and only if, $\sigma < \bar{\sigma}(\gamma)$.

When committing to the agreement, the over-investment in period 1 is eliminated and the government with a low bargaining power $\sigma < \bar{\sigma}$ gains from the agreement. A similar result is found in Maggi and Rodriguez-Clare (1998). Figure 2 depicts this result. The horizontal and vertical axes show the values of σ and θ , respectively. The G^T and L^T regions are the regions in which the government gains and loses from the agreement, respectively.

Note that $\bar{\sigma} \in (0,1)$, $\bar{\sigma}(\gamma)$ is increasing in γ (the slope of the demand for capital in the numeriare sector), $\lim_{\gamma \rightarrow 0^+} \bar{\sigma}(\gamma) = 1$, and $\lim_{\gamma \rightarrow \infty} \bar{\sigma}(\gamma) = 0$.¹¹ The intuition is as follows. From equations (17) and (22), we have:

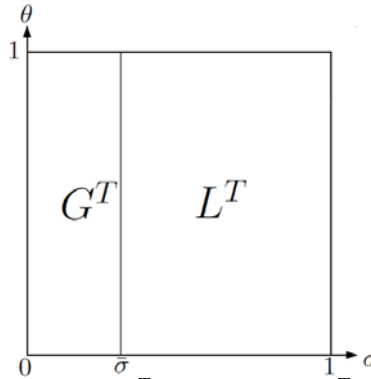


Figure 2. Gain (G^T) and Loss (L^T) from the Tariff Prohibition Agreement

¹¹ Note that $\bar{\sigma}'(\gamma) = 2 - \frac{2\gamma+1}{\sqrt{\gamma^2+\gamma}} = 2 - \frac{2\gamma+1}{\sqrt{(\gamma+\frac{1}{2})^2 - \frac{1}{4}}} > 0$ for $\gamma > 0$.

From $\sqrt{\gamma^2 + \gamma} - \gamma = \frac{\gamma}{\sqrt{\gamma^2 + \gamma} + \gamma}$ and $\lim_{\gamma \rightarrow \infty} \frac{\gamma}{\sqrt{\gamma^2 + \gamma} + \gamma} = \frac{1}{2}$, we have $\lim_{\gamma \rightarrow \infty} \bar{\sigma}(\gamma) = 0$

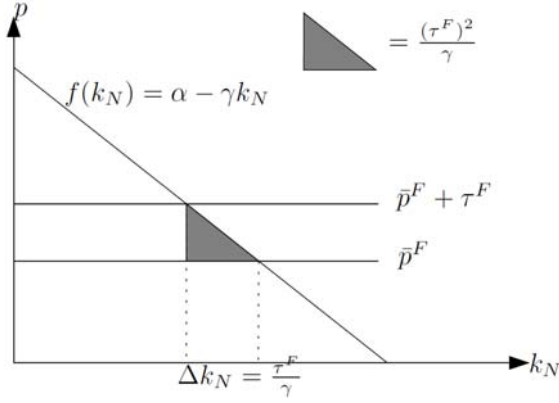


Figure 3. γ and deadweight loss

As $\gamma \rightarrow \infty$, the over-investment ($\tilde{x}_1^H - \underline{x}_1^H$) approaches zero and the benefit from the agreement disappears. On the other hand, the over-investment becomes larger as $\gamma \rightarrow 0$, committing to the trade agreement becomes more beneficial and the G^T region is larger. Figure 3 shows the relationship between the deadweight loss (the gray triangle) and γ in an environment where $\sigma = 0$.

4.2. Export subsidies and export subsidy agreements

This subsection considers the lobbying game in the export sector of Foreign. Unlike that in subsection 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 $i \in \{1, 2\}$ is:

$$p_i^F = \bar{p}_i^F + \tau^F = \bar{p} - \zeta_i + \tau^F \quad \text{and} \quad p_1^F < p_2^F$$

As a result of the increase in p_i^F , sector M grows and capital moves to the sector in period 2: $x_2^F > x_1^F$.

