Tariffication and Agricultural Trade

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CONTENTS

FIGURES

ABSTRACT

This paper considers the effects of tariffication—conversion of a variable import levy, widely used in the European Community, into an equivalent ad valorem tariff—on trade and welfare. While tough negotiations lie ahead over the exact rates of tariff reduction, contracting countries in principle agreed to tariffication proposed by the United States. If producers are risk neutral, tariffication has no effect on production and trade, and gains from a GATT agreement in the Uruguay Round depend on the extent of tariff reductions. If domestic producers are risk averse, however, tariffication reduces domestic production of the importable and thus has a trade expansion effect, which causes a shift in the import demand curve. This trade expansion effect may dominate the increased trade effect resulting from a negotiated tariff reduction, which causes a movement along the import demand curve. Consumers benefit from tariffication but domestic producers lose because of an increased risk premium.

TARIFFICATION AND AGRICULTURAL TRADE

Tariffication—conversion of nontariff barriers (NTBs) to tariffs—is a key component of the U.S. position in the current Uruguay Round of the GATT negotiations for agricultural trade. While tariffs have been reduced for most industrial goods over the last two decades, developed countries have been reluctant to reduce NTBs on agricultural trade. Among other NTBs, the variable import levy (VIL) forms the core of Common Agricultural Policy (CAP) and has been widely used to restrict agricultural imports from the United States and other countries.

Since the breakdown of the Brussels meeting, the European Community (EC) agreed to negotiate three areas: domestic support, market access, and export subsidies (*Inside U.S. Trade* 1991). In principle, the EC agreed to tariffication of VILs (and other NTBs) and gradual reduction of the converted tariffs as well as domestic and export subsidies over an extended period, although tough negotiations lie ahead regarding the extent of reduction.

Currently, the EC sets a target price (or threshold price) on imported grains. A VIL, equal to the difference between the target price and the import price, is then applied to imports. A VIL is random because of price instability originating in the foreign market.[1] With a VIL, domestic producers are insulated from price fluctuations in the foreign market. Tariffication replaces the (random) VIL by a fixed ad valorem tariff so that after tariffication the domestic price is no longer insulated from foreign market price fluctuations. Thus, tariffication will affect domestic production, consumption, and welfare.

It is well known that tariffs and quotas are equivalent but this equivalence may break down under uncertainty. For instance, when the foreign export supply is uncertain, a fixed specific tariff results in random imports and conversely, a fixed import quota causes random price or tariffs. Three potential criteria may be used to compare commercial policies under uncertainty: expected trade volume,

expected price, or expected utility. For example, Pelcovitz (1976) and Young and Anderson (1980) compared quotas with tariffs that yield the same level of expected import.[2] Expected utility criterion was suggested by Young and Anderson (1982), which represents a landmark in the literature of ranking trade policies under uncertainty.[3]

In the U.S. proposal (USTR 1989) for the Uruguay Round, a tentative definition of equivalence based on the expected price criterion is employed. During a 10-year transition period, the existing NTBs will be replaced by tariff-rate quotas.[4] At the end of the transition period, the quotas are eliminated and protection is offered by bounded ad valorem tariffs. That is, a VIL is replaced by a fixed ad valorem tariff. Presumably, if a fixed ad valorem tariff—equal to the mean of VILs over a given period—is chosen, the expected price will be maintained at the target price level before tariffication.

This paper investigates trade and welfare effects of tariffication of a VIL when uncertainty originates in the foreign export supply. Tariffication will generally affect income and the demand for other consumption goods. Due to changes in income and shifts in the demand for traded goods, the general equilibrium effects of tariffication of a VIL are ambiguous. To assess the likely impacts of tariffication, we employ a partial equilibrium analysis, based on zero income effect and constancy of the marginal utility of income. In this case, expected consumer surplus adequately represents consumer welfare (Turnovsky, Shalit, and Schmitz 1980). With these simplifying assumptions, we investigate the effects of tariffication on trade and welfare. The analysis emphasizes the negative supply response and the trade expansion effect of tariffication when producers are risk averse.

