Necessary conditions for welfare improving reforms

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Abstract

We develop necessary conditions for welfare improving reforms. We show that our work may be useful in evaluating the desirability of preferential trading areas (PTAs) and reforming Article XXIV of GATT. The conditions that no country necessarily loses from world trade reform are also derived. \copyright 2000 Elsevier Science S.A. All rights reserved.

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1. Introduction

What kinds of reforms are welfare enhancing? A major question in the policy arena has been about which Preferential Trading Agreements or PTAs should be permitted and which should not. Such questions lie at the heart of policy debates and have been the focus of work in the area of piecemeal policy reform. The literature has emphasized sufficient conditions for the trade reforms to be welfare improving. The necessary conditions for welfare improving reform, however, are rarely considered. Restricting reform to those that are sufficient to ensure a Pareto improvement may be too strict. After all, these conditions are not necessary for welfare to rise so that these requirements could rule out reform which was Pareto improving. A weaker requirement, which is the approach of this paper, might be that no country necessarily loses from the reform as done here. We look at the necessary conditions for an increase in welfare. Our work is based on the work of Ohyama (1972) who derives sufficient conditions for a welfare improvement in the single consumer case.
We show that our work may be useful in evaluating the desirability of preferential trading areas (PTAs) and reforming Article XXIV of GATT which places some constraints on the formation of Customs Unions. There has been considerable and growing interest in Preferential Trading Agreements (PTAs) in recent years. However, it is far from clear whether such agreements should be encouraged or not. If one asks what some indicators of welfare enhancing preferential trading agreements might be, a fair amount of confusion becomes apparent. Article XXIV on the creation of customs unions does put some constraints on their creation, namely that they should not be more restrictive. Unfortunately, when there are many goods and many different tariffs or non-tariff barriers on trade, it is hard to define what this means in practice.

In a series of recent papers, Anderson and Neary (1990), (1992) and Anderson and Bannister (1992) define and implement an index of trade restrictiveness which could be applied to this issue, but O’Rourke (1997) pleads for caution in the use of this index. Simpler criteria are proposed by others. Bhagwati (1993) suggests that a common external tariff on each good set at the minimum of the pre-CU tariffs be seen as meeting this requirement. However, no analytical support for this is provided. In fact, as shown by Ju and Krishna (1996), such reforms are exactly what occur with the creation of Free Trade Areas (FTAs) without Rules of Origin (ROOs) and can reduce the welfare of members of the customs union as well as their imports, but not both! McMillan (1993) suggests an alternative criterion with a distinctly mercantilistic flavor. He suggests that if a customs union raises the volume of trade with the rest of the world, then it should be allowed. This suggests that neither the customs union nor the rest of the world is hurt if trade volume rises. Krugman (1991) argues that the creation of “natural trading blocs” is bound to be desirable. Natural trading blocs are seen as being composed of trading partners who trade inordinately with each other. His arguments are challenged by Bhagwati and Panagariya (1996) and Panagariya (1996).

2. The model

There are assumed to be $n$ goods, with prices denoted by the column vector $P$. Let $P^{wi}$ and $P^d_i$ denote the world and domestic price vectors in time period $i$ respectively, where $i \in \{0,1\}$. In period $i$

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1In particular, it requires that:

“(i) . . . the duties and other regulations of commerce . . . shall not on the whole be higher or more restrictive than the general incidence of the duties or regulations . . . prior to the formation of such union or the adoption of such interim agreement.

(ii) Duties . . . are eliminated with respect to substantially all trade between constituent territories of the union or at least with respect to substantially all the trade in products originating.”

2There are some restrictive assumptions involved in the implementation of their index. They assume implicit separability of the difference between the expenditure and revenue function. This is not ensured by assuming implicit separability of both the functions.


4For a more detailed discussion of this literature see Ju and Krishna (1997).