4.2.1. Export subsidies

Similar to subsection 4.1.1, the lobbying game in the absence of agreements on export subsidies is solved backward. In period 2, because of the increase in the local price (p_i^F), capital moves from sector N to sector M until the rates of return in the two sectors are equal. In equilibrium, capital allocation is determined by:

$$p_i^F = \bar{p}_i^F + \tau^F = \bar{p} - \zeta_i + \tau^F \quad \text{and} \quad p_1^F < p_2^F \quad (24)$$

The rate of return on capital is raised to $\bar{p}_2^F + \tau^F$ in sectors N and M ; this is contrary to that in the tariff case in which the protection τ^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:

$$\begin{aligned} \tilde{\tau}^F(x_1^F) &= \arg \max_{\tau^F} (1 - \theta)\omega^F(x_1^F, \bar{p}_1^F + \tau^F) + \theta\omega^F(x_2^F, \bar{p}_2^F + \tau^F) \\ &\quad + a[(1 - \theta)(\bar{p}_1^F + \tau^F) + \theta(\bar{p}_2^F + \tau^F)]x_1^F \end{aligned}$$

Solving the optimization problem using equation (24), we obtain:

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

Comparing this $\tilde{\tau}^F(\tilde{x}_1^F)$ with the $\tilde{\tau}^H(\tilde{x}_1^H)$ in equation (11), it is observed that for $\tilde{x}_1^F = \tilde{x}_1^H$, $\tilde{\tau}^F(\tilde{x}_1^F) \leq \tilde{\tau}^H(\tilde{x}_1^H)$. This result is broadly consistent with the observation that before the General Agreement on Tariffs and Trade (GATT), the rates of export subsidies was lower than the rates of import tariffs.¹² 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 that moves to sector M in period 2.

The social welfare loss from the subsidy is:

$$\begin{aligned} \Delta^F(\tilde{x}_1^F, \tilde{\tau}^{F*}) &\equiv (1 - \theta)[\omega^F(\tilde{x}_1^F, \bar{p}_1^F) - \omega^F(\tilde{x}_1^F, \bar{p}_1^F + \tilde{\tau}^{F*})] + \\ &\quad \theta[\omega^F(\tilde{x}_2^F(0), \bar{p}_1^F) - \omega^F(\tilde{x}_2^F(\tilde{\tau}^{F*}), \bar{p}_2^F + \tilde{\tau}^{F*})] \\ &= \frac{\tilde{\tau}^{F*2}}{2} \frac{\gamma + \theta}{\gamma} \end{aligned} \quad (26)$$

where $\tilde{\tau}^{F*} \equiv \tilde{\tau}^F(\tilde{x}_1^F)$. Comparing this equation with equation (14), it is observed that the export subsidy in Foreign generates more welfare loss than the tariff in Home with the same level. Substituting (26) and (25) into (12), we have:

$$c^F(\tilde{x}_1^F) = \frac{\gamma}{2(\gamma + \theta)} (1 + \sigma) a\tilde{x}_1^F. \quad (27)$$

The net benefit to the government from the protection is:

$$g^F(\tilde{x}_1^F) \equiv (c^F(\tilde{x}_1^F) - \frac{\Delta^F(\tilde{x}_1^F, \tilde{\tau}^{F*})}{a\tilde{x}_1^F})\tilde{x}_1^F = \frac{\gamma}{2(\gamma + \theta)} \sigma a\tilde{x}_1^{F2}. \quad (28)$$

¹² This asymmetry is discussed in Rodrik, 1995.

