Special Safeguard Mechanisms for the Agricultural Sector: The GATT Negotiations

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ABSTRACT

The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) negotiations is deadlocked on the issue of agricultural policy reform. Although broad consensus has been reached regarding replacing all nontariff trade barriers with "equivalent tariffs," agreement on the questions of domestic farm policy reforms and access to domestic markets by exporting countries has not yet been reached. Arthur Dunkel, Director General of the GATT, has put forward a compromise proposal that seeks to ensure minimum access to the domestic markets of all countries while providing importing countries with special safeguard mechanisms to protect their domestic markets against large price declines and import surges. Within this context, we analyze and compare safeguard mechanisms activated either by prices declining below some benchmark level or by imports surging above a prespecified level.

It is well known that, in the absence of uncertainty and market failure, price and quantity controls are equivalent. In such an environment, price- and quantity-based safeguard mechanisms are equivalent in the sense that any domestic price and/or import volume can be supported by either a quota or an appropriately defined tariff. If a domestic market is not competitive, tariffs generally tend to dominate quotas. In the presence of uncertainty, the comparison depends on sources of uncertainty and the nature of demand and supply functions, among other factors.

Other considerations, many not explicitly recognized in the Dunkel proposal, may alter the results on the equivalency of the trigger mechanisms. For example, realized prices reflect not only external shocks, but also domestic disturbances. A quantity-based trigger mechanism would be relatively easy to implement and monitor continuously. A price-based trigger mechanism may be less easy to implement, however, because higher tariffs may in fact limit world price movements. Other issues such as the source of shock, criteria for policymakers, and different quality levels of goods are important considerations.

SPECIAL SAFEGUARD MECHANISMS FOR THE AGRICULTURAL SECTOR: THE GATT NEGOTIATIONS

Introduction

The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) multilateral trade negotiations started with the ambitious objective of promoting world trade in every area. The commonly agreed upon objectives regarding trade in agricultural commodities include the following:

- establishing a fair and market-oriented agricultural trading system and initiating a reform process through commitments on support and protection and establishment of strengthened and more operationally effective GATT rules and discipline;
- substantially and progressively reducing agricultural support and protection to correct and prevent restrictions and distortions in world trade in agricultural commodities; and
- reaching agreement on specific binding commitments for market access, domestic support, and export competition and on sanitary and phytosanitary issues.

The major contentious issues of the current talks are tariffying nontariff barriers, reducing domestic support and export subsidies, and providing greater market access to exporting countries. Resolving these issues is critical for the successful conclusion of the ongoing negotiations. Recognizing this fact, Arthur Dunkel, Director General of the GATT, put forward a compromise proposal (hereafter referred to as the Dunkel proposal) on December 20, 1991. Among other things, implementation of the proposal would provide importing countries with special safeguard provisions that would allow an automatic increase in import duty, without compensation, in case of a decline in import prices or a surge in import volume.

Under the Dunkel proposal, importing countries would ensure minimum access to domestic markets by exporting countries. This access would increase gradually through the 1990s. However, importing countries would have recourse to special safeguard provisions for "commodities subject to concessionary market access" to protect against large import price declines and import volume surges. The proposed safeguard mechanism may be summarized as follows.

- If the import volume of the product (subject to concession) exceeds that year's trigger level (defined as the average import quantities of the previous three years or the minimum access amount, whichever is greater) by 125 percent, the importing country could increase the tariff rate by a maximum of 30 percent of the ordinary tariff rate in effect for that year.
- If the import price (price/CIF unit value converted into the respective domestic currency) declines below 90 percent of the benchmark price (defined as the average of the 1986-88 reference price), the importing country could increase the tariff based on the difference between the import price and the benchmark price (the additional allowable tariff under such a situation is defined in the proposal).

In either case, the additional tariff would be effective for one year only. The Dunkel proposal provides for separate measures for seasonal and perishable commodities, thereby protecting against both import price declines and import surges for these commodities, "subject to concession." However, no quantitative restriction would be allowed. Within this context, our interest is in analyzing the design and impact of such special safeguard mechanisms for certain agricultural commodities. We compare two alternative trigger mechanisms for safeguard provision that would protect domestic producers against sudden import surges and/or large price declines affecting certain agricultural products. Specifically, we focus on the following questions.

1. What are the impacts on the volatility of domestic and international prices in the agricultural sector of removing quantitative and other nontariff barriers?
2. If certain agricultural products are to be protected by special safeguard mechanisms, are there differences between policies that focus on restricting import quantity (or slowing down the rate of import penetration) and those that attempt to reduce domestic price declines in response to international price movements? Specifically, we are interested in comparing the impacts of a safeguard mechanism that goes into effect in response to downward price movements with one that is activated by a surge in import quantity.
3. How do the characteristics of domestic and world markets for an agricultural product (or group of products) affect possible safeguard mechanisms?

Our discussion is organized as follows. The following section provides a brief discussion of the impacts of quantitative restrictions (including variable levies) on trade volume and domestic and world prices. Then we discuss the effects of removing these nontariff barriers on trade volume and domestic and world prices. In the last section, we discuss different aspects of safeguard mechanisms and their impacts on prices and import quantities. In the Appendix, we present a brief discussion of other issues pertinent to any mechanism intended to protect domestic producers from outside shocks.

Nontariff Barriers and Domestic and World Price Variability

A basic theme of microeconomics is the equivalence of price and quantity controls under perfect competition, product homogeneity, and certainty. Within the context of international trade, the equivalence of these two control modes is identified with the equivalence of tariffs and quotas (provided that import quota licenses are auctioned). As is evident from the previous statement, the equivalence of tariffs and quotas is predicated upon satisfying the preconditions of perfect competition and certainty (Bhagwati 1965). As has been widely discussed in the theory of commercial policy, the equivalence breaks down under imperfect competition and uncertainty, among other factors.

Imperfect Competition

When domestic markets are not competitive, quantitative trade restrictions attributable to import quotas permit noncompetitive behavior by domestic producers. In this situation, import quotas have different effects than do tariffs. If the domestic economy is small (in the sense of facing an elastic world supply curve), imposing a tariff allows domestic monopolistic producers to raise prices to the extent permitted by the import tariff. Under this scenario, the threat of imports (not necessarily actual imports) limits the domestic (noncompetitive) producer's ability to exercise market power and raise price. But if the tariff is replaced by a quota that imposes a ceiling on imports that is not necessarily below the free-trade import level, the domestic producer (monopolist) faces a residual demand curve above the quota limit. For this demand curve, any competitive threat is absent and the domestic producer can exercise market power to charge a higher price. Furthermore, trade restriction under a domestic monopoly may lead to a perverse trade flow in the sense of turning an importing country into an exporting country.

In fact, quotas insulate the domestic market from world price movements—a fact that lies at the heart of many agricultural programs of advanced Western countries. Under the protective shield of import quotas that completely insulate the domestic market from the world market, governments can undertake supply management or other policies to keep internal (producer and consumer) prices above competitive levels (see Moschini and Meilke 1991). Without such de-linking of the domestic market from world price movements, price support policies that attempt to keep domestic consumer and producer prices above competitive levels would become nonoperational. In effect, these quantitative controls allow governments to transfer income directly to target producer groups without imposing additional budgetary pressure on themselves. Consumers are taxed to pay for the transfer. In that sense, a quantitative control is viewed as more than a mere protective measure; it is also a supporting instrument to implement domestic income redistribution policy. Trade liberalization attempts, therefore, should be accompanied by domestic farm policy reforms.

Uncertainty

The equivalence of tariffs and quotas also breaks down in the presence of uncertainty. Without uncertainty, there is a one-to-one correspondence between choice of quantity and choice of price; hence, one can always find a tariff that will result in some import level as given by a specific binding quota. In the presence of uncertainty, this is not necessarily the case. Under uncertainty, a tariff results in a (probability) distribution of import quantities, whereas a binding quota is equivalent to a (probability) distribution of implicit tariffs.

The issue of relative impacts of tariffs and quotas under uncertainty has been widely discussed in the literature. Fishelson and Flatters (1975) and Young (1979) compared quotas and ad valorem tariffs as welfare-improving instruments from the perspective of a large country. They found that the choice will depend on the sources of uncertainty and the properties of demand and supply functions. Pelcovits (1976) demonstrates the nonequivalence of the two instruments when they are used to attain a fixed level of expected imports. Dasgupta and Stiglitz (1977) and Young (1980a) compare tariffs and quotas as revenue-raising instruments. Young (1980b), Anderson and Young (1982), and Young and Anderson (1980) are other examples where tariffs and quotas are compared in terms of their impacts on such factors as domestic welfare and import level.