If producers are risk neutral and the mean domestic price after tariffication is equal to the threshold price, then tariffication has no impact on production and trade in the absence of a further tariff reduction. If domestic producers are risk averse, however, tariffication induces a reduction in domestic production and expands import demand. Expected consumer surplus increases and consumers benefit from tariffication. On the other hand, expected producer surplus declines and the risk premium increases, and hence producers become worse off. Expected tariff revenue also increases when

producers are risk averse. Thus, if the mean domestic price is preserved, tariffication redistributes income from producers to consumers. Since tariffication expands the import demand, agricultural exporters such as the United States and the Cairns Group will benefit from tariffication even without further reductions in tariff rates.

The next section develops a partial equilibrium model to analyze the effects of tariffication. The effects of tariffication under risk neutrality are considered. The analysis is then extended to the case where domestic and foreign producers are risk averse, and the final section contains concluding remarks.

A Partial Equilibrium Analysis

To investigate the effects of tariffication of a VIL on trade and welfare in the simplest way we employ the following assumptions:

1. Foreign production Y^* is random and causes uncertainty in the foreign export supply schedule.
2. Consumers choose quantities demanded after domestic prices are realized.
3. Due to production lags, production decisions are made before observing the random foreign production Y^* or the domestic price p.
4. Transport and marketing costs of the importable are zero.
5. For all realizations of the foreign price of the importable, p^*, the economy imports Y.
6. The domestic demand curve for the importable is unaffected by tariffication.
7. The marginal utility of income is invariant to changes in price.

The VIL is widely used in the EC to control imports of agricultural products from the United States and other countries. A fixed target price is set for the importable. The threshold price is the target price less the transport and marketing costs associated with imports. Assumption 4 implies that the target price is equal to the threshold price of the importable. When the foreign price is below the

target price, a VIL, equal to the difference between the threshold price and the foreign price, is then applied to imports.

The primary function of the VIL is that it responds to changing world market prices while the corresponding target price insulates domestic producers from foreign disturbances. Tariffication of a VIL means that a random tariff is replaced by a fixed ad valorem tariff. After tariffication, domestic producers face random domestic prices for their outputs.

Assumption 6 enables us to employ a partial equilibrium analysis of the effects of tariffication on trade. In a general equilibrium framework tariffication will affect consumer income and demands for consumption goods. If the income effect on the demand for the importable good is negligible, the partial equilibrium analysis provides a close first approximation of the consequences of tariffication in the general equilibrium model. For this reason, we employ a partial equilibrium analysis and assume that the underlying demand curve for the importable good remains unaffected when the VIL is replaced by a fixed ad valorem tariff.

With assumption 7, expected social surplus becomes a valid welfare criterion, and the conventional argument based on expected consumer surplus and producer surplus areas can be used to evaluate the welfare effects of tariffication.

Uncertain Foreign Export Supply

Let X and Y denote the domestic consumption and production of the importable good, respectively. Production decisions are made at the beginning of the unit period, based on the expected price or the price distribution of the importable. Let p be the domestic price and p^* the foreign price of the importable. Under a VIL system, the government announces the target price p^o of the importable. Since transport cost and marketing cost of the importable are zero, the target price is equal to the threshold price. The VIL is then $v = p^o - p^*$.

In the absence of domestic disturbances a VIL system is equivalent to an import quota, even when the foreign price is random. For a given import demand schedule, as shown in Figure 1, a fixed

