APPENDIX B

B.1 The Shifting of Burden of Protection Principle : A Case of Intra-Industry Trade[1]

It has been recognized that a large part of international trade is characterized by simultaneoues imports and exports for products which are close substitutes in the production and/or consumption as known intra-industry trade. Therefore, the shifting analysis has to be modified by revising some implicit assumptions set out in the chapter 3. In particular it is necessary to allow for the possibility of direct substitutability in demand and/or production between importables and exportables. Thus technologies or factor intensities in the production of importables are similar to both exportables and substitutes while it is dissimilar between tradables and non-tradables. Based on this concept, the assumption of zero cross price elasticity between tradables is relaxed. Intra-industry specialization may be expected where :

$$(K/L)_M \geq (K/L)_X \geq (K/L)_H$$

or $$(K/L)_X \geq (K/L)_M \geq (K/L)_H$$

or $$(K/L)_H \geq (K/L)_M \geq (K/L)_X$$

or $$(K/L)_H \geq (K/L)_X \geq (K/L)_M$$

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[1]Greenaway and Milner, "Intra Industry Trade and Incidence of Protection," European Economic Review 32 (December 1988), pp.934-945.

In deriving a revised shift parameter, the first possibility case above, i.e. $(K/L)_M > (K/L)_X > (K/L)_H$ will be considered. In other words, the domestic price of exportables (P_X) is taken as numeraire against which to define the shifting of the incidence of protection.[2] The equilibrium properties of the model in terms of the market for non-tradeables will be again examined.

Base on the chapter 3, we substitute equation (3.7) and (3.8) into equation (1) then obtain the proportionate change in the price of exportables (P_X) generated by an import protection that is necessary to restore equilibrium in the non-tradables market :

$$\text{(B.1)} \quad \hat{P}_X = \left[\frac{H_m^d - H_m^s}{H_X^s - H_X^d}\right] \cdot \hat{P}_m + \left[\frac{H_h^d - H_h^s}{H_X^s - H_X^d}\right] \cdot \hat{P}_h$$

We now redefine P_X in terms of demand and supply elasticities for tradables rather than non-tradables in order to identify the impact of substitutional relationship, between exportables and the other two sectors.

Given the homogeneity constaints :

$$\text{(B.2)} \quad \Sigma M_i^d = \Sigma X_i^d = \Sigma M_i^s = \Sigma X_i^s = 0 \; ; \quad i = M \text{ or } X$$

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[2]It should be noted that $(K/L)_M > (K/L)_H$ is taken as the reference point because it is the same manner as the analysis in the chapter 3 outlined by Sjaastad and Clements.

and

(B.3) $\Sigma E_h^d = \Sigma E_m^d = \Sigma E_x^d = \Sigma E_h^s = \Sigma E_m^s = \Sigma E_x^s = 0$

Where E can denote H, M or X, i.e, the compensated elasticities of demand and supply. Then

(B.4) $H_m^d = -(M_m^d + X_m^d)$

(B.5) $H_m^s = -(M_m^s + X_m^s)$

(B.6) $H_h^d = -(M_h^d + X_h^d)$

(B.7) $H_h^s = -(M_h^s + X_h^s)$

(B.8) $H_x^d = -(M_x^d + X_x^d)$

(B.9) $H_x^d = -(M_x^d + X_x^d)$

Substitute equation (B.4) – (B.9) into equation (B.1), we obtain

(B.10) $\hat{P}_x = W'\hat{P}_m + (1-W')\hat{P}_h$

where

(B.11) $$W' = \frac{M_m^d + X_m^s - M_m^d - X_m^d}{M_x^d + X_x^d + M_x^s - X_x^s}$$

and $M_m^d < 0$, $X_m^d > 0$, $M_m^s > 0$, $X_m^s < 0$, $X_x^s > 0$,

$M_x^s < 0$, $X_x^d < 0$, $M_x^d > 0$.

The results in equation (B.10) and (B.11) are the same as the conditions specified for the inter-industry case in equation (3.10) and (3.11). This of course is as we would expect. The discussion in section 3.2 in the chapter 3 emphasised by Dornbusch that equilibrium could be analysed by refence to the home goods market or by reference to the tradables market. Explicitly when holds, trade is balanced. Analogously when (B.2) and (B.3) hold the non-tradables market is in equilibrium.

