Dynamics and Discriminatory Import Policy

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Abstract

Although the GATT prohibits discriminatory import tariffs, it includes means for circumventing this prohibition. The previous literature uses static models and discriminatory tariffs increase welfare. In a dynamic model, if governments lack the ability to precommit, this is not necessarily true. For example, with consumer switching costs, tariffs are higher for firms with higher market share. Rationally expecting such policies, firms price less aggressively. If switching costs are significant relative to asymmetries, then higher prices can result in lower importing country welfare. Thus it may be in interests of importers to abide by the GATT MFN principle.

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1 Introduction

Although the GATT prohibits discriminatory import tariffs, the means for such policy exists within GATT rules. For example, discriminatory tariffs can be imposed through the enforcement of anti-dumping duty laws. The widespread use of 'voluntary' export restraint agreements is another means for imposing discriminatory tariffs. Of somewhat less significance are programs such as the US Generalized System of Preference and Caribbean Basin Initiative. These programs provide preferential tariff treatment to LDCs. Hence there are numerous means by which the GATT's ban on discriminatory import tariffs can be and is circumvented.

The theory of discriminatory tariffs began with Meade (1955) and Viner (1950) who focus on discrimination by customs unions under perfect competition. Gatsios (1990) and Hwang and Mai (1991) consider discriminatory tariffs in an imperfectly competitive setting. They argue that high cost countries will face lower tariffs and that such policies increase the importing country's welfare. The intuition is that greater rents can be extracted from low cost countries.

As with many papers on strategic trade policy, these studies consider static models. Relying on static models can frequently lead to confusing results. For example, Brander and Spencer (1985) and Eaton and Grossman (1986) get contrasting export subsidy/tax results depending on whether firms compete in output or in prices. These conflicting results can be reconciled by introducing dynamics (To (1994a)). I examine discriminatory tariffs in a dynamic setting where market share is important and governments are unable to precommit to future policy.

I use a model of consumer switching costs to capture the idea that a firm's future profits are increasing in its current market share. With switching costs, it is costly for consumers (or wholesalers) to buy from one producer in one period and from another producer in the next. In an international setting, in addition to the usual description of switching costs, they can include transaction and information costs for importers.[1]

[1]See Klemperer (1995) for a comprehensive survey and To (1994a) for a discussion of switching costs

Market share is important to a firm when there are switching costs because after a consumer purchases from a firm, that consumer becomes bound to that firm and can thus be subjected to higher future prices by that firm. I show that an importing country without the ability to precommit to future policy, imposes discriminatory tariffs which penalize market share and cost advantages in order to maximize the rents extracted from the foreign producers while minimizing the cost to domestic consumers.[2] When asymmetries are relatively large, discriminatory tariffs have a negative impact on the welfare of the importing country because they reduce the value of market share. Other factors can mitigate this effect and are discussed later.

Critical to this result is the assumption that governments lack commitment ability. The common justification for this is that governments face a 'time-inconsistency problem.' While a government might want to pre-commit to a second period tariff, this commitment is often not credible because once the second period arrives, governments will want to, and frequently can, pursue some alternative policy. This would seem to be true for the enforcement of anti-dumping duty laws and the negotiation of VERs. These are reactive policies which respond to foreign market pressures. For example, antidumping duties are imposed only if domestic industries suffer injury and domestic firms can be injured only if foreign firms have captured a significant share of the market. Similarly, VERs are only negotiated once a country has captured a significant share of the market. Thus countries that have successfully captured domestic market share are more likely to have antidumping duties imposed or VERs negotiated. That is, tariffs, on average, can be expected to be greater for these countries. This is consistent with the theoretical prediction of the model.

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in an international context.

[2]The related strand of literature on endogenous protection (e.g., Bhagwati *et al* (1987), Blonigen (1997) and Grossman and Helpman (1994)) also assumes that government's have the ability to use discriminatory tariffs. The current paper is complementary to Grossman and Helpman as endogenous protection is derived as a result of the model and not assumed.

2 The Model

I construct a dynamic model of imperfect international competition using a two-period duopoly model with consumer switching costs. Two exporting countries, with a single firm each, produce a differentiated product which is exported to an importing country which has no production of its own. I follow Klemperer (1987) closely in my implementation of switching costs to examine sub-game perfect, optimal import policies with price competition.