The sources of uncertainty and their interaction with commercial policy instruments in transmitting random shocks from one market to another have been the subject of interest in many studies. Specifically, Bale and Lutz (1979) and Zwart and Blanford (1989) have demonstrated that random shocks are shared by all trading countries when tariffs are used. Nontariff barriers generally insulate the domestic market from external shocks. Of special interest in this context is the variable import levy (VIL) system used by the European Community in implementing its Common Agricultural Policy (CAP). A VIL not only insulates the domestic market from the world market, it also helps transfer domestic disturbances to the world market. Under this system, a fixed target price is set for an importable agricultural product. A threshold price is then defined as the target price less the transport and marketing costs associated with imports. When the world price of the good is below the threshold price, a VIL equal to the difference between the threshold price and the world price is applied. Thus, the target price defines the minimum floor for the domestic price. The VIL responds to world price movements to support the target price as the prevailing domestic price. If there is no uncertainty about domestic demand, a VIL is equivalent to an import quota where the quota rents are fully captured by the government of the importing country. If the threshold price is high enough, the domestic market is completely insulated from world price movements. But if there is uncertainty about domestic (excess) demand, a VIL not only supports the target price, it also transfers the burden of domestic instability to the world market.

Comparing Quantity Restrictions and Equivalent Tariffs

Removing quantitative restrictions and replacing them with appropriately defined equivalent tariffs will allow the market mechanism to direct resource allocation. With tariffs present, there may not be complete transmission of world price movements to the domestic markets of importing countries, but the world price will be reflected in domestic prices. Note that if the domestic market is not competitive, the difference between the domestic and the world price under quantitative restrictions represents not only the level of protection given, but also the market power exercised by domestic producers. Therefore, removing quantitative restrictions, along with allowing price transmission, eliminates the market power of domestic producers (if any such power is present). Specifically, the market power of domestic producers will be limited to the extent permitted by existing tariffs. If tariffs are completely eliminated, all market power will be eliminated and trade will be a perfect substitute for antitrust law.

In the presence of uncertainty, the removal of nontariff barriers (e.g., VILs) will allow price signals to be transmitted from the world market to the domestic economy. To the extent that the domestic price and the world price are not perfectly positively correlated, random disturbances originating in one market will be shared by all trading countries. Domestic markets will no longer be completely insulated from the world market (provided the tariff rate in effect is not a prohibitive one). World price instability, as measured by the respective variance, will be reduced. The commonly observed variability of world prices of some agricultural products exaggerates the extent of world market instability in the sense that the observed variances are the result not only of the inherent instability, but also of the pervasive use of nontariff barriers to protect domestic markets from, and even transfer the burdens of internal shocks to, the world market. With tariffs replacing nontariff barriers, all trading countries will share each other's disturbances and world price fluctuation will be less than what we now observe.

Special Safeguard Mechanisms

The main focus of our discussion is concerned with analyzing the design and impact of special safeguard mechanisms meant to protect certain agricultural commodities against sudden wide swings in world prices and/or temporary import surges that may cause sudden, large declines in domestic prices. The idea behind such mechanisms can be described as follows. Although removing nontariff barriers and replacing them with "equivalent tariffs" is the starting point, the final objective of the GATT is to reduce (and, if possible, eliminate) the tariff rate to some low but bounded level within some specified time period. Some importing countries are concerned about the effects of sudden, large declines in world prices. In the event of such a decline in the world price of a commodity, a bounded tariff may result in low domestic prices. These countries want to protect their domestic producers against such situations.

The fact that nontariff barriers will no longer be available to importing countries means that any such special safeguard mechanism must depend on tariff protection. As is evident from our introductory discussion, the Dunkel proposal safeguards against both import price declines and import volume surges. But here we shall discuss the impacts of the two trigger mechanisms separately and compare the outcomes under each mechanism. After actual implementation of the proposed mechanism, the realization of prices and import quantities at a particular point in time will depend on whether the price-based or the quantity-based trigger mechanism is in effect. Given the specific knowledge about demand and supply parameters and the stochastic disturbance process, this realization will simply be an exercise in finding the solution of prices and quantities (or, more appropriately, their probability distributions), keeping in mind the trigger mechanism in effect.

The Impact of Safeguard Mechanisms

For simplicity, we shall limit our discussion to a two-country, partial equilibrium framework: an importing country and the rest of the world (as exporter). Individual buyers and sellers are price-takers. The importing country faces an upward-sloping (world) export supply curve. This assumption is made keeping in mind that the current impasse in the GATT negotiations on trade in agricultural commodities involves such large importers as the European Community, whose import policies are likely to be felt in world equilibrium prices. We assume that the good is a homogeneous product. Let us assume that domestic demand and supply functions for the good generate the following import demand function:

$$M = M(P) = A(P)^{\eta} U; \quad \eta < 0; \quad A > 0; \tag{1}$$

where M represents import quantity, A is constant, P represents domestic price, and U represents a random disturbance in import demand. World export supply of the good is given by

$$X = X(P^{*}) = B(P^{*})^{\omega} E; \quad \omega > 0; \quad B > 0\ ; \tag{2}$$

where B is constant, X represents world export, P^{*} represents world price, E represents a random disturbance in world export supply, and η and ω in Equations (1) and (2) are fixed parameters. For convenience, we use logarithmic transformation of these equations to write

$$m = a + \eta p + u\ ; \tag{3}$$

$$x = b + \omega p^{*} + e\ ; \tag{4}$$

where the lowercase letters represent corresponding variables in natural logarithm. We assume that $E(u) = E(e) = 0$. Let us suppose that, prior to implementing any special safeguard mechanism, the bounded tariff rate is τ^{*}. This assumption yields

$$P = (1 + \tau^{*})\ P^{*} \qquad \text{or} \qquad p = t^{*} + p^{*};$$

where $t^* = \log(1 + \tau^*)$. With the above specification, we can solve for p^*, p, and m as functions of the import demand shock (u), the export supply shock (e), and the tariff rate (t). The solutions are

$$p^* = p^*(e,u,t) = \frac{a - b + \eta t + u - e}{\omega - \eta}; \tag{5.1}$$

$$p = p(e,u,t) = \frac{a - b + \omega t + u - e}{\omega - \eta}; \tag{5.2}$$

$$m = m(e,u,t) = \frac{a\omega - b\eta + t\omega\eta - \eta e + \omega u}{\omega - \eta}; \tag{5.3}$$

and

$$E[p^*(t)] = \frac{a - b + \eta t}{\omega - \eta}; \tag{6.1}$$

$$E[p(t)] = \frac{a - b + \omega t}{\omega - \eta}; \tag{6.2}$$

$$E[m(t)] = \frac{a\omega - b\eta + \omega\eta t}{\omega - \eta}. \tag{6.3}$$

Deterministic Import Demand and Stochastic Export Supply

Because the import demand is deterministic, $u \equiv 0$. For simplicity, we assume that the export supply shock, e, has two realizations, e^{high} (henceforth e^h) and e^{low} (henceforth e^l), with equal probabilities and $E(e) = 0$. Therefore, $e^h > 0$ and $e^l < 0$ and $e^h = | e^l |$. Because e has only two possible realizations, given the initial tariff, t^*, there are only two possible solutions for each of our endogenous variables p, p^*, and m. These solutions are

Positive World Supply Shock: $e = e^h > 0$;

$$p^* = p^*(t^*,e^h) = \frac{a - b + \eta t^* - e^h}{\omega - \eta}; \tag{7.1}$$

$$p = p(t^*,e^h) = \frac{a - b + \omega t^* - e^h}{\omega - \eta}; \tag{7.2}$$

$$m = m(t^*,e^h) = \frac{a\omega - b\eta + t^*\omega\eta - \eta e^h}{\omega - \eta}; \tag{7.3}$$

and

Negative World Supply Shock $e = e^{l} < 0$

$$p^{*} = p^{*}(t^{*},e^{l}) = \frac{a - b + \eta t^{*} - e^{l}}{\omega - \eta}; \tag{8.1}$$

$$p = p(t^{*},e^{l}) = \frac{a - b + \omega t^{*} - e^{l}}{\omega - \eta}; \tag{8.2}$$

$$m = m(t^{*},e^{l}) = \frac{a\omega - b\eta + t^{*}\omega\eta - \eta e^{l}}{\omega - \eta}. \tag{8.3}$$

Also, we have

$$E[p^{*}(t^{*})] = \frac{a - b + \eta t^{*}}{\omega - \eta}; \tag{9.1}$$

$$E[p(t^{*})] = \frac{a - b + \omega t^{*}}{\omega - \eta}; \tag{9.2}$$

$$E[m(t^{*})] = \frac{a\omega - b\eta + \omega\eta t^{*}}{\omega - \eta}. \tag{9.3}$$

We assume that the government of the importing country wishes to protect a minimum domestic price floor at some level $\bar{p}$. Also, we assume that

$$p(t^{*},e^{h}) < \bar{p} < E[p(t^{*})] < p(t^{*},e^{l}).$$

Thus, with tariff t^{*}, domestic price declines below $\bar{p}$ only when $e = e^{h} > 0$. A tariff rate higher than t^{*} is required to support a minimum domestic price at $\bar{p}$ only when there is a positive supply shock.