The total protection surplus the two bargaining parties receive is:

$$g^F(\tilde{x}_1^F; \sigma = 1) = \frac{\gamma}{2(\gamma + \theta)} a \tilde{x}_1^{F2}.$$

The higher the value of θ 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:

$$\theta f(\bar{k} - \tilde{x}_1^F) + (1 - \theta) f(\bar{k} - \tilde{x}_2^F(\tilde{\tau}^{F*})) = \theta \bar{p}_1^F + (1 - \theta) \bar{p}_2^F + \tilde{\tau}^{F*} - c^F(\tilde{x}_1^F). \quad (29)$$

The LHS and the RHS are the total (periods 1 and 2) returns on capital allocated in sector N and sector M , respectively. Simplifying equation (29) by using (27) and (25), we have:

$$f(\bar{k} - \tilde{x}_1^F) = \bar{p}_1^F + \tilde{\tau}^F(\tilde{x}_1^F) - \frac{c^F(\tilde{x}_1^F)}{1 - \theta} = \bar{p}_1^F + \frac{(1 - 2\theta - \sigma)}{2(1 - \theta)(\gamma + \theta)} a \gamma \tilde{x}_1^F. \quad (30)$$

Solving this equation by using (27) and (25), we have:

$$\tilde{x}_1^F = \frac{2(1 - \theta)(\gamma + \theta)(\bar{p}_1^F - f(\bar{k}))}{\gamma h(\theta)} > 0 \quad (31)$$

where $h(\theta) = 2\gamma - a(1 - \sigma) + 2\theta(a + 1 - \gamma - \theta)$.¹³ Differentiating equation (31), we have:

$$\frac{d\tilde{x}_1^F}{d\theta} = - \frac{2aJ(\sigma)(\bar{p}_1^F - f(\bar{k}))}{bh^2(\theta)} < 0 \quad (32)$$

where $J(\sigma) = \sigma(b + 2\theta - 1) + b - 1 - 2\theta(1 - \sigma)$.¹⁴ Intuitively, as θ increases, the free-rider problem is more severe and the incentive to invest capital in sector M in period 1 decreases. From (28) and (32), we have:

¹³The function h is a bell-shaped quadratic function. For $\theta \in [0, 1]$, $h(\theta) \geq \min(h(0), h(1))$. From

$h(0) = 2\gamma - a(1 - \sigma) > 0$ and $h(1) = a(1 - \sigma) > 0$, we have $h(\theta) > 0$ for $\theta \in [0, 1]$

¹⁴ $J(0) = (1 - \theta)^2 + \theta^2 + b$ and $J(1) = 2(b + \theta)^2$. The linearity of J , $J(0) > 0$ and $J(1) > 0$ imply $J(\sigma) > 0$ for $\sigma \in [0, 1]$.

$$\frac{dg^F}{d\theta} = \frac{\partial g^F}{\partial \theta} + \frac{\partial g^F}{\partial \tilde{x}_1^F} \frac{\partial \tilde{x}_1^F}{\partial \theta} < 0;$$

The rent that the government receives from protection is decreasing in θ . Now the game is solved. The government welfare under this game is:

$$\tilde{\Omega}^F = (1 - \theta)\omega^F(\tilde{x}_1^F, \bar{p}_1^F + \tilde{\tau}^{F*}) + \theta\omega^F(\tilde{x}_2^F(\tilde{\tau}^{F*}), \bar{p}_2^F + \tilde{\tau}^{F*}) + ac^F(\tilde{x}_1^F)\tilde{x}_1^F \quad (33)$$

4.2.2. 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 $\tau^F = 0$. Because the transportation cost drops, the local price of M increases. In period 2, capital moves from sector N to sector M . In equilibrium, the sunk capital constraint ($x_1^F \geq x_2^F$) is not binding. Therefore, capital in periods 1 and 2 is allocated according to:

$$f(\bar{k} - \underline{x}_1^F) = \bar{p}_1^F \quad \text{and} \quad f(\bar{k} - \underline{x}_2^F) = \bar{p}_2^F. \quad (34)$$

In solving these two equations, we obtain:

$$\underline{x}_1^F = \frac{\bar{p}_1^F - f(\bar{k})}{\gamma} \quad \text{and} \quad \underline{x}_2^F = \frac{\bar{p}_2^F - f(\bar{k})}{\gamma}. \quad (35)$$

Comparing equations (30) and (34), we have:

$$\tilde{x}_1^F > \underline{x}_1^F \quad \text{for} \quad 2\theta + \sigma < 1, \quad \tilde{x}_1^F < \underline{x}_1^F \quad \text{for} \quad 2\theta + \sigma > 1 \quad \text{and} \quad \tilde{x}_1^F = \underline{x}_1^F \quad (36)$$

Figure 4 shows the over-investment and under-investment regions. In the north-east region of figure 4, where θ and σ are high and $2\theta + \sigma > 1$, lobbying creates under-investment in period 1. 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. Moreover, high θ 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 south-west region of figure 4, the lobbying creates over-investment in period 1.

