STATIC EFFECTS OF NTB ELIMINATION ON TRADE VALUES *

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INTRODUCTION

The importance of reducing or even eliminating certain barriers to international trade other than tariffs, for the purpose of increasing the national welfare of the trading partners, has long been recognized. However, the distorting effect of the non-tariff barriers was considered for the first time in 1973 in Tokyo during the Nixon Round. This paper is primarily concerned with the development of a model which will be appropriate to estimate the static effects of NTB (non - tariff barriers) elimination on trade values. In order to examine the trade restrictive effect of the NTBs on one particular commodity, one can proceed either by examining each NTB alone or by measuring the combined effect of a set of NTBs. Since most of them are also applied in combination with tariffs, it is possible to measure the joint effect of tariffs and NTBs as well. However, in the cases where more than one of the NTBs are applied to the same commodity, it is even more difficult to estimate, what would be the impact on the trade flows if only one of them was eliminated. The nature of the most of the NTBs is such that allows the administrative authorities to make frequent changes and therefore they can be applied with different intensities. Besides, some of the NTBs are usually applied jointly. As a first step for any sort of comparison of the various NTBs and for the measurement of their trade restrictive effect, the reduction of all NTBs to some common standard is considered as necessary. Assuming that there is no interaction between tariffs and NTBs, the trade restrictive effect of one or of a set of NTBs refers to the reduction of the trade flows caused by their existence. In order to measure this effect it is necessary to compare the actual

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trade volume with the one that would have been realised after the elimination of the NTBs, provided that all other conditions remained unchanged.

At the outset it is assumed that the commodity in question faces only tariffs; the equations which measure the changes in trade values are developed following a tariff reduction under partial equilibrium conditions. The paper proceeds from the simple tariff case to the composite case when both, tariffs and NTBs (which cause the import supply curve to shift) are applied. The equations which measure the changes in trade values are developed, following the elimination of tariffs and NTBs. The overall tariff effect and the overall NTB effect are shown by means of graphs and equations. The changes in trade values caused by a tariff reduction or elimination tend to be biased upwards if the NTB effect is not considered. The nature and the magnitnde of the bias ere shown by the corresponding equations. The equations showing the overall tariff effect and the overall NTB effect are finally reformulated under the assumption of an infinitely import supply curve. The limitations of the analysis are discussed in Appendix A which includes an empirical example as well. Finally Appendix B consists of the derivations of all the equations found in the text.

I. Changes in trade values caused by a tariff reduction

If we assume a downward sloping demand for imports, an upward sloping (foreign) import supply curve and that partial equilibrium conditions hold [1], the changes in trade values caused by a tariff reduction can be calculated[2], making use of equations (1) and (2).

$$\Omega_1 = \frac{e_m}{e_m - e_s} \frac{\Delta_t}{1 + t} V \qquad (1)$$

$$\Omega_2 = e_s \frac{e_m}{e_m - e_s} \frac{\Delta_t}{1 + t} (V + \Omega_1) \qquad (2)$$

where :

e_m = elasticity of demand for imports.

e_s = elasticity of supply of imports.

t = initial tariff rate.

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1. The analysis is concerned only with one product. Furthermore, it is assumed that the demand for imports is equivalent to the excess demand (i.e. domestic demand - domestic supply), the domestic supply is identical with the marginal cost of domestic production, that money income is constant, and that the domestic good and the importable are perfect substitutes. (For a detailed discussion, see Appendix C, (1)).

2. For the derivation of equations (1) and (2), see Appendix B, (1).

Δt = change in the tariff rate (i.e. $\Delta t = t\text{-}t_1$: where t_1 is the new tariff rate. If the tariff is eliminated $\Delta_t = t$ since $t_1 = 0$.

V = value of imports at c.i.f. prices.

Ω_1 = the increase of the initial trade value attributed to the increase in foreign price from P_{f_2} to P_{f_1} (area $AP_{f_2}\ P_{f_1}\ B$, in figure 1).

Ω_2 = the increase in the trade value attributed to the expanded quantity from Q_2 to Q_1 (area Q_2BCQ_1).

$\Omega = \Omega_1 + \Omega_2$ overall effect.

P_f = c.i.f. price of imports (foreign price).

P_{dl} = domestic price.

In figure 1, Dm represents the demand curve for imports, and S_0 the supply curve of imports under free trade conditions. An imposition of a tariff at a rate t_2 causes S_0 to shift upwards, into position S_2. A reduction in the tariff rate causes S2 to shift into position S_1.