<u>The price-based trigger mechanism</u>. A price-based trigger mechanism may be defined by the following tariff rule.

(i) So long as the world price (p^{*}) is such that $p^{*}(t^{*}) + t^{*} \geq \bar{p}$, the effective tariff rate is t^{*}.

(ii) If the world price at the initial tariff rate (t^{*}) is such that $p^{*}(t^{*}) + t^{*} < \bar{p}$, the tariff rate is raised to a higher level, t_1.

For our case, e can have one of only two values. The higher tariff rate, t_1, is chosen such that it just protects a minimum domestic price at $\bar{p}$ when the export supply shock is positive ($e = e^{h}$), given the initial import demand function.[1]

Let us define $\overline{p}^*$ such that $\overline{p}^*(t^*) + t^* = \overline{p}$. So, $p(t^*)$ falls below $\overline{p}$ only when $p^*(t^*) < \overline{p}^*$. Now we discuss the effects of introducing a price-based safeguard mechanism. If the world supply shock is positive, $e = e^h > 0$, then without any safeguard mechanism,

$$p^*_{low} = \frac{a - b + \eta t^* - e^h}{\omega - \eta}; \tag{10.1}$$

$$p_{low} = \frac{a - b + \omega t^* - e^h}{\omega - \eta}; \tag{10.2}$$

$$m = \frac{a\omega - b\eta + t^*\omega\eta - \eta e^h}{\omega - \eta}; \tag{10.3}$$

where the subscript *low* stands for the lower of the two realizations of p and p^*. Since $p_{low} < \overline{p}$, the safeguard mechanism comes into effect and the tariff rate becomes t_1, giving

$$p^*_{low} = \frac{a - b + \eta t_1 - e^h}{\omega - \eta}; \tag{11.1}$$

$$p_{low} = \frac{a - b + \omega t_1 - e^h}{\omega - \eta}; \tag{11.2}$$

$$m = \frac{a\omega - b\eta + t_1\omega\eta - \eta e^h}{\omega - \eta}. \tag{11.3}$$

If the export supply shock is negative, $e = e^l < 0$, the tariff rate is t^* with or without the safeguard mechanism, and the solutions are

$$p^*_{high} = \frac{a - b + \eta t^* - e^l}{\omega - \eta}; \tag{12.1}$$

$$p_{high} = \frac{a - b + \omega t^* - e^l}{\omega - \eta}; \tag{12.2}$$

$$m = \frac{a\omega - b\eta + t^*\omega\eta - \eta e^l}{\omega - \eta}; \tag{12.3}$$

where the subscript *high* refers to the higher of the two possible realizations of p and p^*.

With a safeguard mechanism, higher realizations of p and p^* are the same as those without any safeguard mechanism available. But lower realizations of p (p^*) are higher (lower) with the safeguard mechanism than without it. Therefore, the availability of a special safeguard mechanism raises the mean and reduces the variance of the domestic price, given an initial import demand function. The opposite is true for the world price. In fact, with an initial import demand function in effect, the safeguard mechanism truncates the lower end of the domestic price distribution below $\overline{p}$, and the mean of p rises and its variance declines. It is well known that, if a firm's output decision is made before the price is known (which is a reasonable assumption about agricultural production), a risk-neutral firm produces at a level where its marginal cost equals the expected price. If the firm is risk averse, mean-preserving risk reduction (lowering the variance) increases the firm's supply (Sandmo 1971). Because the safeguard mechanism raises the mean and reduces the variance of the domestic price, introducing the mechanism should increase domestic supply. When domestic demand is unchanged (or changes less in magnitude than does supply) the import demand function should shift downward. For simplicity, we assume that the import demand function shifts downward (a parallel shift) to a new position given by

$$m = a' + \eta p \; ; \quad a' < a. \tag{13}$$

We assume that when the world supply shock is negative ($e = e^l < 0$), $p(t^*)$ is above $\overline{P}$, even with the new (lower) import demand function. Thus, the final realizations are

Positive World Supply Shock: $e = e^h > 0$;

$$p^*_{low} = \frac{a' - b + \eta t_1 - e^h}{\omega - \eta}; \tag{14.1}$$

$$p_{low} = \frac{a' - b + \omega t_1 - e^h}{\omega - \eta}; \tag{14.2}$$

$$m = \frac{a'\omega - b\eta + t_1\omega\eta - \eta e^h}{\omega - \eta}; \tag{14.3}$$

and

Negative World Supply Shock: $e - e^l < 0$;

$$p^*_{high} = \frac{a^l - b + \eta t^* - e^l}{\omega - \eta}; \quad (15.1)$$

$$p_{high} = \frac{a^l - b + \omega t^* - e^l}{\omega - \eta}; \quad (15.2)$$

$$m = \frac{a^l\omega - b\eta + t^*\omega\eta - \eta e^l}{\omega - \eta}. \quad (15.3)$$

Note that in this section of our discussion we are assuming that there is no domestic disturbance. The only source of uncertainty is the world export supply. Thus, p^* can fall below $\overline{p}^*$ (and p can go below $\overline{p}$) only if the export supply shock is positive. Because we have assumed that $E[p(t^*)] > \overline{p}$ (or $E[p^*(t^*)] > \overline{p}^*$) without any safety mechanism, the realized domestic and world prices remain above $\overline{p}$ and $\overline{p}^*$, respectively, whenever there is a negative export supply shock. Therefore, even if a safeguard mechanism is available, the safety trigger is not activated when the export supply shock is negative. Thus, given the initial import demand function, the introduction of the safeguard mechanism affects neither the equilibrium prices nor the import volume when the export supply shock is negative [see Equations (8.1) through (8.3) and (9.1) through (9.3)]. If a safeguard mechanism is available, it becomes effective only when there is a positive export supply shock. In that case, the higher tariff rate (t_1) goes into effect and, as a result, the domestic price declines by less than would have been the case without the safeguard mechanism [compare Equations (7.2) and (11.2)]. On the other hand, the higher tariff rate activated by the safeguard mechanism forces the world price to decline by more than would have been necessary without the safeguard mechanism [compare Equations (7.1) and (11.1)]. Because import demand is a function of only the domestic price, its volume remains at a lower level than would have been the case without the safeguard mechanism [compare Equations (7.3) and (11.3)].

Introducing the safeguard mechanism leaves the equilibrium outcomes unaffected when the export supply shock is negative and the realized prices are at their respective high levels. The mechanism comes into effect only to protect the domestic price from declining below $\bar{p}$. Hence, the mean of the domestic price rises and its variance declines. On the other hand, the mean of the world price declines while its variance rises. If domestic import demand declines as result of introducing a safeguard mechanism, the qualitative aspects of the mechanism's effects remain unchanged: the higher realizations of the prices remain unaffected and the safeguard mechanism protects the domestic price at a relatively higher level and forces the world price to adjust to a lower level.

We can illustrate our analysis of safeguard mechanisms with the help of four simple diagrams. The diagrams reflect the log-linear transformation of the original equations. In each of these diagrams, the horizontal axis represents both x and m and the vertical axis represents the domestic price. In Figures 1 and 2, the m-curve represents the (deterministic) initial import demand. In Figures 1 through 4, the $x(t,e)$ curves represent (stochastic) export supply, where t and e denote the tariff rate and the export supply shock, respectively. The curves $x(t = 0,e)$ would represent supply curves with no tariff and would allow us to determine the net price received by the exporter. We assume that the minimum tariff in effect is t^*. The x-curves that are combinations of segments with different slopes (the heavy segments) represent effective supply curves with the safeguard mechanism in operation.