In each period, $t = 1, 2$, each firm simultaneously chooses price (p_t^j, $j = 0, 1$) and consumers from the importing country purchase from one of the firms. In addition, at the beginning of the second period, the government of the importing country chooses a tariff policy, (T_2^0, T_2^1). One can easily allow the importing government to impose tariffs in both periods but this adds nothing to the analysis and for simplicity is not considered.[3]

Consumers from the third country have mass one and are uniformly located on the interval $[0, 1]$ and incur a transportation cost of one per unit of distance. 'Transportation costs' can be considered, in part or in whole, to be actual transportation costs and so the good can be considered to be homogeneous. In each period, consumers inelastically demand one unit of the good, produced by either of the firms. The consumers' reservation value, r, is sufficiently large that all consumers buy in equilibrium but not so large that firms would prefer to forgo all new consumers in order to exploit captured old consumers. Once a consumer has purchased from one supplier, it is too costly to switch to another supplier. This is standard and ensures that demand curves are differentiable. At the end of period 1, mass $\nu \in (0, 1]$ of uniformly and randomly chosen consumers leave the market and are replaced by new consumers. The turnover rate ν serves as a proxy for finite switching costs with large values of ν implying that switching costs are small 'on average.' Consumers minimize discounted expected price and transportation costs.

There are two exporting countries, 0 and 1, each with a single firm, 0 and 1, that maximize discounted profits and produce a spatially differentiated product. Firms 0 and

[3]This possibility was included in a prior version of the paper.

1 are located at 0 and 1 and have constant marginal costs c^0 and c^1. The government of the importing country maximizes discounted welfare, measured as the discounted sum of consumer surplus and tax receipts. I assume that the firms in the exporting countries and the government and consumers in the importing country have the same discount factor δ.

3 The Second Period

Solving the game backwards, I begin with the consumers' second period problem.

3.1 The Consumer's Problem

In the second period, consumers minimize their second period costs given that they are either locked-in to some producer or that they are new consumers with no previous ties.

First consider the ν new consumers. If new consumer i buys from firm 0 (or 1), i's total cost is firm 0's (or 1's) price plus the tariff on firm 0 (or 1) plus i's transportation cost: $p_2^0 + i + T_2^0$ (or $p_2^1 + (1-i) + T_2^1$).[4] Let i^* be the new consumer that is indifferent between buying from firm 0 and from firm 1; $i^* = (1 + p_2^1 - p_2^0 + T_2^1 - T_2^0)/2$. As long as $|p_2^1 - p_2^0 + T_2^1 - T_2^0| \leq 1$ and $0 \leq i^* \leq 1$. Firm 0 sells to mass νi^* new consumers and firm 1 sells to mass $\nu(1-i^*)$ new consumers. Now consider the $1-\nu$ old consumers. Since it is too costly to switch, old consumers buy from the same firm. Firm j sells to mass $(1-\nu)q_1^j$ of the old consumers where q_1^j is the number of consumers that bought from firm j in the first period.

Firm j's second period demand is equal to the sum of the new consumers that buy from j and the remaining old consumers that bought from j in the first period.

$$q_2^j = (1-\nu)q_1^j + \nu\left[\frac{1 + p_2^k - p_2^j + T_2^k - T_2^j}{2}\right]. \tag{1}$$

[4]Note that I have assumed that tariffs are imposed directly on consumers. The results are identical if tariffs are imposed instead on the exporting firms.

where $j, k = 0, 1$ and $j \neq k$.

3.2 The Firm's Problem

Firms maximize second period profits through choice of prices, given their market share from the first period, and the second period import policy chosen by the home government. Firm j's second period profits are:

$$\pi_2^j = (p_2^j - c^j)q_2^j \tag{2}$$

Taking the first order conditions and solving, the second period equilibrium price is:

$$p_2^j = \frac{1}{\nu} + \frac{2c^j + c^k}{3} + \frac{(1-\nu)(2q_1^j - 1)}{3\nu} + \frac{T_2^k - T_2^j}{3} \tag{3}$$

Price is increasing in both firm's costs, market share and tax advantage. Substituting the equilibrium price, yields second period output and second period profits.

