The Optimum Tariff, Retaliation and Autarky

EDWARD TOWER*

Tibor Scitovsky (1942) and Harry G. Johnson (1953-4) have explored what would happen to a country which imposes the optimum tariff when its trading partner retaliates by imposing the optimum tariff in its turn. In their analyses "it is assumed that 'retaliation' takes the form of the imposition of an optimum tariff, on the assumption that the other country's tariff will remain unchanged," and the two countries take turns imposing the optimum tariff until a commercial-policy equilibrium or a recurrent tariff cycle is attained. Scitovsky (p. 99) concluded that equilibrium "need not but probably will be reached before international trade is completely eliminated..." Johnson amended this conclusion by noting: "That the adjustment process will never end in the elimination of trade is a logical consequence of the classical proposition that some trade is always better than no trade." However, this does not exclude the possibility that when both countries retaliate by imposing optimum tariffs, the system could approach autarky in the limit, or come within an "e" of autarky for any "e" given sufficient time. This paper demonstrates that even this is impossible if in autarky neither country would be completely specialized, and the community indifference curves are strictly convex.

Let us suppose that the tariffs of both countries are so high that trade has been cut to a very small proportion of consumption and production of both commodities in both countries.

Since import demand is an excess demand for the commodity in question, we would expect the elasticity of the offer curve to approach infinity as trade approaches zero, and our expectation is borne out, for in appendix A it is shown that the elasticity of the tariff-distorted home demand for imports as a function of the terms of trade is

$$\mu = \frac{D\delta^* + S\alpha + M}'{(1 + t)} \quad (1)$$

where $\mu$ is the elasticity of home demand for imports as a function of the terms of trade, defined to be positive for normal values;

$\delta^*$ is the elasticity of home demand for the importable (along an indifference curve, i.e. holding real income constant) and $\delta^* > 0$;

$\alpha$ is the elasticity of home supply of the import good and $\alpha > 0$;

$t$ is the home tariff as a proportion of the world price of the import;

$m$ is the home marginal propensity to spend on the importable out of income;

$D$, $S$, and $M$ are respectively home consumption of the importable, home production of the importable and the level of imports. Also, variables without primes refer to the home country and variables with primes refer to the foreign one.

Suppose it is the home country's turn to adjust its tariff and the world economy is resting in an equilibrium where $1 - m'(1 + t') < 0$. The Optim

Then either the home country will accept a unilateral tariff reduction (until it ceases to hold the home tariff zero), or else the two tariff-distorted curves must cross again somewhere along both of them, where well countries is higher. In the latter case both countries take the economy to the mutual equilibrium before either tariff is raised.

Thus, only in the normal case, $(1 + t) > 0$, is tariff escalation justifiable. Restricting our attention to that later that neither country would in the absence of trade. Clear point, as tariff escalation shrinks domestic relative to $D$ and $S$, and infinity. By invoking the same foreign country, it is clear approaches infinity in the limit approaches zero, where $\mu$ is the foreign demand for foreign imporation of the foreign terms of trade.

*These conclusions can be demonstrated trade indifference curves an offer curves. It is only necessary following Kemp (1968) has addition for the foreign terms of trade move out from the origin along the $x$ is $1 - m'(1 + t') < 0$. Second, a must be an increasing function of if any of its offer curves (whether diso.

*These must be so, for as autarky is denominated approachs zero. Even curves which just touch but does not necessarily frontier has a kink contact between the two curves, in the point at any equilibrium which goes on the indifference curve and $\mu$ must exceed 0. Note that $t$ strict convexity of indifference curve satisfaction in autarky implies that at be zero.