5These could be final or intermediate goods. Intermediate goods enter the output vector as negative elements and pure intermediate goods enter the demand vector as zeros.
Specific tariffs are denoted by the vector $T^i$. Hence, $P^i = P^{wi} + T^i$. Assuming that tariff revenue is redistributed among consumers in a lump-sum fashion, the budget constraint for country $h$ may be written as:

$$E^h(P^h,u^h) = R(P^h,V^h) + T^hM^h$$

(1)

where $E(\cdot)$ is the standard expenditure function of the country, $R(\cdot)$ is the revenue function, $u$ is the utility level, $V$ is the factor endowments vector. We assume that $E(\cdot)$ and $R(\cdot)$ have all the standard properties. $E_p(\cdot)$ and $R_p(\cdot)$ are column vectors which represent the first partials of the expenditure and revenue functions with respect to domestic prices. Thus, $E^h(P^h,u^h) = C(P^h,u^h)$ is demand, and $R^h(P^h,V^h) = X(P^h,V^h)$ is supply. $M(.) = E_p(.) - R_p(.)$ is the net trade vector. World prices, and from them, the domestic prices, are determined by world market clearing conditions:

$$\sum_{h \in H} [E^h(P^h,u^h) - R^h(P^h,V^h)] = 0. \quad (2)$$

where $H$ is the set of all countries. Thus, (1) and (2) can be used to solve for the endogenous variables in the system, namely equilibrium levels of utility and price.

3. Necessary conditions

For any given country, we know that:

$$E(P^0,u^0) = P^0C(P^0,u^0) - P^0C(P^1,u^1) + P^0C(P^1,u^1) \geq P^0[C(P^0,u^0) - C(P^1,u^1)] + E(P^0,u^1)$$

If $g = P^0[C(P^0,u^0) - C(P^1,u^1)] > 0$, then welfare must fall due to the tariff reform from $T^0$ to $T^1$. Thus, for welfare to rise, it is necessary that $g \leq 0$ or:

$$P^0[C(P^0,u^0) - C(P^1,u^1)] \leq 0. \quad (3)$$

This says that a necessary condition for reform to be welfare improving is that the new consumption bundle not be affordable at the old prices. Note that if (3) is a necessary condition, so is $P^0[C(P^0,u^0) - C(P^1,u^1)] - A \leq 0$ for $A \geq 0$. Thus,

$$P^0[C(P^0,u^0) - C(P^1,u^1)] - P^0[X(P^0,V^0) - X(P^1,V^1)] \leq 0$$

is also necessary since $P^0[X(P^0,V^0) - X(P^1,V^1)] \geq 0$ from profit maximizing. Hence an alternative form of the necessary condition for welfare to rise due to the reform is that:

$$P^0[M(P^0,u^0,V^0) - M(P^1,u^1,V^1)] \leq 0. \quad (4)$$

In a small country case, world prices are given so that $P^{w0} = P^{w1}$ and assume the trade is balanced, thus:
\[ P^0 \left[ M(P^0, u^0, V^0) - M(P^1, u^1, V^1) \right] = P^* \left[ M(P^0, u^0, V^0) - M(P^1, u^1, V^1) \right] \\
+ T^0 \left[ M(P^0, u^0, V^0) - M(P^1, u^1, V^1) \right] \\
= T^0 \left[ M(P^0, u^0, V^0) - M(P^1, u^1, V^1) \right] \]

Hence, for a small country to gain from the tariff reform, it is necessary for:

\[ T^0 \left( M(P^0, U^0, V^0) - M(P^1, U^1, V^1) \right) \leq 0. \]  

(5)

Thus, we suggest looking at the effects of reforms on consumption, imports or tariff revenue evaluated at their pre-reform levels. If these would have fallen short of pre-reform levels, the reforms could not have raised welfare!

Our results here are summarized below.

**Proposition 1.** A necessary condition for the change in tariffs to be welfare improving is that:

\[ P^0 \left[ C(P^0, u^0) - C(P^1, u^1) \right] \leq 0, \]

or

\[ P^0 \left[ M(P^0, u^0, V^0) - M(P^1, u^1, V^1) \right] \leq 0. \]

For a small country with balanced trade, this can be written as:

\[ T^0 \left( M(P^0, u^0, V^0) - M(P^1, u^1, V^1) \right) \leq 0. \]