$$q_2^j = \frac{1}{2}\left[1 + \frac{(1-\nu)(2q_1^j - 1)}{3} + \frac{\nu(c^k - c^j)}{3} + \frac{\nu(T_2^k - T_2^j)}{3}\right] \tag{4}$$

$$\pi_2^j = \frac{1}{2\nu}\left[1 + \frac{(1-\nu)(2q_1^j - 1)}{3} + \frac{\nu(c^k - c^j)}{3} + \frac{\nu(T_2^k - T_2^j)}{3}\right]^2 \tag{5}$$

Next, substitute equilibrium prices (3) into i^* to compute its equilibrium value.

$$i^* = \frac{1}{2} + \frac{c^1 - c^0}{6} - \frac{(1-\nu)(2q_1^0 - 1)}{3\nu} + \frac{T_2^1 - T_2^0}{6} \tag{6}$$

This will be required to solve the government's problem. Output and profits are increasing in market share, cost advantage and tax advantage. To get the non-discriminatory value for second period price, output, profits and i^*, substitute $T_2^k = T_2^j$ into (3), (4), (5) and (6).

3.3 The Home Country's Problem

The home government maximizes second period welfare through its choice of import tariffs. The importing country's welfare is the sum of gross surplus and tax revenues minus total consumer costs. The total transportation cost of all of the new consumers that buy from firm 0 is $\nu(i^*)^2/2$ and the total transportation cost of all of the old consumers that buy from 0 is $(1-\nu)(q_1^0)^2/2$. Similarly, for firm 1. Hence, home country welfare is:

$$\begin{aligned} W_2 &= r + T_2^0 q_2^0 - (p_2^0 + T_2^0)q_2^0 - \frac{1-\nu}{2}(q_1^0)^2 - \frac{\nu}{2}(i^*)^2 + \\ &\quad T_2^1 q_2^1 - (p_2^1 + T_2^1)q_2^1 - \frac{1-\nu}{2}(q_1^1)^2 - \frac{\nu}{2}(1-i^*)^2 \\ &= r - p_2^0 q_2^0 - \frac{1-\nu}{2}(q_1^0)^2 - \frac{\nu}{2}(i^*)^2 - p_2^1 q_2^1 - \frac{1-\nu}{2}(q_1^1)^2 - \frac{\nu}{2}(1-i^*)^2. \end{aligned} \tag{7}$$

Because of the nature of the Hotelling model of consumer demand, equal changes in the magnitudes of both tariffs result in a one-for-one tradeoff between consumer expenditures and government revenues. Thus as long as tariffs are not too high, consumer behavior depends only on the difference between the tariffs faced by country 0 and country 1. This means that the importing country only needs to choose this difference and not the magnitudes of the tariffs.

Using the equilibrium values of price, output, profit and i^*, I compute the importing country's first order condition and then compute the equilibrium difference between tariffs.

$$T_2^1 - T_2^0 = -\frac{2(c^1 - c^0)}{5} - \frac{2(1-\nu)}{5\nu}(2q_1^0 - 1) \tag{8}$$

Equation (8) implies that the home government should increase the tariff that a firm faces if it has a cost advantage or if it has a large market share. This result also provides a theoretical basis for models of endogenous protection which assume that tariffs are increasing in market share (examples include, Bhagwati *et al* (1987) and Blonigen and Ohno (1997)).

Substituting this into price, output, profits and i^* I get,

$$p_2^j = \frac{1}{\nu} + \frac{4c^j + c^k}{5} + \frac{1-\nu}{5\nu}(2q_1^j - 1) \tag{9}$$

$$q_2^j = \frac{1}{2}\left[1 + \frac{\nu(c^k - c^j)}{5} + \frac{1-\nu}{5}(2q_1^j - 1)\right] \tag{10}$$

$$\pi_2^j = \frac{1}{2\nu}\left[1 + \frac{\nu(c^k - c^j)}{5} + \frac{1-\nu}{5}(2q_1^j - 1)\right]^2 \tag{11}$$

$$i^* = \frac{1}{2} + \frac{c^1 - c^0}{10} - \frac{2(1-\nu)(2q_1^0 - 1)}{5\nu}. \tag{12}$$