This revised shift parameter (W') is again a weighted average, index of substability in demand and production. Let D signify the denominator in equation (B.11) then it can be reformed as:

$$\text{(B.12)} \quad W' = b_1 \left| \frac{M_m^s}{M_x^s} \right| + b_2 \left| \frac{X_m^s}{X_x^s} \right| + b_3 \left| \frac{M_m^d}{M_x^d} \right| + b_4 \left| \frac{X_m^d}{X_x^d} \right|$$

where $b_1 = M_x^s / D$

$b_2 = X_x^s / D$

$b_3 = M_x^d / D$

$b_4 = X_x^d / D$

and $b_1 + b_2 + b_3 + b_4 = 1$

The ratio $|M_m^s/M_x^s| = |X_m^s/X_x^s|$ is an index of substitutability in production or supply between importables and exportables which equal unity when $M_h^s = 0 = X_h^s$. The ratio $|M_m^d/M_x^d| = |X_m^d/X_x^d|$ is an index of substitutability in demand between importables and exportables which equals unity when $M_h^d = 0 = X_h^d$. Actually the W' is bound between zero and one as in the case of W (if there is no complementary between exportables and importables).

Rearrangement of equation (B.10) shows that W' indicates the elasticity of P_x/P_h with respect to P_m/P_h:

(B.13) $$\hat{P}_x - \hat{P}_h = W'(\hat{P}_m - \hat{P}_h)$$

That is, W' indicates the extent to which the incidence of protection is shifted, in this case from importables onto non-tradeables. When W' = 1 (X and M are perfect substitutes then $\hat{P}_x = \hat{P}_h$ and $\hat{P}_h = 0$, while when W' = 0 (X and H are perfect substitutes) then $\hat{P}_x = \hat{P}_h = 0$ (where s = 0). This latter possibility is identical with W = 0 as derived in section 3.3 as the substitutional possibilities between exportables and importables are ruled out. The attention in this annex shall be on the context of intra-industry trade where values of W' might be expected to tend to unity rather than zero.

B.2 True Tariffs in the Case of Intra-Industry Trade

In the case of inter-industry trade, true protection is identified by reference to how the post-tax prices of imports and exports change relative to the price of home goods. However in the case of intra-industry trade, P_x is the numeraire. Therefore the true tariff can be defined by reference to how P_m alters relative to P_x. Our old diagram can be used again to explain this concept. In figure E.1 the vertical axis represents the relative price of importables to exportables, whilst the horizontal axis represents the relative price of home goods to exportables. The schedule HH now demonstrates alternative relative prices of importables and home goods (relative to exportables) that generate trade balance and zero excess demand for non-tradables. The ray OT represents the relative price of non-tradables to importables. Free trade equilibrium is at A.

To illustrate the effects of an import tariff, relative prices are assumed initially are at unity. A uniform tariff t on all importables raises the price of importables relative to the price of home goods and causes OT to rotate to OT'. The price of importables relative to the price of exportables initially increase to 1+t. The economy is at C which is not in equilibrium. The rise in the price of exportables restore the equilibrium at B provided substitutability between importables and exportables and between exportables and home importable goods in this intervening situation.

The ultimate rise in the price of importables relative to the price of exportables is less than that indicates by the impact effect of the nominal tariff. Hence the true tariff can be redefined as

$$(B.14) \qquad t^* = \left[\frac{P_m}{P_x} \right] = \frac{1+t}{1+\hat{P}_x} - 1 = \frac{t-\hat{P}_x}{1+\hat{P}_x}$$

Therefore the true tariff depends on the stope of HH and the extent to which the home price of importables rises relative to the domestic price of exportables. If W' = 1 and t > 0 (with s = 0) then $t = \hat{P}_x$ and the true tariff is zero. In words net protection of importables relative to exportables is importable. This case is represented in figure B.1 by equilibrium point D. In this circumstance importables and exportables are perfect substitues for each other and the tariff does not alter P_m over P_X. However P_m/P_X falls by the full amount of the tariff (1+t) and HH is horizontal. On the other hand if W' = 0 and t > 0 (with s = 0) then $t^* = t$ and true protection of the importable relative to exportables is at its maximum. This case is demonstrated in the figure E.1 by equilibrium at point C. Home goods and exportables are perfect subsitutes for each other in this situation. Hence P_m/P_X rises by 1+t while P_h/P_X remains unaltued. HH curve is vertical over the relevant range.

It should be noted that once substitutional relationship between importables and exportables is permitted, the import sector may no longer gain from protection relative to exportable sector. Moreover in this intra-industry trade circumstance, when exportable sector become the numeraire, the true subsidy can not be redefined. This does not mean that the exportables can not have net protection relative to each of the other two sectors.[3] If the prices of exportables and importables are closly linked, an import tariff protects both importables and exportables relative to home goods. If on the other hand exportables and importables prices can diverge then an export subsidy can confer net protection on exportables relative to importables and non-tradables.

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[3]Greenaway, and Milner, "Intra Industry Trade and Incidence of Protection," op. cit., footnote 1, p.939.

Figure B.1
The Shifting of Tax Burden Principle :
Intra-Industry Trade Case.