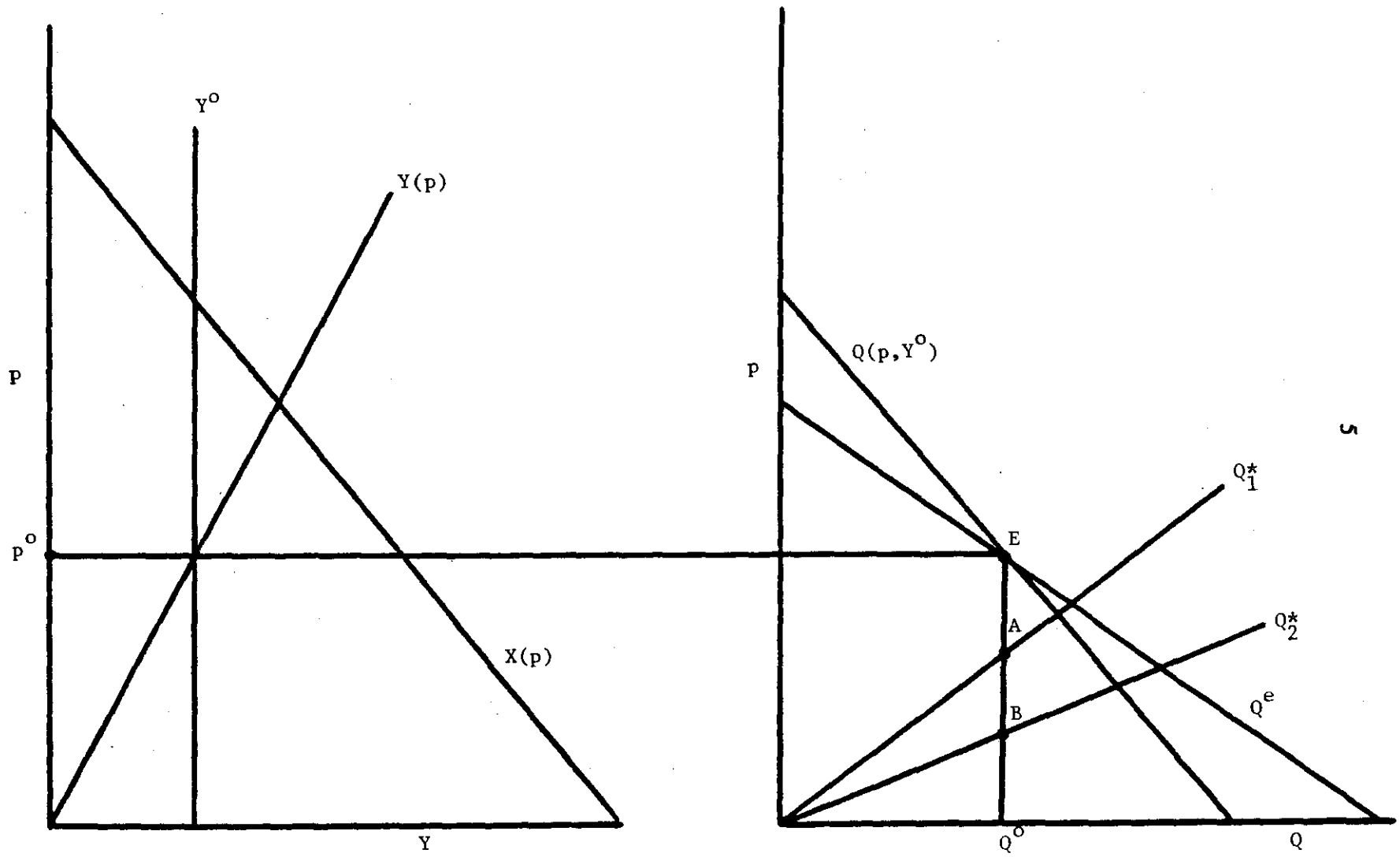

Figure 1. Ex post import demands and VIL

target price p^o yields a constant level of import $Q^o \equiv Q(p,Y)$. If the foreign price p^* rises, the VIL is reduced by the same amount, while the import quantity remains constant at Q^o. The target price p^o and an import quota Q^o yield identical levels of domestic price, consumption, and production.

It is important to distinguish the ex ante and ex post import demand schedules. For most manufactured goods production is almost instantaneous. For example, the typical assembly lines in a modern automobile plant produce a car every minute. For agricultural products, however, long production lags exist between production decisions and realization of outputs. Although price expectation can guide input decisions made at the time of planting, realized outputs cannot respond to changes in output price revealed after harvest.

Let $Y(p)$ denote the ex ante supply schedule, where p is the price that prevails at the end of the production period. If p^o is the target price of the importable, the realized output at the end of the period is $Y^o \equiv Y(p^o)$. Although planned output is positively related to price along the ex ante supply schedule $Y(p)$, the realized domestic output Y^o is not responsive to changes in prices observed ex post. Given the realized domestic output Y^o and the foreign export supply schedule $Q^*(p^*)$, consumption and trade decisions are made and equilibrium domestic and foreign prices are determined simultaneously.