Notice that after substituting the welfare maximizing second period discriminatory tariffs, cost advantages and market share are less valuable than without discrimination (compare equation (11) to equation (5) when $T_2^k = T_2^j$). This maximizes the rents extracted from the exporting firms at the least cost to consumers. A firm with a cost and market share advantage earns greater profits and hence more rents can be extracted from that firm. This discriminatory tariff also reduces the disparity in direct consumer costs (i.e., price plus tariff), reducing consumer transportation costs incurred.[5]

Second period welfare is increased by discriminatory import policy since, in general, the optimal policy, $T_2^1 - T_2^0$, is non-zero. I show in the next section, however, that because the firm with the greater market share faces a higher tariff in the second period, market share is not as valuable in the first period and as a result, firms do not compete as vigorously for first period market share. With decreased first period competition, total discounted welfare in the importing country may fall due to the use of discriminatory tariffs.

[5]Transportation costs are minimized if $i^* = 1/2$.

4 The First Period

4.1 The Consumers' Problem

Consumers must decide which firm to purchase from, knowing how firms and governments will behave in the second period and knowing that if they are still in the market in the second period, they are 'locked-in' to whichever firm they purchase from. Each consumer i minimizes total discounted expected costs.

Consumer i's discounted expected cost from purchasing from firm 0 is her first period cost plus her total discounted expected second period cost: $p_1^0 + i + \delta(1-\nu)(p_2^0 + i + T_2^0)$. Similarly, if i buys from firm 1. Let i^{**} be the consumer that is indifferent between purchasing from firm 0 and firm 1.

$$p_1^0 + i^{**} + \delta(1-\nu)(p_2^0 + i^{**} + T_2^0) = p_1^1 + (1 - i^{**}) + \delta(1-\nu)(p_2^1 + (1 - i^{**}) + T_2^1) \quad (13)$$

Firm 0's first period output is $q_1^0 = i^{**}$ since i will buy from firm 0 if $i < i^{**}$, and from firm 1 if $i > i^{**}$. I substitute q_1^0 for i^{**} and (9) for p_2^j and then solve for firm 0's first period demand, q_1^0. Firm 1's first period demand is $q_1^1 = 1 - q_1^0$, so firm j's first period demand is,

$$q_1^j = \frac{1}{2} + \lambda(p_1^k - p_1^j) + \gamma\lambda(c^k - c^j) \quad (14)$$

where,

$$\lambda = \frac{1}{2\left(1 + \delta(1-\nu)\left(1 + \frac{4(1-\nu)}{5\nu}\right)\right)}, \ \gamma = \frac{\delta(1-\nu)}{5}.$$

An unusual feature of this model is that first period consumer demand depends on firm costs; costs enter the demand function through consumer expectations about the future price.[6] Also notice that $\lambda = 1/2$ if either $\nu = 1$ or $\delta = 0$ and $\lambda < 1/2$ if both $\nu < 1$ and $\delta > 0$; $\nu = 1$ corresponds to the case when there are no switching costs. Thus demand is more inelastic if there are switching costs and consumers are not myopic.

[6] This is easily be eliminated if one assumes that consumers are myopic (i.e., $\delta = 0$).

4.2 The Firms' Problem

Firms maximize discounted profits through choice of first period prices, given that it anticipates the second period outcome (i.e., the importing government's tariff policy and both firms' second period prices). Firm j's discounted profits are:

$$\pi^j = \pi_1^j + \delta\pi_2^j = (p_1^j - c^j)q_1^j + \delta(p_2^j - c^j)q_2^j \tag{15}$$

Firm j's first order condition is,

$$\begin{aligned}\frac{\partial \pi^j}{\partial p_1^j} = & -\left(2\lambda - \frac{\delta\mu^2}{\nu}\right)p_1^j + \left(\frac{1}{2} - \frac{\delta\mu}{\nu}\right) + \left(\lambda - \frac{\delta\mu^2}{\nu}\right)p_1^k \\ & + \lambda c^j + \gamma\left(\lambda - \frac{\delta\mu^2}{\nu}\right)(c^k - c^j) - \frac{\delta\mu}{5}(c^k - c^j) = 0\end{aligned} \tag{16}$$

where, $\mu = 2\lambda(1-\nu)/5$.