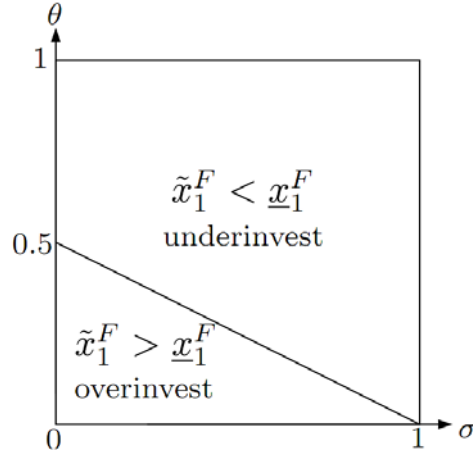


Figure 4. Over-investment and under-investment

Subtracting the government welfare under the subsidy agreement ($\underline{\Omega}^F$) from that, in the absence of the agreement, we have:

$$\begin{aligned}
 \tilde{\Omega}^F - \underline{\Omega}^F &= (1 - \theta)[\omega^F(\underline{x}_1^F, \bar{p}_1^F) - \omega^F(\tilde{x}_1^F, \bar{p}_1^F + \tilde{\tau}^{F*})] + \\
 &\quad \theta[\omega^F(\underline{x}_2^F, \bar{p}_2^F) - \omega^F(\tilde{x}_2^F, \bar{p}_2^F + \tilde{\tau}^{F*})] - ac^F(\tilde{x}_1^F)\tilde{x}_1^F \\
 &= (1 - \theta)(\omega^F(\underline{x}_1^F, \bar{p}_1^F) - \omega^F(\tilde{x}_1^F, \bar{p}_1^F)) - ac(\tilde{x}_1^F)\tilde{x}_1^F + \Delta^F(\tilde{x}_1^F, \tilde{\tau}^{F*})\tilde{x}_1^F \\
 &= \frac{1 - \theta}{2}(\underline{x}_1^F - \tilde{x}_1^F)^2 - \frac{a\gamma(\tilde{x}_1^F)^2}{2(\gamma + \theta)}(a(1 + \sigma) - 1) \\
 &= \frac{a^2(\bar{p}_1^F - f(\bar{k}))^2(1 - \theta)}{2\gamma[a(1 - \sigma) - 2(1 - \theta)(\gamma + \theta - a) - 2a]^2}Q(\theta, \sigma)
 \end{aligned}$$

where $Q(\sigma, \theta) \equiv 4\theta(4\theta(1 + \sigma) - 1) - 4\gamma\sigma(1 - \theta) + (1 - \sigma)^2$. The function Q has the following properties:

- i) $Q(0, \theta) = (1 - 2\theta)^2$ and $Q(0, \theta) > 0$ for $\theta \neq 0.5$.
- ii) $Q(\sigma, 0) = (1 - \sigma)^2 - 4\gamma\sigma$ and $Q(\sigma, 0) > 0$ for $\sigma > \bar{\sigma}(\gamma) = 1 - 2(\sqrt{\gamma^2 + \gamma} - \gamma)$. 15
- iii) $Q(\sigma, 1) = (1 + \sigma)^2 > 0$. By continuity, we have $Q(\sigma, \theta) > 0$ if θ is sufficiently closed to 1.
- iv) $Q(1, \theta) = 4(2\theta^2 + \theta(\gamma - 1) - \gamma)$. $Q(1, \theta) > 0$ for $\theta > \bar{\theta}(\gamma) = \frac{1}{4}(1 + \sqrt{\gamma^2 + 6\gamma + 1} - \gamma)$. 16
 $\bar{\theta}(\gamma)$ is increasing in γ , $\lim_{\gamma \rightarrow 0} \bar{\theta}(\gamma) = \frac{1}{2}$ and $\lim_{\gamma \rightarrow \infty} \bar{\theta}(\gamma) = 1$.
- v) $Q(\sigma, 0.5) = \sigma(\sigma - 1 - 2\gamma) < 0$ for $\sigma \in (0, 1)$.