Figure 1 illustrates how the ex post import demand schedule is derived. In the left panel, the domestic demand and supply curves are denoted by X and Y, respectively. The ex ante import demand schedule $Q^e \equiv X(p) - Y(p)$ is derived by subtracting the ex ante supply schedule $Y(p)$ from $X(p)$. If a target price p^o is announced, producers choose $Y(p^o)$ along the positively sloped ex ante supply schedule $Y(p)$. At the end of the period, production is realized and the ex post supply schedule is the vertical supply curve Y^o. Thus, the ex post import demand schedule $Q(p,Y^o)$ is given by,

$$Q = X(p) - Y^o. \tag{1}$$

The horizontal difference, $X(p) - Y^o$, is the ex post import demand schedule in the right panel. Clearly, the ex post import demand schedule is more inelastic than the ex ante import schedule.

Recall that since the ex post import demand schedule Q is not random, fixing the domestic price at p^o is equivalent to an import quota $Q^o = Q(p^o, Y^o)$. Let $Q^*(p^*)$ denote the foreign export supply schedule. The market clearing condition for the importable is

$$Q(p, Y^o) - Q^*(p^*) = 0. \tag{2}$$

Since the target price is fixed at p^o, equation (2) implicitly defines the VIL $v(p^o, p^*) = p^o - p^*$.

Consider two states of nature, 1 and 2. In state i the foreign export supply schedule, Q_i^*, is observed, i = 1, 2. Figure 1 illustrates how a VIL responds to a change in the foreign export supply schedule. Given the ex post import demand schedule $Q(p, Y^o)$, the target price p^o determines the import volume Q^o, and hence the target price at p^o is equivalent to an import quota Q^o. If the foreign export supply curve is Q_i^*, the market clearing foreign price is at the intersection of Q_i^* and the vertical line EQ^o. Thus, the target price p^o requires a VIL, $v_i = p^o - p_i^*$. In state 1, the VIL is $v_1 = EA$, and in state 2 it is $v_2 = EB$. In both states the quantity of import remains at Q^o.

It is well known that in the absence of uncertainty an import quota and a tariff are equivalent if they yield identical trade volume, price, and utility. In the presence of uncertainty, however, a tariff and a quota that yield the same expected domestic price need not guarantee equalization of expected import volume, or utility levels. Thus, there are three potential criteria for equivalent tariffs: expected price, expected trade volume and expected utility. In the current Uruguay Round of the GATT, the expected price criterion has been employed.

We now investigate how tariffication of a VIL will affect the expected volume of trade and expected social surplus. If the VIL is replaced by a fixed ad valorem tariff α, the domestic and foreign prices will be random and satisfy the condition

$$Q[p^*(1 + \alpha), Y] - Q^*(p^*) = 0.$$

If state i occurs the foreign market clears at p_i^*, and the domestic price is $p_i = p_i^*(1 + \alpha)$. Observe also that with a fixed ad valorem levy the volume of import Q is also random and assumes the value $Q_i = Q(p_i^*)$ in state i.

To show how the foreign price p_i^* is determined, the ex post import demand schedule $Q(p,Y^o)$ is rewritten as $q(p^*) \equiv Q[p^*(1 + \alpha),Y^o]$. Note that domestic price p is used for the ex post import demand schedule $Q(p,Y^o)$ in Figure 2. If the foreign price p^* is used in the same figure, the ex post import demand schedule corresponds to the import schedule $q(p^*)$ with the vertical axis now measuring the foreign price p^*. The intersection of $q(p^*)$ and the foreign export supply schedule Q_i^* determines the market clearing foreign price p_i^* and the equilibrium import level Q_i^*. The corresponding domestic price $p_i = p_i^*(1 + \alpha)$ is then obtained at E_i by finding the domestic price corresponding to Q_i^* along the ex post import demand schedule $Q(p,Y^o)$.

If domestic demand is linear and production is unaffected by tariffication, then the expected import volume will remain unaffected by tariffication. If the demand curve is convex (concave) and production is unaffected, tariffication results in a larger (smaller) expected import volume.