In Figure 1, the trigger price $(\bar{p})$ is given by the ordinate of point C. If the safeguard mechanism is in operation, the segment passing through CD below $\bar{p}$ becomes relevant. The effective supply curve is shown by the heavy line segments joined together. With the initial demand curve and a negative supply shock ($e = e^l$), the domestic price is determined at point A and no safeguard mechanism is required. But if the supply shock is positive ($e = e^h$), then without any safeguard mechanism, the domestic price (given by the ordinate of point B) goes below $\bar{p}$ and the safeguard mechanism is activated. This activation ensures a domestic price at $\bar{p}$. But, as we

No Import Demand Uncertainty
World Export Supply Random

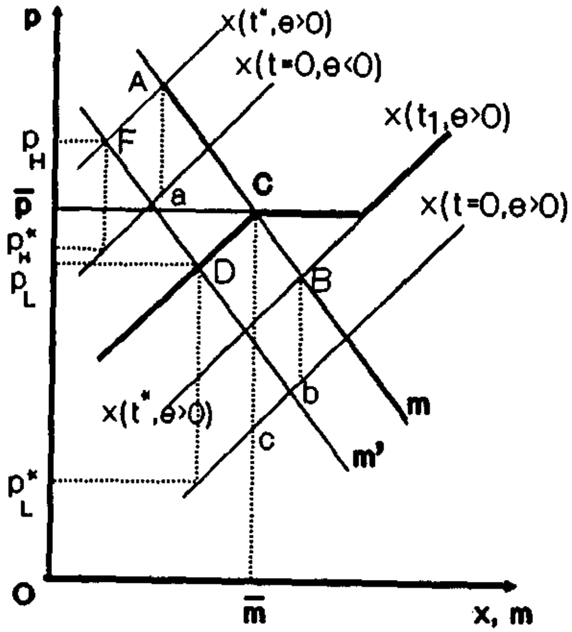

Fig 1: Price-Based Trigger

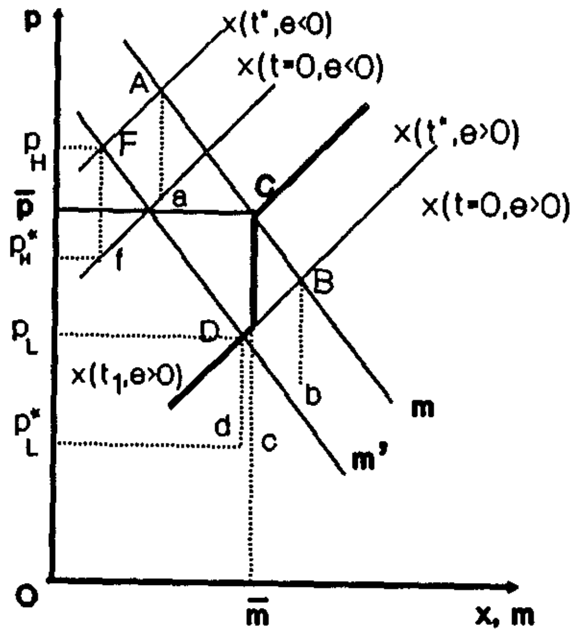

Fig 2: Quantity-Based Trigger

Import Demand Random
World Export Supply Random

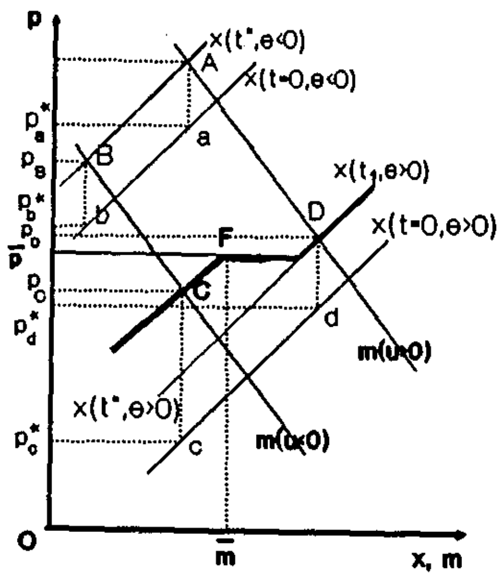

Fig 3: Price-Based Trigger

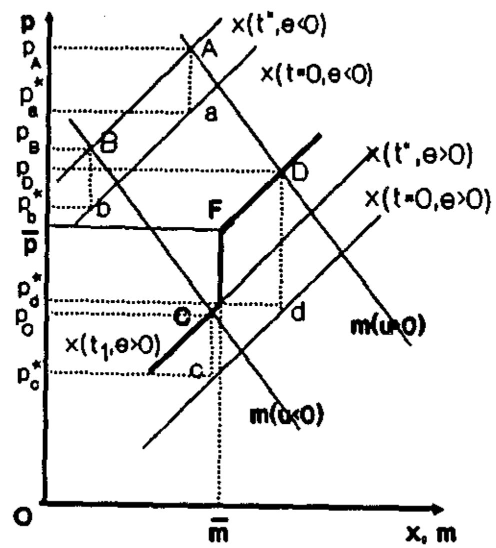

Fig 4: Quantity-Based Trigger

discussed earlier, this brings the import demand curve downward to a position like m'. The final equilibrium realizations follow.

- If the supply shock is negative, equilibrium domestic and world prices are p_H and $p_H{}^*$, respectively, where the subscript H refers to the higher realizations of prices.

- If the supply shock is positive, equilibrium domestic and world prices are p_L and $p_L{}^*$ respectively, where the subscript L refers to the lower realizations of the prices.

<u>The quantity-based trigger mechanism.</u> A quantity-based trigger mechanism may be defined by the following tariff rule.[2]

(i) So long as the quantity imported at the initial tariff rate, t^*, during the time period (generally one year) remains below some prespecified level, $\bar{m}$, the effective tariff rate is t^*.

(ii) Once the import volume (at tariff rate t^*) during the time period reaches $\bar{m}$, the effective tariff rate becomes t_1 for any additional imports during that time period.

In our discussion of a price-based trigger mechanism, t_1 is chosen such that when $e = e^h > 0$ (positive world supply shock), t_1 protects a minimum domestic price $\bar{p}$, equal to $\bar{p}^* + t_1$, with import demand at the initial level. For consistent comparison, we choose $\bar{m}$ such that, with the initial import demand function,

$$\bar{m} = a + \eta \bar{p}.$$

With no domestic uncertainty, if the safeguard mechanism does not shift the import demand function downward (via an increase in the mean and a decrease in the variance of the domestic price), price- and quantity-based trigger mechanisms will have the same effects. But if the import demand function shifts downward (as is generally expected), that may mean one of the following two possibilities.

First, the import demand function may shift downward sufficiently to make the safeguard mechanism redundant. That is, with $m = a' + \eta p$ and $t = t^*$, when $e = e^h > 0$, the quantity imported is

$$m = \frac{a'\omega - b\eta + \omega\eta t^* - \eta e^h}{\omega - \eta} < \bar{m}.$$

In that case,

$$p^*_{high} = \frac{a' - b + \eta t^* - e^l}{\omega - \eta}; \tag{16.1}$$

$$p_{high} = \frac{a' - b + \omega t^* - e^l}{\omega - \eta}; \tag{16.2}$$

$$m_{low} = \frac{a'\omega - b\eta + \omega t^*\eta - \eta e^l}{\omega - \eta}; \tag{16.3}$$

and

$$p^*_{low} = \frac{a' - b + \eta t^* - e^h}{\omega - \eta}; \tag{17.1}$$

$$p_{low} = \frac{a' - b + \omega t^* - e^h}{\omega - \eta}; \tag{17.2}$$

$$m_{high} = \frac{a'\omega - b\eta + \omega t^*\eta - \eta e^h}{\omega - \eta}, \tag{17.3}$$

where the subscripts and superscripts carry the meanings assigned earlier.

Alternatively, it may happen that, even after the import demand function has shifted downward, the quantity imported with $e = e^h > 0$ and $t = t^*$ exceeds $\bar{m}$. In that event, the effective tariff rate is t_1 and the results are identical to those with a price-based trigger mechanism.