The optimum tariff, retaliation and autarky

The demand is an excess demand for utility in question, we would expect the offer curve to approach trade approaches zero, and our excess borne out, for in Appendix A it is the elasticity of the tariff-determined for imports as a function of the trade is

\[ D_0 + S_0 + M_0 + (1 + r) \]

\[ M [1 - mt/(1 + r)] \]  \hspace{1cm} (1)

- the elasticity of home demand for imports as a function of the terms of trade, defined to be positive for normal values;
- the elasticity of home demand for the importable (along an indifference curve, i.e., holding real income constant) and \( \delta^* > 0 \);
- the elasticity of home supply of the import good and \( q > 0 \);
- the home tariff as a proportion of the world price of the import;
- the home marginal propensity to spend on the importable of income;
- \( M \) are respectively home consumption, portable, home production of the import, and the levels of imports. Also, various primes refer to the home country; with primes refer to the foreign one.

Then either the home country will benefit from a unilateral tariff reduction (until the inequality ceases to hold or the home tariff has fallen to zero), or else the two tariff-distorted offer curves must cross again somewhere further along both of them, where welfare for both countries is higher. In the latter case, we assume that both countries take measures to move the economy to the mutually preferable equilibrium before either tariff is altered.

Thus, only in the normal case, where \( (1 + r) > 0 \), is tariff escalation a possibility. Restricting our attention to that case, we postulate that neither country would be specialized in the absence of trade. Clearly, after some point, as tariff escalation shrinks trade, \( M \) declines relative to \( D \) and \( S \), and \( \alpha \) approaches infinity. By invoking the same argument for the foreign country, it is clear that \( \mu' \) also approaches infinity in the limit as trade approaches zero, where \( \mu' \) is the elasticity of foreign demand for foreign imports as a function of the foreign terms of trade.

\[ dW/dt = [-1 + \epsilon(\mu' - 1)] M(d\pi/dt) \]

where \( 1/\pi \) is the terms of trade of the home country. If the equilibrium is unstable, \( dW/dt \) is positive, and a little geometry easily shows that unilateral tariff reduction will always improve the welfare of the tariff-cutting country. If the equilibrium is stable, an increase in a country's tariff will improve its terms of trade. In this case, \( dW/dt \) is negative, and unilateral tariff reduction by the home country will increase home real income so long as \( t > 1/\mu' \). Therefore, if tariff escalation has already caused trade in both commodities to fall close to zero, both \( \mu \) and \( \mu' \) will be close to infinity and both countries will have an incentive to reduce tariffs unilaterally.

Thus, the adjustment process will never end in the elimination of trade, even in a limiting sense, if neither country would be specialized in the absence of trade, and the community indifference curves are strictly convex.

As Johnson (1967, p. 58) (among others) notes, \( 1/\mu' - 1 \) defines the optimum tariff.

This must be so, for as autarky is approached the denominator approaches zero. Even if the indifference curve which just touches but does not cross the production possibilities frontier has a kink at the point of contact between the two curves, in the neighborhood of that point at any indifference curve where there is some trade going on the indifference curve must be smooth and \( \delta^* \) must exceed 0. Note that the assumption of strict convexity of indifference curves and non-specialization in autarky implies that autarky is achieved before \( t \rightarrow 0 \).
Appendix A: Derivation of the Elasticity of the Tariff-Ridden Offer Curve

We assume that both countries produce and consume two goods. Using the notation of the text, we consider the home country. A tariff drives a wedge between the internal relative price of the import (p) and the external one (π) such that

\[ p = (1 + t)\pi \]  

(A1)

where both prices are measured in units of the export per unit of the import.

The tariff revenue, R, (measured in units of the exportable) is given by \( R = t\pi M \). Thus, with the tariff constant

\[ dR = td[\pi M] \]  

(A2)

and

\[ dp = (1 + t)d\pi. \]  

(A3)

Imports make up the difference between domestic consumption and production of the importable, so

\[ M = D - S. \]  

(A4)

Movements along the transformation schedule are defined by

\[ dS/S = \sigma dp/p. \]  

(A5)

Disposable income (measured in units of the exportable) is defined by \( Y = Sp + B + R \), where \( B \) is home production of the exportable. Differentiating this relationship, while remembering that \( p \) is the slope of the production frontier so that \( p = -dB/dS \), yields

\[ dY = S dp + dR. \]  