Using this, the first period equilibrium prices are:

$$p_1^j = \frac{\alpha}{1-\beta} + \frac{1}{1+\beta}(\beta c^k + c^j) + \frac{\gamma\beta - \eta}{1+\beta}(c^k - c^j) \tag{17}$$

where

$$\alpha = \frac{\frac{1}{2} - \frac{\delta\mu}{\nu}}{2\lambda - \frac{\delta\mu^2}{\nu}},\ \beta = \frac{\lambda - \frac{\delta\mu^2}{\nu}}{2\lambda - \frac{\delta\mu^2}{\nu}},\ \eta = \frac{\frac{\delta\mu}{5}}{2\lambda - \frac{\delta\mu^2}{\nu}}. \tag{18}$$

It can be seen by simplifying the expression for β that $\beta \in (0,1)$. After substituting prices, first period output is:

$$q_1^j = \frac{1}{2} + \frac{\lambda[(1-\beta)(1+\gamma) + \eta]}{1+\beta}(c^k - c^j) \tag{19}$$

so that firm j's period 1 output is increasing in its cost advantage.

Recall that second period tariffs are greater for the firm which successfully captures market share. As we will now see, this has an adverse effect on first period incentives, giving rise to the following Proposition.

Proposition 1 *In period 1, if $|c^1 - c^0|$ is not too large then, importing country welfare is greater under non-discriminatory tariff policy.*

Proof: Consider first the case when $c^1 = c^0 = 0$. In this case, $q_1^j = 1/2$ and $p_1^j = \alpha/(1-\beta)$. Simplifying p_1^j,

$$p_1^j = \frac{5\nu + \delta(1-\nu)(\nu+2)}{5\nu}. \tag{20}$$

The non-discriminatory tariffs first period price can be computed by solving the firm's profit maximization problem using (5) evaluated at $T_2^j = T_2^k$. This yields:

$$p_1^{j\prime} = \frac{3 + \delta(1-\nu)}{3}. \tag{21}$$

A comparison of the discriminatory price and the non-discriminatory price verifies that the discriminatory price is greater. With equal market share and identical costs, the second period discriminatory price and non-discriminatory price are both $1/\nu$. Since price is greater in the first period and the same in the second period, welfare must be lower with discriminatory tariffs. Now since discriminatory prices and outputs are continuous in costs, welfare must be continuous in costs. This implies that for any c^0 in some neighborhood of c^1, welfare must be strictly lower with discriminatory tariffs. ■

Proposition 1 says that when foreign producers are relatively similar, if the importing country is unable to precommit to future policy, discriminatory tariffs actually reduce home country welfare. There are two offsetting welfare effects. The first—a static effect—is a welfare gain which arises because greater rents can be extracted from the low-cost/high-market-share firm. The second—a dynamic effect—is a welfare loss which arises because firms expect market share to be penalized in the future. Thus market share is less valuable, leading firms to compete less aggressively in the first period. The overall welfare effect depends on which effect is more important. If there are large asymmetries between countries, then the static gains from discriminatory behavior become relatively

more important. On the other hand, if asymmetries are relatively small, the static gains from discrimination are small and thus the adverse dynamic effect overrides the static gain.[7]

In addition to the magnitude of cost asymmetries, $\Delta c = |c^1 - c^0|$, the overall welfare result also depends on the significance of switching costs, ν. This can be seen by considering some parameter combination for which discriminatory tariffs are welfare reducing, (i.e., ν is large relative to Δc). If we now reduce the significance of consumer switching costs by increasing ν, it must be that for sufficiently large ν, discriminatory policy increases welfare. To see this, note that in the limit as $\nu \to 1$, there are no switching costs and as a result the Gatsios (1990) and Hwang and Mai (1991) results must be true. Thus there is a tradeoff between the significance of switching costs and the magnitude of asymmetries so that if switching costs are very important, discriminatory tariffs may have a negative effect on importing country welfare even if cost asymmetries are large.

5 Discussion and Related Literature

I now discuss a number of additional features which in some cases, if included can have an offsetting effect on any negative effect of discriminatory tariffs. I then relate my model to the existing literature.