The quantity-based trigger mechanism focuses on restricting the import volume rather than on protecting the domestic price directly. But, in the absence of any domestic (import) demand uncertainty, attempts to restrict the import volume are equivalent to protecting the domestic price. In fact, the threshold domestic price, $\bar{p}$, and the trigger import level, $\bar{m}$, have been chosen such that, with the initial import demand function, the choice of $\bar{p}$ is equivalent to the choice of $\bar{m}$ as the trigger level. Therefore, if the import demand is unaffected by the introduction of the safeguard mechanism, the outcomes under the quantity-based trigger mechanism are exactly the same as those under the price-based trigger mechanism.

It is only if the import demand function shifts downward sufficiently so that the import level at domestic price $\overline{p}$ remains below $\overline{m}$ that the quantity-based trigger mechanism produces results that are different from those under the price-based trigger mechanism. The reason for the difference is that, with the lower import demand function, the original correspondence between $\overline{p}$ and $\overline{m}$ no longer exists. The price-based trigger mechanism continues to go into effect whenever the domestic price goes below $\overline{p}$, whereas the quantity-based trigger mechanism may not be activated for some domestic price below $\overline{p}$. Because we have assumed that the safeguard mechanism is activated only when there is a positive export supply shock, the two trigger mechanisms may differ in terms of their effects only in the case of a positive export supply shock. It is evident from Equations (11.1) through (11.3) and (17.1) through (17.3) that the quantity-based trigger mechanism may now result in a lower domestic price and a higher world price compared with those under the price-based trigger mechanism. In the case of a negative export supply shock, the two trigger mechanisms yield identical results [see Equations (12.1) through (12.3) and (16.1) through (16.3)].

A diagrammatic illustration of this trigger mechanism is presented in Figure 2. For ease of comparison, Figures 1 and 2 are drawn to the same scale and the notations are identical. The only difference is in the effective supply curve with the safeguard mechanism in effect. In each of these diagrams, the effective supply curve with the safeguard mechanism is illustrated by the heavy line segments joined together. For consistent comparison, we have chosen $\overline{m}$ to be the import level when the domestic price is $\overline{p}$ and the import demand curve is at the initial level. With the safeguard mechanism in effect and the import demand curve at the initial level, the higher tariff goes into effect only when the supply shock is positive. In that case, the realizations are exactly as those shown in Figure 1. As the import demand curve shifts to m', however, the safeguard mechanism becomes redundant and equilibrium is attained at intersections of m' and $x(t^*,e)$, either at point F or at point D (depending on the realized e). If, however, the m'-curve cuts the effective supply curve on the Cc segment, the effective tariff rate is t_1 and the equilibrium realization is exactly as shown in Figure 1.

A comparison of price- and quantity-based trigger mechanisms. With no domestic uncertainty, price- and quantity-based trigger mechanisms yield identical results if the import demand function does not shift as a result of introducing the safeguard mechanism. These results are summarized in Table 1. Even if the import demand function shifts downward, if the shift is not large enough to make the safeguard mechanism redundant under the quantity-based trigger, the two alternative mechanisms are identical in terms of their impacts. It is only when the import demand function shifts downward sufficiently as a result of the introduction of the safeguard mechanism so that the import volume remains below the trigger level, even when the supply shock is positive, that the quantity-based trigger mechanism produces results that are different from those under the price-based trigger mechanism. In that case, p^*_{high} and p_{high} will be the same as those under the price-based trigger. But, p^*_{low} will be higher and p_{low} will be lower with the quantity-based trigger than the corresponding values under the price-based mechanism. Also, in this case, the quantity-based trigger mechanism leads to a higher mean and a lower variance for p^* compared with those under the price-based trigger mechanism. However, the quantity-based trigger mechanism leads to a lower mean and a higher variance in p compared with the results under a price-based trigger mechanism.

Stochastic Import Demand and Stochastic Export Supply

Next, we consider the case for which domestic import demand and world export supply are stochastic. The import demand function becomes

$$m = a + \eta p + u \ ; \quad \eta < 0. \tag{18}$$

The export supply function is

$$x = b + \omega p^* + e \ ; \quad \omega > 0 . \tag{19}$$

We assume that both u and e have two realizations, (u^h, u^l) and (e^h, e^l), and $Pr(u^h) = Pr(u^l) = Pr(e^h) = Pr(e^l) = 1/2$. Also, we assume that u and e are independent and that $E(u) = E(e) = 0$. Equilibrium solutions of p, p^*, and m will now be functions of u, e, and t.

The price-based trigger mechanism. In defining a price-based trigger mechanism, it is important to distinguish between movements in the world equilibrium prices attributable to import demand shocks and movements attributable to world export supply shocks. If the importing country is small in the sense that its import demand fluctuation has no effect on world equilibrium price, we can treat the world price as exogenous to the importing country. But if the importer is as large as the European Community, its import demand fluctuation will affect world equilibrium price. The Dunkel proposal does not distinguish between import demand shocks and export supply shocks. Accordingly, we do not differentiate betweens sources of disturbances.

We begin by assuming that the initial tariff rate is t^*. Let us define a benchmark world price $\overline{p}^*$ such that $\overline{p}^* + t^* = \overline{p}$, where $\overline{p}$ is the benchmark domestic price that the government wants to protect. A price-based trigger safeguard mechanism may be defined by the following tariff rule.

(i) So long as $p^*(t^*,e,u)$ is greater than $\overline{p}^*$ (so that $p^*(t^*) + t^* \geq \overline{p}$), the effective tariff rate is t^*.

(ii) If $p^*(t^*,e,u)$ falls below $\overline{p}^*$ [and, as a result, $p^*(t^*,e,u) + t^* < \overline{p}$], the effective tariff increases to t_1.[3]

The higher tariff rate, t_1, is chosen such that, if the import demand is at its mean level and there is a positive export supply shock, t_1 will ensure a domestic price equal to $\overline{p}$. We assume that

$$E[p^*(t^*)] > \overline{p}^* \quad \text{and} \quad E[p(t^*)] > \overline{p}.$$

Case A-I. First, we consider the case of positive import demand and positive export supply shocks ($u = u^h > 0, e = e^h > 0$). Without any safeguard mechanism available, $t = t^*$ and the solutions are

$$p^* = \frac{a - b + \eta t^* + u^h - e^h}{\omega - \eta}; \tag{20.1}$$

$$p = \frac{a - b + \omega t^* + u^h - e^h}{\omega - \eta}; \tag{20.2}$$

$$m = \frac{a\omega - b\eta + \omega t^* \eta + \omega u^h - \eta e^h}{\omega - \eta}. \tag{20.3}$$

With a safeguard mechanism in place, the effective tariff rate will depend on whether $\frac{a - b + \eta t^* + u^h - e^h}{\omega - \eta} \lesseqgtr \bar{p}^*$. If $\frac{a - b + \eta t^* + u^h - e^h}{\omega - \eta} \geq \bar{p}^*$, then t^* is the effective tariff rate and the solutions are the same as those with no safeguard mechanism [Equations (20.1) through (20.3)]. If $\frac{a - b + \eta t^* + u^h - e^h}{\omega - \eta} < \bar{p}^*$, the effective tariff rate is t_I and the solutions are

$$p^* = \frac{a - b + \eta t_1 + u^h - e^h}{\omega - \eta}; \tag{21.1}$$

$$p = \frac{a - b + \omega t_1 + u^h - e^h}{\omega - \eta}; \tag{21.2}$$

$$m = \frac{a\omega - b\eta + \eta t\omega + \omega u^h - \eta e^h}{\omega - \eta}. \tag{21.3}$$

Case A-II. The second case is one for which there is a positive import demand shock ($u = u^h > 0$) and a negative export supply shock ($e = e^l < 0$). In this case, without a safety mechanism,

$$p^* = \frac{a - b + \eta t^* + u^h - e^l}{\omega - \eta}; \tag{22.1}$$

$$p = \frac{a - b + \omega t^* + u^h - e^l}{\omega - \eta}; \tag{22.2}$$

$$m = \frac{a\omega - b\eta + \omega t^*\eta + \omega u^h - \eta e^l}{\omega - \eta}. \tag{22.3}$$

Now, p^* with $t = t^*$ is greater than $\bar{p}^*$ (implying that $p > \bar{p}$), and the safeguard mechanism is redundant. Therefore, (22.1) through (22.3) are the solutions for p^*, p, and m.