¹⁵ The $\bar{\sigma}(\gamma)$ is defined in section 3.1.2.

¹⁶ $\frac{d\bar{\theta}}{d\gamma} = \frac{1}{8} \frac{2\gamma + 6}{\sqrt{\gamma^2 + 6\gamma + 1}} - \frac{1}{4} = \frac{1}{4} \frac{\gamma + 3}{\sqrt{(\gamma + 3)^2 - 8}} - \frac{1}{4} > 0$. From $\sqrt{\gamma^2 + 6\gamma + 1} - \gamma = \frac{6\gamma + 1}{\sqrt{\gamma^2 + 6\gamma + 1} + \gamma}$ and $\lim_{\gamma \rightarrow \infty} \frac{6\gamma + 1}{\sqrt{\gamma^2 + 6\gamma + 1} + \gamma} = 3$ we have $\lim_{\gamma \rightarrow \infty} \bar{\theta}(\gamma) = 1$

The government gains from committing to the agreement for $Q(\sigma, \theta) > 0$ and loses for $Q(\sigma, \theta) < 0$. Figure 5 shows the G^S and L^S 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 θ and γ .

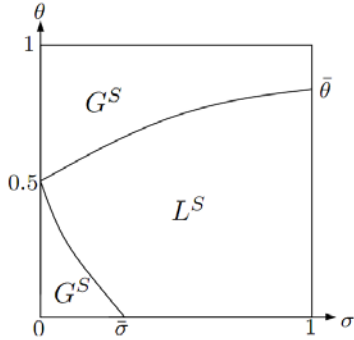


Figure 5. Gain (G^S) and loss (L^S) from subsidy prohibition

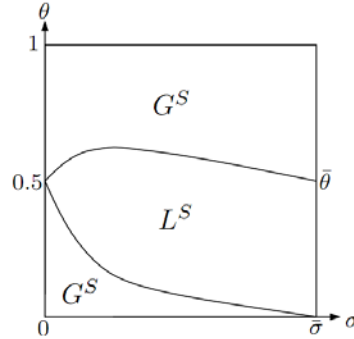


Figure 6. Gain (G^S) and loss (L^S) from subsidy prohibition ($\gamma \rightarrow 0$)

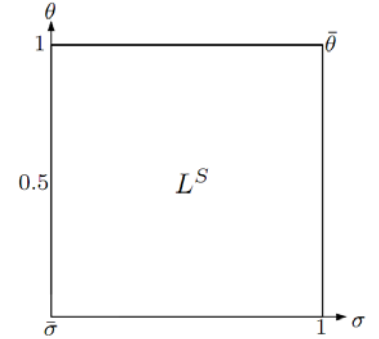


Figure 7. Gain (G^S) and loss (L^S) from subsidy prohibition ($\gamma \rightarrow \infty$)

From the property (b) of Q , the government gains if θ is sufficiently high. The intuition is as follows. 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 θ approaches one, period 1 gets shorter and the welfare loss and the political contribution drop to zero – from equations (27) and (32). However, the political contribution drops at a faster rate;¹⁷ the increase in θ has two negative effects on the total contribution: the size of the protected sector, \tilde{x}_1^F , and the political contribution per unit of capital, $c^F \tilde{x}_1^F$, 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.