### 4. Applications

We first apply the necessary conditions to Free Trade Areas (FTAs). Assume that goods are differentiated by country of origin so that a country consumes all goods but produces only the domestic one. This is the “Armington Assumption”. Denote by \( P^0 \) the price of the good made only by country \( k \), consumed in country \( s \), at time 0. Similarly, \( M^0_0(P^0, u^0, V^0) \) denotes the imports of goods produced only by country \( k \) into country \( s \) at time zero. Suppose that countries \( A \) and \( B \) form a FTA and exclude the rest of the world \( C \), then a necessary condition for welfare improvement in country \( A \) due to the formation of an FTA is:

\[ P^A_0 \left[ M^A_0(P^A_0, u^A_0, V^A_0) - M^A_0(P^A_1, u^A_1, V^A_1) \right] + P^B_0 \left[ M^B_0(P^A_0, u^A_0, V^A_0) - M^B_0(P^A_1, u^A_1, V^A_1) \right] \]

\[ + P^C_0 \left[ M^C_0(P^A_0, u^A_0, V^A_0) - M^C_0(P^A_1, u^A_1, V^A_1) \right] \leq 0. \]

The above expression can be rewritten as

\[ P^A_0 \left[ M^A_0(P^A_1, u^A_1, V^A_1) - M^A_0(P^A_0, u^A_0, V^A_0) \right] \]

\[ \geq P^A_0 \left[ \left( - M^A_0(P^A_1, u^A_1, V^A_1) \right) \right] \]

\[ - \left( - M^A_0(P^A_0, u^A_0, V^A_0) \right) \]

\[ - P^C_0 \left[ M^C_0(P^A_1, u^A_1, V^A_1) \right] \]

\[ - M^C_0(P^A_0, u^A_0, V^A_0) \]

(6)

which states that if the increase in the value of imports from the partner country, valued at pre-FTA
domestic prices, is less than the difference between the increase in the value of exports and the increase in the value of the imports from the rest of the world due to the FTA, then the welfare of the country must fall. For example, if U.S. imports from the rest of the world fall due to NAFTA (so that the third term in (6) is positive) and U.S. exports rise or are constant, (so that the second term in (6) is positive) then a necessary condition for U.S. welfare to rise is that imports from its partner country rises. In fact, imports from Mexico by the U.S. have significantly increased after NAFTA. While public opinion concerning this increase in imports is generally negative, we argue that the U.S. would have suffered a welfare loss due to NAFTA had such increases not occurred!

Next we apply necessary conditions to world trade reform. If all of K countries met the necessary conditions for the change in tariffs to be welfare improving, it must be the case that:

$$\sum_{k=1}^{K} T^{k0}[M^{k}(P^{k0},u^{k0},V^{k0}) - M^{k}(P^{k1},u^{k1},V^{k1})] \leq 0.$$  

Thus, if it were the case that:

$$\sum_{k=1}^{K} T^{k0}[M^{k}(P^{k0},u^{k0},V^{k0}) - M^{k}(P^{k1},u^{k1},V^{k1})] > 0$$  

(7)

then there must exist some countries who lose from the reform. The above inequality can be written as

$$\sum_{k=1}^{K} T^{k0}[M^{k}(P^{k0},u^{k0},V^{k0}) - M^{k}(P^{k1},u^{k1},V^{k1})] + \rho^{0} \left[ \sum_{k=1}^{K} M^{k}(P^{k0},u^{k0},V^{k0}) - \sum_{k=1}^{K} M^{k}(P^{k1},u^{k1},V^{k1}) \right] > 0.$$  

(8)

Eq. (8), together with the world market clearing conditions (which require that the sum of net imports across all countries be zero) gives:

**Proposition 2.** If

$$\alpha = \sum_{k=1}^{K} P^{k0}[M^{k}(P^{k0},u^{k0},V^{k0}) - M^{k}(P^{k1},u^{k1},V^{k1})] > 0$$

or

$$\beta = \sum_{k=1}^{K} T^{k0}[M^{k}(P^{k0},u^{k0},V^{k0}) - M^{k}(P^{k1},u^{k1},V^{k1})] > 0$$

then at least one country in the world must lose from the reforms.

\(^{6}\)If we are concerned with only a subset of countries the summation in (7) should be over those countries only.
5. Discussion

While our results do not help guide policy ex-ante, they may help in providing guidelines which need to be met. Our work suggests the form some minimal safeguards for the formation of PTAs might take. It also has wider applicability as it can be used both when a country itself alters its policies, as well as when other countries policies impact on it. On the other hand, as it only provides necessary conditions, our conditions do not ensure a Pareto improvement occurs. As a more general caution, it should be remembered that in practice many exogenous variables change over time and the kind of controlled experiment postulated above does not occur. Nevertheless as the data needed to implement it is relatively easily available these days, it may be useful in practice.

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