Case A-III. Next, we consider the case of a negative import demand shock ($u = u^l < 0$) and a positive export supply shock ($e = e^h > 0$). Without a safeguard mechanism, the effective tariff rate is t^* and the solutions are

$$p^* = \frac{a - b + \eta t^* + u^l - e^h}{\omega - \eta}; \tag{23.1}$$

$$p = \frac{a - b + \omega t^* + u^l - e^h}{\omega - \eta}; \tag{23.2}$$

$$m = \frac{a\omega - b\eta + \omega t^* \eta + \omega u^l - \eta e^h}{\omega - \eta}. \tag{23.3}$$

The realizations of p^* and p are at their respective minimums in this case. The effective tariff rate is t_1 if the safeguard mechanism is available, and the solutions are

$$p^* = \frac{a - b + \eta t_1 + u^l - e^h}{\omega - \eta}; \tag{24.1}$$

$$p = \frac{a - b + \omega t_1 + u^l - e^h}{\omega - \eta}; \tag{24.2}$$

$$m = \frac{a\omega - b\eta + \omega t_1 \eta + \omega u^l - \eta e^h}{\omega - \eta}. \tag{24.3}$$

Case A-IV. Finally, we consider the case for which there is a negative import demand shock ($u = u^l < 0$) and a negative export supply shock ($e = e^l < 0$). If no safeguard mechanism is available, $t = t^*$ and the solutions are

$$p^* = \frac{a - b + \eta t^* + u^l - e^l}{\omega - \eta}; \tag{25.1}$$

$$p = \frac{a - b + \omega t^* + u^l - e^l}{\omega - \eta}; \tag{25.2}$$

$$m = \frac{a\omega - b\eta + \omega t^* \eta + \omega u^l - \eta e^l}{\omega - \eta}. \tag{25.3}$$

If a safeguard mechanism is available, the tariff rate is t^* when $\frac{a - b + \eta t^* + u^l - e^l}{\omega - \eta} \geq \bar{p}^*$ and the solutions are as those shown in (25.1) through (25.3). If the reverse is true (that is, $\frac{a - b + \eta t^* + u^l - e^l}{\omega - \eta} < \bar{p}^*$), the effective tariff rate is t_1 and the solutions are

$$p^* = \frac{a - b + \eta t_1 + u^l - e^l}{\omega - \eta}; \tag{26.1}$$

$$p = \frac{a - b + \omega t_1 + u^l - e^l}{\omega - \eta}; \tag{26.2}$$

$$m = \frac{a\omega - b\eta + \omega t_1 \eta + \omega u^l - \eta e^l}{\omega - \eta}. \tag{26.3}$$

With both the import demand and the export supply stochastic, we now have more possible outcomes. When the import demand shock is positive and the export supply shock is negative (Case A-II), both the domestic and the world price remain above their respective mean level and the availability of a safeguard mechanism has no impact [Equations (22.1) through (22.3)]. On the other hand, when the import demand shock is negative and the export supply shock is positive (Case A-III), the realizations of the prices are at their respective minimum. If a safeguard mechanism is available, the higher tariff rate comes into effect, which keeps the domestic price at a relatively higher level and forces the world price to a relatively lower level compared with their levels without the safeguard mechanism [compare Equations (23.2) with (24.2) and (23.1) with (24.1), respectively]. The other two cases are those for which the safeguard trigger may or may not be activated (Cases A-I and A-IV). For these cases, both shocks have the same sign. If the positive import demand shock outweighs the concurrent positive supply shock or the negative supply shock outweighs the concurrent negative demand shock, the safeguard trigger mechanism is not activated and the solutions are given by (20.1) through (20.3) and (25.1) through (25.3), respectively. The safeguard trigger mechanism is activated in the reverse cases and the higher tariff becomes the effective rate. If activated, the safeguard trigger mechanism protects the domestic price at a relatively higher level and forces the world price to a relatively lower level compared with the solutions without a safeguard mechanism [compare Equations (20.1) through (20.3) with (21.1) through (21.3) and (25.1) through (25.3) with (26.1) through (26.3)].

Figure 3 illustrates this trigger mechanism. The notations are the same as before, but we now have demand fluctuating according to the realization of u. For example, the $m(u > 0)$-curve represents import demand with a positive shock. The curve representing the average demand is not drawn to avoid cluttering the diagrams. However, t_1, $\bar{p}$, and $\bar{m}$ are chosen based on the assumption that the expected import demand curve is the only (fixed) relevant demand curve. This average demand curve would pass through point F.

Now let us relate our discussion to Figure 3. In the discussion of Case A-I ($e > 0$, $u > 0$), equilibrium is given by point D. In Figure 3, the safeguard mechanism does not come into operation (because p remains above $\bar{p}$). But for a different demand and/or supply structure, the safeguard mechanism may become binding, which would result in higher domestic and lower world prices compared those without the mechanism. Case A-II of our discussion ($u > 0$, $e < 0$) is represented by point A, and the safeguard trigger is not activated. Realized domestic and world prices are p_A and p_a^*, respectively (in fact, these are the highest realizations of p and p^*). Case A-III of our discussion ($u < 0$, $e > 0$) is where the trigger is necessarily activated and the effective tariff rate becomes t_1. Equilibrium domestic and world prices are p_C and p_c^*, respectively. The domestic price is higher and the world price is lower than those without the safeguard mechanism. Case A-IV ($u < 0$, $e < 0$) in our diagram results in a realized domestic price that is greater than $\bar{p}$, and t^* remains the effective tariff rate. Equilibrium domestic and world prices are p_B and p_b^*, respectively. But, as in Case A-II, for some other demand and/or supply structure, the safeguard mechanism may require the higher tariff rate (t_1), raising the domestic price and lowering the world price.

The quantity-based trigger mechanism. As discussed in the previous section, it is important to distinguish between import demand shocks and export supply shocks if the importing country is large. Following the Dunkel proposal, we do not differentiate between domestic and external disturbances. A quantity-based safeguard mechanism may be defined by the following tariff rule.

(i) With the tariff rate at the initial level, t^*, so long as the total import volume during the period (generally one year) remains below some benchmark level, $\bar{m}$, the effective tariff rate is t^*.

(ii) Once the quantity imported during the period (with tariff t^*) reaches $\bar{m}$, the effective tariff rate becomes t_1 for the remainder of the period.

For consistent comparison with the price-based mechanism trigger, $\bar{m}$ is the import level when the import demand function is at its mean level and the domestic price is at $\bar{p}$, that is, $\bar{m} = a + \eta\bar{p}$.

Case B-I We again consider a positive import demand shock ($u = u^h > 0$) and a positive export supply shock ($e = e^h > 0$). In this case, with $t = t^*$, $m > \bar{m}$ and the effective tariff rate is t_1 if the safeguard mechanism is available. Otherwise, the tariff rate remains t^*. Thus, without the quantity-based safeguard mechanism, the solutions are exactly the same as those in the case of the price-based trigger mechanism and $\frac{a - b + \eta t^* + u^h - e^h}{\omega - \eta} \geq \bar{p}^*$ [Equations (20.1) through (20.3)]. With the safeguard mechanism in effect, the solutions are

$$p^* = \frac{a - b + \eta t_1 + u^h - e^h}{\omega - \eta}; \tag{27.1}$$

$$p = \frac{a - b + \omega t_1 + u^h - e^h}{\omega - \eta}; \tag{27.2}$$

$$m = \frac{a\omega - b\eta + \omega t_1 \eta + \omega u^h - \eta e^h}{\omega - \eta}. \tag{27.3}$$

These solutions are the same as those in the case of the price-based trigger mechanism, and $\frac{a - b + \eta t^* + u^h - e^h}{\omega - \eta} < \bar{p}^*$ [see Equations (21.1) through (21.3)].