(A6)

The demand schedule for the importable is given by

\[ dD/D = -\delta dp/p + \left[\mu(dM/M)\right]dY \]  

(A7)

where \( \delta \) = the elasticity of home demand for the importable (holding constant income measured in units of the exportable), and \( \delta > 0 \) for normal values. By definition:

\[ \mu = -\left[\frac{dM/M}{d\pi/\pi}\right]. \]  

(A8)

Substituting (A2) into (A6) to eliminate \( dR \), and then substituting the result into (A7) to eliminate \( dY \), yields an equation which (using (A1) and (A3) to eliminate \( p \) and \( dp \) and using (A8) to eliminate \( dM \)) can be rewritten as

\[ \frac{dD/D}{[D(1 + t)]} = -\delta + \frac{m[tM - tMu + S(1 + t)]}{[D(1 + t)]}d\pi/\pi. \]  

(A9)

We substitute the derivative of (A4) into (A8) to acquire

\[ \mu = -\left[\frac{(dD - dS)/M}{d\pi/\pi}\right]. \]  

(A10)

Combining (A5) with (A1) and (A3) yields

\[ dS/S = \sigma d\pi/\pi \]  

(A11)

Using the Slutsky decomposition to rewrite \( \delta \) as \( \delta^* + m \), and substituting (A9) and (A11) into (A10) to eliminate \( dD \) and \( dS \), yields, with the aid of (A4):

\[ \mu M[1 - m]/(1 + t) = \delta^* + Su + (M + S)m - m[tM + S(1 + t)]/(1 + t) \]  

(A12)

which simplifies to equation (1) of the text.

Appendix B: The Welfare Impact of a Tariff Change

Defining \( dW \) as the change in home real income measured in units of the exportable, and \( X \) as the level of home exports, we can write

\[ dW = p\delta M - dX. \]  

(B1)

Since payments balance is continually maintained

\[ X = \pi M. \]  

(B2)

Substituting the derivative of (B2) into (B1) to eliminate \( dM \), and substituting from (A1) into the result to eliminate \( p \) yields

\[ dW = \pi dX. \]  

By definition:

\[ \mu' = \frac{dX/X}{d\pi/\pi} \]

which we substitute into (B3) to

Substituting from (B2) to elir dividing the result by \( dt \) yields the text.

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ues. By definition:
\[ \mu = -\frac{dM/M}{d\pi/\pi} \]  \hspace{2cm} (A8)

Substituting the result into (A7) to \( d\mu \), yields an equation which (using A3) to eliminate \( p \) and \( dp \) and using \( dM \) can be rewritten as:
\[ \frac{-\delta + m \{tM - tM\mu + S(1 + t)\}}{[D(1 + t)]} \frac{d\pi}{\pi} \]  \hspace{2cm} (A9)

The derivative of (A4) into (A8)
\[ = \frac{(dD - dS)(M)}{[d\pi/\pi]} \]  \hspace{2cm} (A10)

We Slutsky decomposition to rewrite \( \delta \)
and substituting (A9) and (A11) into eliminate \( dD \) and \( dS \), yields, with the:
\[ m\delta (1 + t) = D\delta S + S(1 + t) \]  \hspace{2cm} (A12)

Solves to equation (1) of the text.

Appendix B: The Welfare Impact of a Tariff Change

\[ dW \] as the change in home real income in units of the exportable, and the welfare of home exports, we can write:
\[ dW = pdM - dX \]  \hspace{2cm} (B1)

The welfare changes balance is continually maintained
\[ X = \pi M. \]  \hspace{2cm} (B2)

By definition:
\[ \mu' = \frac{dX/X}{d\pi/\pi} \]  \hspace{2cm} (B4)

which we substitute into (B3) to eliminate \( dX \).
Substituting from (B2) to eliminate \( X \) and dividing the result by \( d\tau \) yields equation (2) of the text.

References