The Effects of Tariffication under Risk Neutrality

If a system of a threshold price and the associated VIL is replaced by a fixed ad valorem tariff equal to the expected VIL, that is, $\alpha = E(p^o - p^*)/Ep^*$, then tariffication may raise or lower the expected domestic price, depending on the supply responses of domestic and foreign producers. Now assume that an ad valorem tariff α is chosen so that the expected producer price Ep is at the level of target price before tariffication, $Ep = p^o$. Let $p_i = p_i^*(1 + \alpha)$ be the domestic price associated with a fixed ad valorem tariff α. In this case, tariffication results in a mean preserving spread (MPS) in the domestic price of the importable.

Assume first that domestic producers are risk neutral. In this case production of the importable occurs where the expected domestic price is equal to marginal cost, $Y = Y^o$. Thus, domestic output of the importable is unaffected by tariffication. Recall that the domestic demand curve for the importable

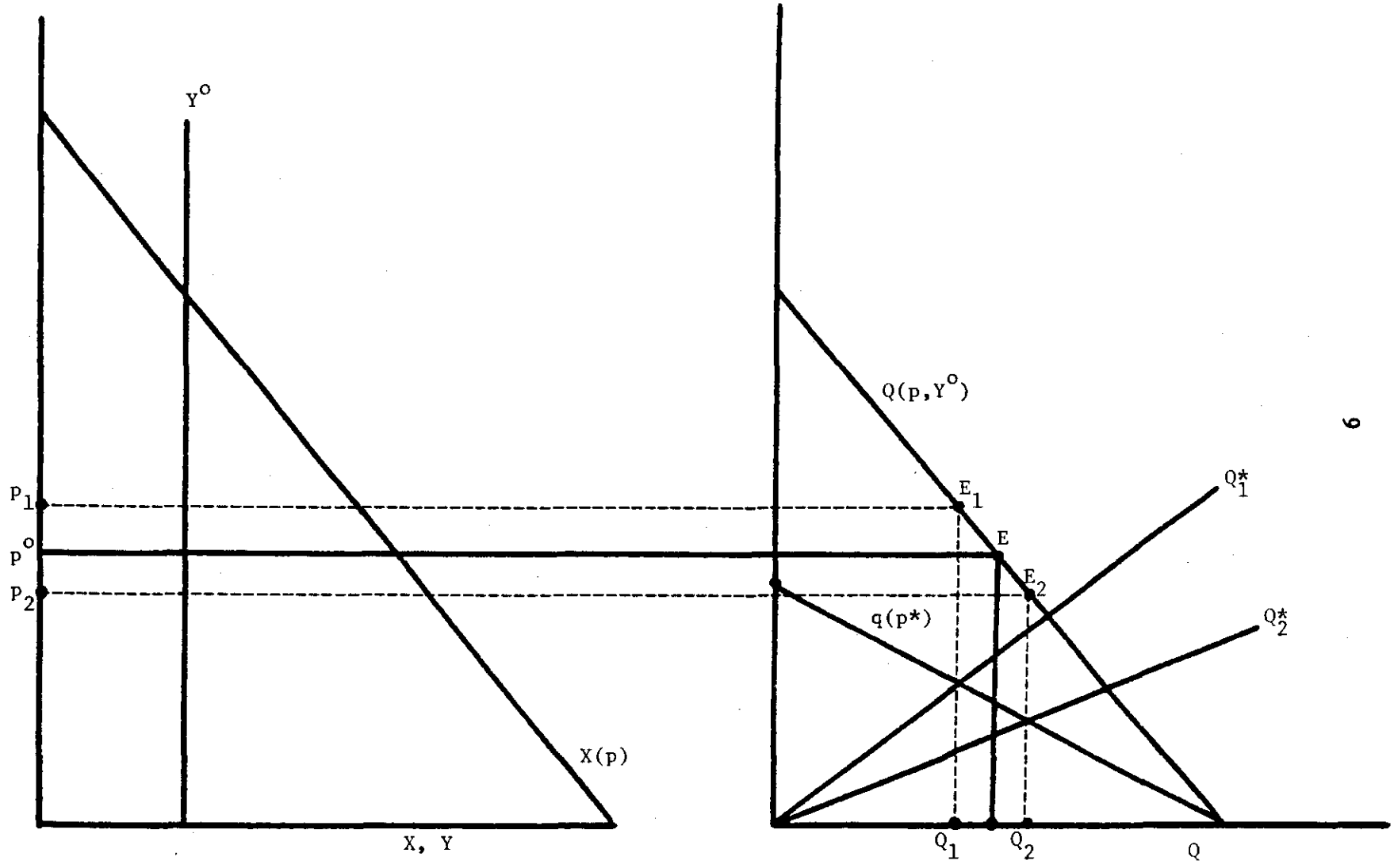

Figure 2. Tariffication of a VIL and trade

remains unchanged, although the quantity demanded is now random and responds to the realized domestic price p. Thus, the ex post import demand schedule also remains unaffected by tariffication. The expected volume of import is $EQ(p,Y^o) = EX(p,Y) - Y^o$. If the demand for the importable is linear in the domestic price, tariffication has no effect on the expected volume of trade $EQ(p,Y^o)$. On the other hand, if $X(p,Y)$ is convex (concave) in price, then $EX(p,Y) > (<) X(Ep,Y) = X(p^o,Y)$, and tariffication increases (decreases) expected import volume. Hereafter, the demand for the importable is assumed to be linear in price. Thus, tariffication has no effect on production and producer welfare.[5]

Waugh (1944) showed that if the market price is destabilized consumers would benefit since expected Marshallian consumer surplus is higher under price instability. Moreover, Turnovsky, Shalit, and Schmitz (1980) demonstrated that expected Marshallian consumer surplus is a valid welfare criterion when the marginal utility of income is invariant to changes in price. Since the domestic price is destabilized while preserving the mean, tariffication of the VIL increases expected consumer surplus. Since the import demand curve is linear, the expected tariff revenue, $ET = E\alpha Q(p,Y) = \alpha EQ(p,Y) = \alpha Q(p^o,Y)$, is unaffected by tariffication.

Tariffication and Risk Aversion

In two independent studies Baron (1970) and Sandmo (1971) investigated the behavior of the competitive firm that makes production decisions before the market price is observed. They have shown that price uncertainty has an adverse effect on the output of the risk averse competitive firm. That is, the risk averse competitive firms produce less when the output price is random than when the mean price is observed with certainty.

When producers are risk averse, the effects of tariffication on supply response and trade can be illustrated by Figure 3. Since tariffication replaces the certain target price by a random price with the same mean, the risk averse domestic firms will produce less output after tariffication. Thus, the ex post supply curve shifts from Y to Y′ in the left panel. Consequently, the ex post import demand