Case B-II. The next case is one for which the import demand shock is positive ($u = u^h > 0$) and the export supply shock is negative ($e = e^l < 0$). The quantity imported with $t = t^*$ may or may not exceed $\bar{m}$. The result depends on the magnitudes of u^h and e^l and the elasticities (η and ω). If $\eta e^l > \omega u^h$, with $t = t^*$, $m < \bar{m}$ and the solutions are the same as those under the price-based trigger mechanism [Equations (22.1) through (22.3)]. However, if $\eta e^l < \omega u^h$, then with $t = t^*$, $m > \bar{m}$ and the effective tariff rate is t_1. The solutions, without the safeguard mechanism, are

$$p^* = \frac{a - b + \eta t^* + u^h - e^l}{\omega - \eta}; \tag{28.1}$$

$$p = \frac{a - b + \omega t^* + u^h - e^l}{\omega - \eta}; \tag{28.2}$$

$$m = \frac{a\omega - b\eta + \omega t^* \eta + \omega u^h - \eta e^l}{\omega - \eta}. \tag{28.3}$$

With the safeguard mechanism available, $t = t_1$ and the solutions are

$$p^* = \frac{a - b + \eta t_1 + u^h - e^l}{\omega - \eta}; \tag{29.1}$$

$$p = \frac{a - b + \omega t_1 + u^h - e^l}{\omega - \eta}; \tag{29.2}$$

$$m = \frac{a\omega - b\eta + \omega t_1 \eta + \omega u^h - \eta e^l}{\omega - \eta}. \tag{29.3}$$

Case B-III We consider once again the case of a negative import demand shock ($u = u^l < 0$) and a positive export supply shock ($e = e^h > 0$). As in Case B-II above, with $t = t^*$, the quantity imported may or may not exceed $\overline{m}$. If $|\eta e^h| > |\omega u^l|$, $t = t^*$ would imply an import level above $\overline{m}$ and, with the safeguard mechanism available, the effective tariff rate becomes t_1. Without the safeguard mechanism, the solutions are

$$p^* = \frac{a - b + \eta t^* + u^l - e^h}{\omega - \eta}; \tag{30.1}$$

$$p = \frac{a - b + \omega t^* + u^l - e^h}{\omega - \eta}; \tag{30.2}$$

$$m = \frac{a\omega - b\eta + \omega \eta t^* + \omega u^l - \eta e^h}{\omega - \eta}. \tag{30.3}$$

With the safeguard mechanism in place, $t = t_1$ and the solutions are

$$p^* = \frac{a - b + \eta t_1 + u^l - e^h}{\omega - \eta}; \tag{31.1}$$

$$p = \frac{a - b + \omega t_1 + u^l - e^h}{\omega - \eta}; \tag{31.2}$$

$$m = \frac{a\omega - b\eta + \omega t_1 \eta + \omega u^l - \eta e^h}{\omega - \eta}. \tag{31.3}$$

If $|\eta e^h| < |\eta u^l|$, with $t = t^*$, $m < \overline{m}$, and the effective tariff rate is t^l with or without any safeguard mechanism available. The solutions are

$$p^* = \frac{a - b + \eta t^* + u^l - e^h}{\omega - \eta}; \tag{32.1}$$

$$p = \frac{a - b + \omega t^* + u^l - e^h}{\omega - \eta}; \tag{32.2}$$

$$m = \frac{a\omega - b\eta + \omega t^* \eta + \omega u^l - \eta e^h}{\omega - \eta}. \tag{32.3}$$

Case B-IV. Finally, we again consider the case of a negative import demand shock ($u = u^l < 0$) and a negative export supply shock ($e = e^l < 0$). In this case, with $t = t^*$, $m < \overline{m}$ (in fact, the import level is at its minimum) and, therefore, t^* remains the effective tariff rate with or without a safeguard mechanism. The solutions are

$$p^* = \frac{a - b + \eta t^* + u^l - e^l}{\omega - \eta}; \tag{33.1}$$

$$p = \frac{a - b + \omega t^* + u^l - e^l}{\omega - \eta}; \tag{33.2}$$

$$m = \frac{a\omega - b\eta + \omega t^* \eta + \omega u^l - \eta e^l}{\omega - \eta}. \tag{33.3}$$

Note that, with the price-based trigger mechanism, it is possible to have $t = t_1$ when $u = u^l < 0$ and $e = e^l < 0$. But, with the quantity-based trigger mechanism, the effective tariff rate always equals t^*.

The quantity-based trigger mechanism attempts to restrict the import volume rather than to protect the domestic price directly. When both the import demand and the export supply shocks are positive (Case B-I), the import volume is at its maximum level. If a quantity-based safeguard mechanism is in effect, the trigger is activated in this situation (otherwise, the safeguard mechanism is redundant). The higher tariff rate keeps the domestic price at a relatively higher level and pushes the world price to a relatively lower level compared with the solutions without the safeguard mechanism [compare Equations (20.1) through (20.3) with (27.1) through (27.3)].

Note that a price-based trigger mechanism does not necessarily activate the higher tariff rate in this case [see Equations (20.1) through (20.3)]. In contrast, when there is a positive import demand shock and a negative export supply shock (Case B-II), the domestic price remains above $\overline{p}$ and the price-based trigger implies that the higher tariff rate does not come into effect in this situation [see Equations (22.1) through (22.3)]. But, if the positive import demand shock is strong enough (given our elasticity of import demand), the import volume may exceed $\overline{m}$ and the quantity-based trigger may go into effect, leading to a relatively higher domestic price and a relatively lower world price [compare Equation (22.2) with (29.2) and (22.1) with (29.1), respectively]. A negative import demand shock and a positive export supply shock (Case B-III) necessarily calls for the higher tariff (if a safeguard mechanism is available) under the price-based trigger mechanism [see Equations (24.1) through (24.3)]. But, under a quantity-based trigger mechanism, the negative import demand shock may be more dominant than the positive export supply shock and the import level may remain below $\overline{m}$. In that case, compared to the price-based mechanism, the quantity-based mechanism may result in a relatively lower domestic price and a relatively higher world price [see Equations (24.1) through (24.3) and (32.1) through (32.3)]. If the safety trigger is activated (which is possible), the results are the same under either trigger mechanism. Finally, when the import demand shock and the export supply shock are negative, import volume is at its lowest level and, under the quantity-based trigger mechanism, the higher tariff rate does not go into effect. But, if the negative demand shock is strong enough compared to the negative supply shock, the domestic price may decline by enough to activate the trigger under the price-based mechanism. In that case, the quantity-based trigger mechanism may result in a lower domestic price and a higher world price compared to the price-based trigger mechanism [compare Equations (26.2) with (33.2) and (26.1) with (33.1), respectively]. If the trigger is not activated under the price-based mechanism, the results are the same under either trigger mechanism.

Figure 4 illustrates the quantity-based trigger mechanism.[4] For ease of comparison with Figure 3, the same scale has been maintained. Notations and curves are exactly as those shown in Figure 3, except for the effective supply curve under the safeguard mechanism. As before, that curve is illustrated by the heavy line segments joined together. Case B-I ($u > 0$, $e > 0$) now requires that the safety trigger be activated and the effective tariff rate become t_1. Domestic and foreign prices are p_D and p_d^*, respectively (and are different from those in Figure 3). For Case B-II ($u > 0$, $e < 0$), the realizations are identical in Figures 3 and 4. Domestic price is at p_A and world price is at p_a^*. But that does not always have to be true. For some demand and/or supply functions, the safeguard mechanism may become operational under the quantity-based trigger mechanism and yield results that are different from those in Figure 3. Case B-III in Figure 3 requires that the tariff rate be t_1, resulting in domestic and world prices at p_C and p_c^*, respectively. But, under the quantity-based trigger mechanism, as our diagram shows, it may not be necessary to activate the safety trigger in this case and we may have results different from those in Figure 3. Case B-IV ($u < 0$, $e < 0$) shows that the effective tariff rate is t^* and domestic and foreign prices are p_B and p_b^*, respectively. But, that is not necessarily the case under the price-based trigger mechanism described in Figure 3; the two mechanisms may differ in their outcomes. These results are summarized again in Table 1.

Related Issues

The primary motivation for having special safeguard mechanism within the GATT framework (at least as put forward by the countries pressing for such protection) is to protect against the (downward) variability of domestic prices. This motivation implicitly assumes that price variability, at least beyond a certain level, is undesirable. We have not addressed any such normative issue; instead, we have focussed exclusively on some positive questions. We have analyzed two alternative ways to implement a special safeguard mechanism by comparing impacts on domestic and foreign prices and on trade volume. A normative evaluation would require imposing more structure on the problem by defining the producer preference pattern and the objective function of the policymaker. Even if we assume that producers are expected utility maximizers and risk averse (in the sense of a Von Neumann-Morgenstern utility function), it is not immediately obvious that income-risk-averse producers will be better off with any price stabilization program that keeps the mean of the price distribution unchanged.