First, the existence of a domestic producer can affect the welfare results.[8] Since discriminatory tariffs reduce the incentive for foreign firms to compete for market share in the first period, they have the beneficial effect of shifting first period rents to domestic producers. Thus there are two offsetting effects—reduced first period competition, shifts foreign profits to the domestic producer but reduces consumer surplus—either effect can dominate. In particular, the effect of increased foreign prices will increase welfare only

[7]The nature of the asymmetry is unimportant. Suppose for example, that consumers have different tastes for firm 0 and firm 1's products, reflected in different transportation cost parameters, τ_0 and τ_1. When there is perfect symmetry ($\tau_0 = \tau_1$) the situation is identical to the above and the negative welfare result obtains. Sufficiently small asymmetries will not alter this.

[8]Existence of domestic producers are important in that the most realistic examples of GATT allowable discriminatory import policy are the enforcement of antidumping laws and negotiated VERs.

if foreign market share is sufficiently small. In other words, when foreign imports are significant,[9] the loss in consumer surplus due to increased foreign prices can outweigh the value of increased domestic profits. Thus, although weakened, the negative welfare result can still hold.

Next, critical to this analysis is the exclusion of the possibility that the home government can precommit to a second period tariff policy at the beginning of the first period. That is, suppose in the first period that the importing government announces a discriminatory, second period tariff schedule. If this announcement is credible (i.e., some constraint prevents the government from later changing its policy) then discriminatory policy must be welfare increasing since, at worst, the government can always commit to a non-discriminatory tariff policy.

Finally, with learning-by-doing, qualitatively identical results follow logically from earlier work. Consider, for example, a two period learning-by-doing model with constant marginal costs and where the exporting countries are initially symmetric (i.e., marginal costs are given by $c_2^j = c(q_1^j)$ where q_1^j is first period output). In the second period, by Gatsios (1990), and Hwang and Mai (1991), tariffs are higher for the exporter with the lower marginal cost. Since firms are initially symmetric, this is the firm which made greater sales in the first period. As a result their first period incentive to price aggressively is reduced. Thus with learning-by-doing, discriminatory tariffs also have a negative effect on first period incentives.[10] This negative first period effect has a further negative effect since second period costs, and as a result, prices can be higher.

Choi (1995) bears some similarity to the current work. In his model, firms first choose their production technology. The government of the importing country then chooses its tariff policy. Finally, firms compete in output. With discriminatory tariffs, the firm which chooses the technology with the lower cost of production faces a higher tariff. This discourages the adoption of more efficient technologies and as a result, prices are

[9]This will also tend be when AD duties or VERs are most likely to be imposed.

[10]If the government chooses both first and second period tariffs, second period policy can be to subsidize imports (see Gatsios (1989)). However, this does not eliminate the second period policy's negative effect on incentives.

higher than under MFN tariffs. With the current model, like Choi, firms make an initial investment (in market share). Discriminatory tariffs reduce the value of this investment, resulting in 'underinvestment.' One important difference between the current work and Choi is that he assumes symmetry at the outset. That is, prior to making their technology choice, firms are perfectly symmetric. If firms were initially asymmetric (e.g., one firm has an initial cost advantage) then discriminatory tariffs would also have a welfare increasing effect which can override the negative effect on investment incentives.

Also of some similarity is Anderson (1992). In contrast to the current paper, he argues that VERs are the long term result of multilateral negotiations (e.g., the MFA) which were initially bilaterally negotiated agreements. In my framework, VERs should be viewed as the shorter term bilateral agreements which in Anderson (1992) would eventually become a universal, multilateral agreement. With long term multilateral agreements, he argues that the total available level of quotas, $\bar{Q}$, is fixed and that any single firm's share of $\bar{Q}$ is an increasing function of their current market share. Thus in contrast, his result yields fiercer current competition in the hopes of securing a larger share of the available quota licenses. In general one would expect both effects to be relevant with the short term effect dominating if the length of time required to go from free trade to bilateral VER agreements and antidumping duties to multilateral VER agreements is relatively long. Conversely if this process is relatively short then it seems likely that Anderson's long term effect is more relevant.

6 Conclusion

The GATT provides a legal framework by which governments can credibly commit to a policy of non-discrimination, however, it also provides 'escape clauses' by which governments can discriminate. When dynamics are important and governments are unable to precommit, discriminatory tariffs can have a negative incentive effect which can lead to reduced welfare, even though in a static sense, such a policy may be welfare maximizing.

Thus governments should carefully consider a decision to circumvent the GATT ban on discriminatory tariffs.

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