Observe that in figure 5, for $(\sigma, \theta) = (0, 0.5)$, although the government has no bargaining power and does not receive any political contributions under the lobbying game, committing to the subsidy agreement does not improve its welfare. As mentioned above, the government may gain from the agreement since it helps eliminate inefficient investment in period 1. However, from equation (36), for $(\sigma, \theta) = (0, 0.5)$, investment is at its efficient level under the lobbying game. Therefore, there is no gain from committing to the agreement.

¹⁷ Mathematically, as $\theta \rightarrow 1$, the social welfare loss decreases approximately at rate $\frac{1}{2-\theta}$, but the total political contribution approximately decreases at rate $\frac{1}{1-\theta}$

In the south-west region of figure 5, where σ and θ are low, the government also gains from committing to the agreement. The agreement helps the government eliminate over-investment in period 1.

The main finding in this subsection is summarized in Proposition 2:

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

The comparative statistics of the G^F and L^F regions are now studied in figure 5.

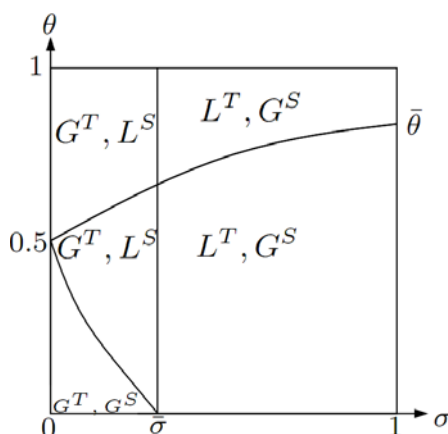


Figure 8. Gain and loss from subsidy prohibition and tariff prohibition

Because the function Q has only one parameter (γ), the shapes of the G^F and L^F regions depend only on γ . To study how these regions change as γ changes, the two extreme cases are considered: $\gamma \rightarrow 0$ and $\gamma \rightarrow \infty$. Figure 6 shows the G^F and L^F regions, generated numerically for $\gamma \rightarrow 0$. Comparing figure 5 with figure 6, it can be seen that the L^F region shrinks and the G^F region grows as γ drops to zero. The term γ 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 γ , the more responsive is the demand for capital to the change in the rate of return in the numeriare sector. As discussed in subsection 4.1.2, for $\gamma \rightarrow 0$, 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 region gets larger as $\gamma \rightarrow 0$. On the other hand, in figure 7, for $\gamma \rightarrow \infty$, investment in period 1 is irresponsive to protection, the agreement has no benefit to the government and the region disappears.

4.3. Optimal agreements

In this subsection, it is supposed that Home and Foreign are under an international trade agreement on tariffs and subsidies. The condition is found in which it is optimal for the agreement to ban export subsidies but allow import tariffs.

Figure 8 combines figures 2 and 5. Consider the most interesting region of figure 8, i.e., the north-east region. In this region, the agreement that prohibits only export subsidies is optimal compared to the following simple agreements: (a) the agreement that prohibits tariffs and export subsidies; (b) the agreement that prohibits only tariffs; (c) the agreement that prohibits only export subsidies; and (d) the agreement that prohibits nothing. The main result of this paper can be summarized by Proposition 3.

Proposition 3: For sufficiently high σ and θ , 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 (σ). 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 σ and θ . For a sufficiently high θ , the political contribution that the Foreign government receives from export subsidies is highly eroded by free-riders and the government would be better off when committing to prohibit export subsidies. Therefore, for sufficiently high σ and θ , the optimal agreement is the one that prohibits only export subsidies.

5. Conclusion

This paper proposes a simple small-country model to explain the asymmetric treatment between import tariffs and export subsidies in WTO. In the model, the anticipation of protection creates inefficient investment. A government may choose to commit to a tariff prohibition agreement and/or export subsidy prohibition agreement in order to eliminate this anticipation and achieve a social welfare gain. However, when committing to these agreements, that government loses the political contributions collected from protection. Therefore, that 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 those 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, it is found 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