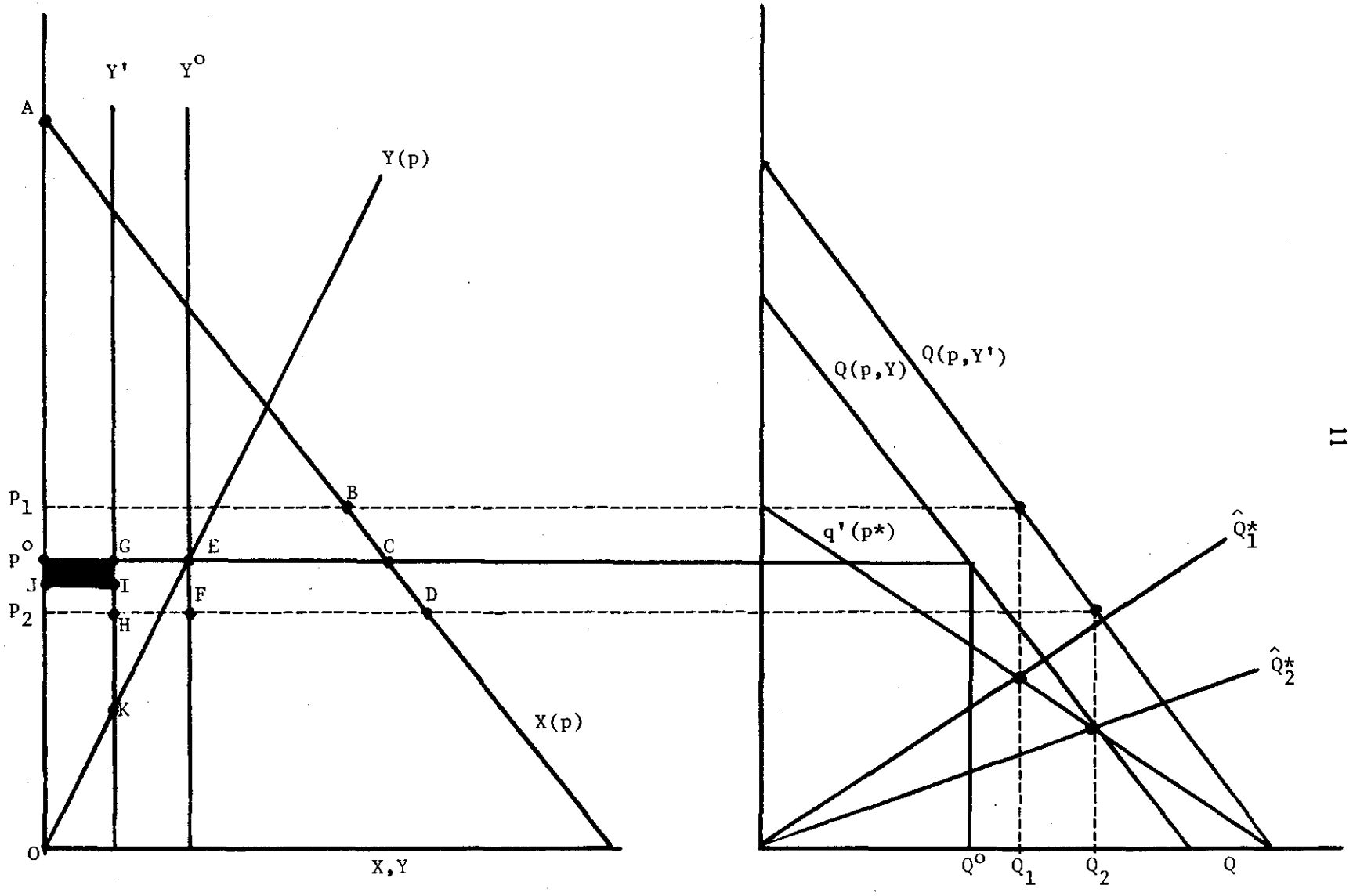

Figure 3. Tariffication and the trade expansion effect

schedule shifts to the right from $Q(p,Y^o)$ to $Q(p,Y')$ in the right panel. Thus, if the competitive producers are risk averse, tariffication has a trade expansion effect.

Consider first the case where tariffication does not affect the supply in the foreign market. The new import demand schedule $Q(p,Y')$ corresponds to the import demand schedule $q'(p^*) \equiv Q[p^*(1+\alpha),Y']$ when the foreign price p^* is used for the vertical axis. To simplify the diagram the foreign export supply schedules Q_i^* are not drawn. In each state i, the domestic and foreign prices will be higher than if domestic producers are risk neutral. Thus, the expected domestic and foreign prices will increase after tariffication.

PROPOSITION: Assume that a system of a target price and the corresponding VIL is replaced by a fixed ad valorem tariff. If the domestic producers are risk averse, tariffication increases import demand and raises expected domestic and foreign prices.

Next, consider the effects of tariffication when the foreign suppliers also respond to tariffication. Since domestic producers partly share the price variability, the foreign producers encounter less foreign price variability after tariffication. This reduced foreign price variability alone will induce a positive supply response in the foreign market. The foreign export supply schedule in state i shifts to the right from Q_i^* (not drawn) to $\hat{Q}_i^*$ (Figure 3). The intersection of the new import demand schedule $q'(p^*)$ and the new foreign export supply schedule $\hat{Q}_i^*$ determines the import quantity Q_i and the foreign price p_i^*.

In Figure 3, the ad valorem tariff rate α is chosen so that in the presence of a positive foreign supply response the expected domestic price Ep is maintained at p^o, the target price level before tariffication. If the two states have even chances, then $p^o = (p_1 + p_2)/2$. How does tariffication of a VIL affect consumer welfare? In state 1 consumer surplus is the area of triangle ABp_1, and it is ADp_2 in state 2. As Waugh (1944) has shown, the expected consumer surplus is larger than the area ACp^o, which is the consumer surplus area before tariffication. Thus, consumers unambiguously benefit from tariffication.