Also, to go into any normative discussion such as optimality of alternative safeguard mechanisms, we first need to specify why we need such intervention. Is the intervention to occur for any market failure? Or does the policymaker have income distribution considerations in mind? The optimization problem and policy prescriptions may not be the same for the two reasons for intervention: correcting market failure or changing income distribution.

Another aspect of the problem is that we are dealing with agricultural commodities, some of which may be intermediate inputs for other production processes. For example, grains are inputs for the livestock industry. Stabilizing grain prices while keeping the mean unchanged may not be beneficial to risk-averse grain producers. Also, such stabilization may affect input demand by other sectors. For example, grain price stabilization may increase or decrease demand from the livestock sector for other inputs such as labor. Such linkages should be kept in mind when prescribing a policy instrument.

If producers of the good in question are risk averse such that stabilization of the price increases domestic supply, then, with demand unchanged, import demand will decline. If the good is an intermediate product for other sectors, however, price stabilization may increase demand for the good as an intermediate product. This increase in demand for the product as an input may more than offset the supply increase, so import demand may not necessarily decline only as a result of price stabilization.

If domestic production and/or marketing of the good is in the hands of an institution or firm having the ability to control domestic supply, a safeguard mechanism may lead to further distortions. In one year, for example, if domestic production were to decline, imports would be expected to increase in that year. If the quantity-based trigger mechanism was in operation, the domestic supplier could initially reduce supply (sales), leading to imports reaching the benchmark level for that year. By being able to control domestic supply, the domestic supplier would guarantee a higher price for the remainder of the year. For most agricultural products, this example may not be interesting and relevant. But we may find examples such as the production and supply of certain fruits and vegetables that are dominated by a few large firms. For those cases, the example is relevant. Also, if domestic producers and exporters are limited in number and have market power, the presence of the safeguard mechanism may promote collusion among them, leading to overall welfare loss.

It is possible that exchange rate movements or other macroeconomic policies may activate the trigger, even when there is no demand or supply shock. For example, exchange rate appreciation in the importing country could lead to import price declines that would trigger the safeguard mechanism, even though the world price of the commodity has not changed. Issues such as these should be addressed when defining the rules of any such safeguard mechanism.

In our discussion, we have kept the higher tariff rate, t_1 (the effective rate when the safety mechanism is activated), the same under the two alternative trigger mechanisms to keep our analysis simple. If the importing country or the policymaker has a specific objective in mind (e.g., to keep the average domestic price the same under the two alternatives, or to keep the average import volume the same under both trigger mechanisms), the additional tariff may not be the same under the two safeguard mechanisms.

If both the domestic import demand and the world export supply are stochastic, the sources of the shocks should be taken into account when defining the safeguard mechanism. If the objective is to protect the domestic price of the importable good, a higher import volume should not activate any additional tariff if the import surge is attributable to positive import demand shock. Similarly, if a negative demand shock in the importing country causes the (world) price decline that activates a price-based trigger mechanism, exporting counties are penalized for the importer's domestic disturbances. The Dunkel proposal seems to have failed to take into account these factors.

Implementing a safeguard mechanism may become a problematic issue. If the objective is to protect domestic producers from large external shocks, the safety trigger should be tied to the realized world export supply shock. In reality, however, we observe prices and quantities, not actual shocks. The realized prices reflect both external and internal shocks. Of the two mechanisms, a quantity-based trigger mechanism is relatively easy to implement because we can monitor and add total import volume continuously. A price-based trigger is less easily monitored and implemented. For example, let us suppose that for some reason world price falls and remains below $\overline{p}^*$ for some time period. As a result, the price-based trigger is activated and the higher tariff rate comes into effect. This higher rate may prevent the world price from returning to above $\overline{p}^*$, which might otherwise have been possible. The Dunkel proposal seems to have treated all importers as small countries and has not considered issues such as this.

Another potential area for disputes may arise for commodities that have more than one quality available in the market. For example, meat has many different varieties and cuts and their prices are significantly different. It is not clear in the Dunkel proposal how different qualities of the same commodity are to be treated. Lower prices of low-quality rice or cheaper cuts of meat may give the importing country a pretext for raising the tariff when it actually imports a small quantity of the cheaper variety compared with the volume of import of the expensive variety, whose world price may remain above $\overline{p}^*$.

Finally, the Dunkel proposal allows for additional tariffs if import volume during any year exceeds 125 percent of the average of the previous three years' imports, or if the import price falls below 90 percent of the 1986-88 (fixed) reference price. These provisions have distinct implications.

The import quantity that will activate the safeguard mechanism is not fixed. If import volume for a country gradually increases over time, the import quantity needed to trigger the additional tariff will also increase. A regressive element is also built into this quantity-based trigger mechanism. For example, if the import volume for a country declines sharply in one year (e.g., in response to positive domestic production shock), it will push down the import trigger level for the following years. On the other hand, the price-based trigger mechanism is very rigid in its definition: any time the import price falls below 90 percent of the 1986-88 reference price, the higher tariff rate may be activated by the importing country. Thus, the price-based trigger fails to respond to gradual price changes over time. If the world price of a commodity declines gradually, not because of any random shock but because of structural changes in world production, it would be desirable for special safeguard mechanisms to recognize such structural change and to respond differently in such a case. In that respect, the quantity-based trigger is less rigid than is the price-based trigger mechanism as defined in the Dunkel proposal.

Table 1. Summary of results

A. Deterministic Import Demand and Stochastic Export Supply

I. If import demand is unaffected (or does not decline far enough) as a result of introducing the safeguard mechanism, price- and quantity-based trigger mechanisms have the same effects.

II. For a sufficiently large decline in the import demand as a result of introducing the safeguard mechanism,

P (price based) $>$ P (quantity based); P^* (price based) $<$ P^* (quantity based); and M (price based) $<$ M (quantity based).

B. Stochastic Import Demand and Stochastic Export Supply

	Case I	Case II	Case III	Case IV
	Demand Shock > 0 and Supply Shock > 0	Demand Shock > 0 and Supply Shock < 0	Demand Shock < 0 and Supply Shock > 0	Demand Shock < 0 and Supply Shock < 0
Domestic Price (P)	Price based $\leq$ Quantity based	Price based $\leq$ Quantity based	Price based $\geq$ Quantity based	Price based $\geq$ Quantity based
World Price (P^*)	Price based $\geq$ Quantity based	Price based $\geq$ Quantity based	Price based $\leq$ Quantity based	Price based $\leq$ Quantity based
Import Volume (M)	Price based $\geq$ Quantity based	Price based $\geq$ Quantity based	Price based $\leq$ Quantity based	Price based $\leq$ Quantity based

Demand shock = Import demand shock (u).

Supply shock = Export supply shock (e).

ENDNOTES

1. For a supply shock that is continuous over some interval, protection of a minimum domestic price would require a VIL. If there is an upper limit on the allowed tariff, we may define the tariff rule under a safeguard mechanism as follows.

   - For $p^*(t^*) + t^* \geq \overline{p}$, the effective tariff rate is t^*.
   - For $p^*(t^*) + t^* < \overline{p}$, the effective tariff rate, t, is defined such that $p^*(t) + t = \overline{p}$ with the constraint that $t \leq t_1$ where t_1 is as defined in the text. For our simple case in which either $e = e^h$ or $e = e^L$, the discontinuity in the tariff rate is not a serious issue. Note that t_1 is defined as $t_1 = \log(1 + \tau_1)$ where τ_1 is the actual ad valorem tariff rate.

2. Ideally, we should treat import surges attributable to demand shock differently from those attributable to supply shock. In this section, we are assuming that the import demand function is deterministic. Thus, the only reason for an import surge is a positive export supply shock. Our discussion and the diagram representing the quantity-based trigger mechanism ignores the possibility of any import volume surges above $\overline{m}$ when the export supply shock is negative.

3. As discussed in endnote 1, for continuous e and u, protection of a minimum price would require a VIL. To avoid a VIL, an upper limit on the admissible tariff rates may be defined. The tariff rule may be modified to avoid a discontinuous jump in the tariff rate, as discussed in endnote 1. Our discussion is based on e and u each taking one of only two possible realizations. Hence, a discontinuous jump in the tariff rate is not a serious problem.

4. In Figure 4, $m(t^*,e,u)$ exceeds $\overline{m}$ only when both shocks are positive. The higher tariff rate is reflected in the effective supply curve only in that case. To keep the diagram simple, other potential cases are not shown.

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