- Bagwell, K. and R. W. Staiger (2001). "Strategic trade, competitive industries and agricultural trade disputes, *Economics and Politics*, pp. 113-128.
- (1999). "An economic theory of GATT," *American Economic Review*, vol. 89, pp. 215-248.
- Baldwin, J. R. and W. Gu (2004). "Trade liberalization: Export-market participation, productivity growth and innovation", *Oxford Review of Economic Policy*, vol. 20, pp. 372-392.
- Baldwin, R. and F. Robert-Nicoud (2002). "Entry and asymmetric lobbying: Why governments pick losers." NBER Working Paper No. 8756. National Bureau of Economic Research, Cambridge, MA, United States.
- Bernard, A. B. and J. B. Jensen (2002). "The deaths of manufacturing plants," NBER Working Paper No. 9026. National Bureau of Economic Research, Cambridge, MA, United States.
- Brander, J. A. and J. B. Spencer (1985). "Export subsidies and international market share rivalry," *Journal of International Economics*, vol. 18, No. 2, pp. 83-100.
- Ethier, W. J. (2003). "Trade agreements based on political externalities", (mimeograph), University of Pennsylvania, United States.
- Feenstra, R. C., J. Romalis and P. K. Schott (2002). "U.S. imports, exports and tariff data", NBER Working Paper No. 9387. National Bureau of Economic Research, Cambridge, MA, United States.
- Glismann, H. and F. Weiss (1980). "On the political economy of protection in Germany", World Bank Staff Working Paper No. 427. . World Bank, Washington, D.C.
- Grossman, G. and E. Helpman (1996). "Rent dissipation, free riding, and trade policy," *European Economic Review*, vol. 40, pp. 795-803.
- (1995). "Trade wars and trade talks," *Journal of Political Economy*, vol. 103, No. 4, pp. 675-708.
- (1994). "Protection for sale," *American Economic Review*, vol. 84, No. 4, pp. 833-850.
- Hufbauer, G. and H. Rosen (1986). *Trade Policy for Troubled Industries*, Policy Analyses in International Economics 15, Institute for International Economics, Washington, D.C.
- Hufbauer, G., D. Berliner and K. Elliot (1986). *Trade Protection in the United States: 31 Case Studies*, Institute for International Economics, Washington, D.C.
- Johnson, H. (1954). "Optimum tariffs and retaliation," *Review of Economic Studies*, vol. 21, No. 2, pp. 142- 153.
- Levy, I. P. (1999). "Lobbying and international cooperation in tariff setting", *Journal of International Economics*, vol. 47, pp. 345-370.
- Maggi, G. and A. Rodriguez-Clare (2005a). "A political-economy theory of trade agreements", (mimeograph), Princeton University, United States.
- (2005b). "Import tariffs, export subsidies and the theory of trade agreements", (mimeograph), Princeton University, United States.
- (1998). "The value of trade agreements in the presence of political pressures", *Journal of Political Economy*, vol. 106, pp. 574-601.

- Mitra, D. (2002). "Endogenous political organization and the value of trade agreements", *Journal of International Economics*, vol. 57, pp. 473-485.
- Rodrik, D. (1995). "Political economy of trade policy", in G. Grossman and K. Rogoff (eds.), *Handbook of International Economics*, pp. 1457-1495.
- Staiger, R. W. and G. Tabellini (1987). "Discretionary trade policy and excessive protection", *American Economic Review*, vol. 77, pp. 823-837.
- Subramanian, A. and S. J. Wei (2003). "The WTO promotes trade, strongly but unevenly", NBER Working Paper No. 10024. National Bureau of Economic Research, Cambridge, MA, United States.
- Tornell, A. (1991). "Time inconsistency of protectionist programs", *Quarterly Journal of Economics*, vol. 106, pp. 963-974.

ARTNeT Working Paper Series

are available from <http://www.artnetontrade.org>



ARTNeT Secretariat
United Nations
Economic and Social Commission for Asia and the Pacific
Trade and Investment Division
United Nations Building
Rajadamnern Nok Avenue
Bangkok 10200, Thailand
Tel.: +66 2 2882251
Fax.: +66 2 2881027
E-mail: artnetontrade@un.org
Web site: <http://www.artnetontrade.org>