Next, consider how the tariffication affects producer welfare. Since risk averse producers reduce output from Y^o to Y', expected producer surplus reduces from OEp^o to $OKGp^o$. However, risk averse producers maximize certainty equivalent producer surplus, equal to the expected producer surplus less the risk premium. Suppose the latter is represented by the rectangular area p^oGIJ. The certainty equivalent producer surplus unambiguously declines after tariffication. Since the volume of import increases by GE, expected tariff revenue increases by $\alpha p^o(GE)$. This increased expected tariff revenue may be used to compensate domestic producers adversely affected by tariffication. This extra tariff revenue would also be politically easier to use for compensation than increasing taxes on consumers.

Concluding Remarks

The Uruguay Round of multilateral negotiations was relaunched after the EC agreed to negotiate domestic supports, market access barriers, and export subsidies. At the Brussels meeting last December, the EC suggested 30 percent cuts over 10 years (or 3 percent annually) from a 1986 base, while the United States and the Cairns Group of nations wanted cuts of 75 percent in internal price supports and market barriers, and 90 percent reductions in export subsidies over a ten-year period. The Hellstrom proposal suggested 30 percent over five years (or 6 percent annually) from a 1990 base across the three areas.[6] In these proposals, NTBs such as VILs and import quotas are converted into equivalent tariffs, and are further subject to reductions over an extended period. While tough negotiations lie ahead over the exact rates of tariff reduction, contracting countries agreed in principle to tariffication proposed by the United States.

This paper has examined the effects of tariffication of a VIL on trade and welfare when price instability originates in the foreign market. The system of a target price and a VIL insulates domestic producers from foreign market disturbances. When the VIL is converted into an equivalent tariff, domestic producers face price uncertainty. Among three alternative criteria for equivalent tariffs, the expected price criterion proposed by the United States has been adopted in the Uruguay Round. In the

absence of further tariff reductions, tariffication results in an MPS in the domestic price of the importable.

If producers are risk neutral, tariffication has no effect on production and trade. Expected tariff revenue will also remain unaffected. Although Waugh's analysis suggests that consumers will benefit from tariffication itself, the principal gains from a GATT agreement in the Uruguay Round depend on the extent of tariff reductions.

If domestic producers are risk averse, however, tariffication reduces domestic production of the importable and has a trade expansion effect, which causes a shift in the import demand curve. The trade expansion effect may dominate an increased trade effect resulting from a negotiated tariff reduction, which causes a movement along the import demand curve. Consumers benefit from tariffication but domestic producers lose because of increased risk premium. As imports increase, the expected tariff revenue also rises. If the mean domestic producer price is preserved by tariffication, the expected consumer surplus rises and consumers benefit. Since the expected producer surplus declines while the risk premium increases, producers unambiguously lose from tariffication. The increased tariff revenue and the expected consumer surplus may more than offset the loss of producers, depending on producers' attitudes toward risk.

ENDNOTES

1. Comparing the mean consumer welfare under price instability (with known price paths) and consumer welfare under stable prices over two or more periods is analytically equivalent to comparing expected consumer welfare under price uncertainty and certainty in a single period. For this reason, price instability and price uncertainty are used interchangeably, and so are mean price and expected price.

2. The ranking of trade policies under an expected revenue constraint has also been investigated. For instance, using social surplus areas, Dasgupta and Stiglitz (1977) and Young (1980) compared quotas and ad valorem tariffs that yield the same expected revenue.

3. Turnovsky, Shalit, and Schmitz (1980) showed that the expected surplus criterion is a valid welfare measure only if the marginal utility of income is constant. For this reason Young and Anderson (1982) employ expected utility.

4. Countries need to negotiate further on a low below-quota tariff and a high above-quota tariff. The tariff-rate quota is a temporary regime that would soften the blow of tariffication during the transition period.

5. Similarly, risk neutral foreign producers will not be affected by tariffication either.

6. The Hellstrom text circulated in Brussels was an acceptable reference for negotiation for all major trading countries except for the EC, whose refusal triggered the walk-out by Brazil and other members of the Cairns Group, which brought the Brussels meeting to an end.

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