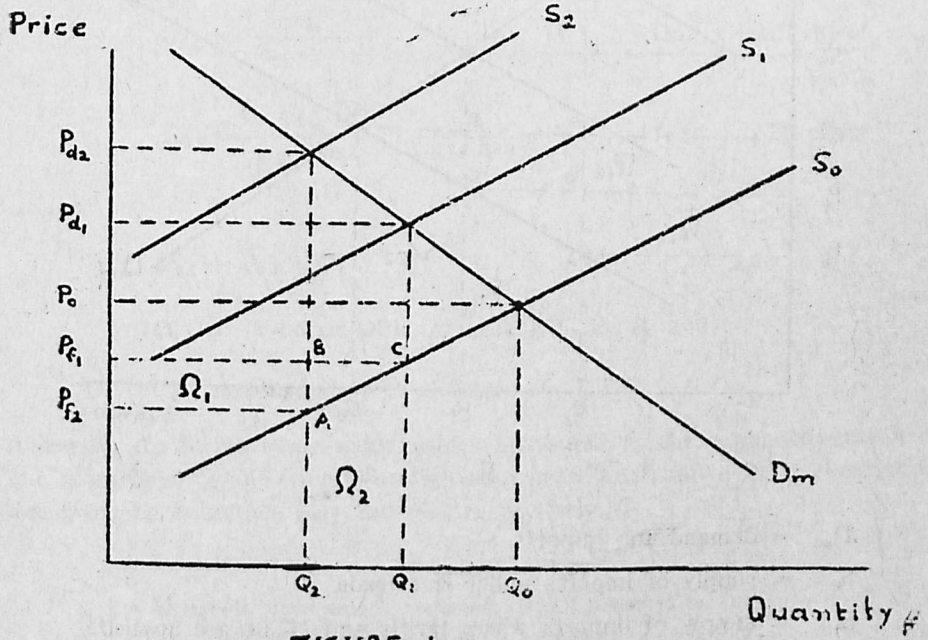

FIGURE 1.

II. Changes in trade values caused by the elimination of tariffs & NTBs

In the case that a certain commodity faces both tariffs and NTBs, which cause the supply curve of imports to shift, the domestic price exceeds the foreign (world) price by the tariff rate plus the tariff equivalent of the NTBs, since S_0 has shifted to S_2 under the influence of both factors (i.e. tariffs and NTBs). The elimination of both tariffs and NTBs would cause the supply curve to go back into position S_0; there, the equilibrium price and quantity which prevail under free trade would be P_0 and Q_0.

The tariff equivalent $TE_2 = \dfrac{P_{d_2} - P_{f_2}}{P_{f2}}$ can be calculated since P_{d2} and P_{f2} are observable. TE_2 consists of two components, the tariff component and the NTB component. Figure 2 shows the case where tariffs and NTBs are applied.

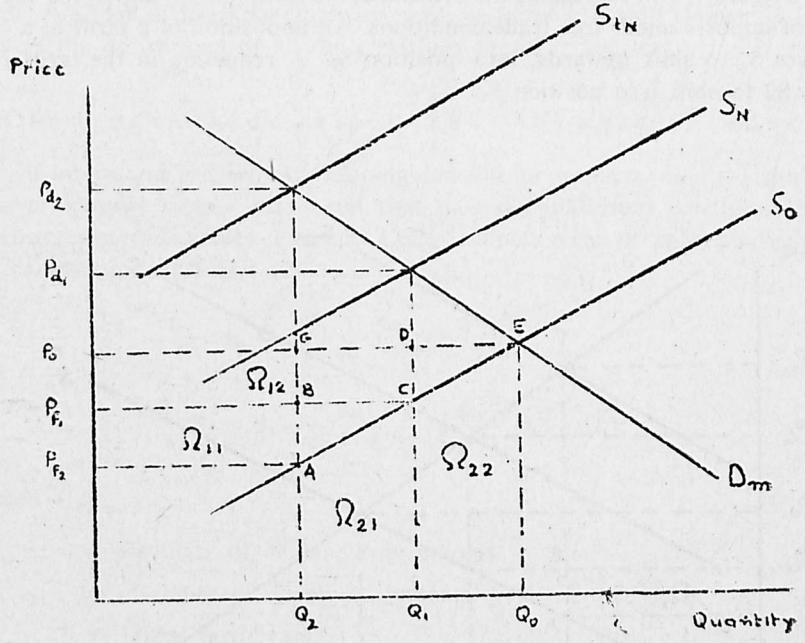

FIGURE 2.

D_m = demand for imports.

S_0 = supply of imports under free trade.

S_{tN} = supply of imports where tariffs and NTBs are applied.

S_N = supply of imports when only NTBs are applied.

The changes in the trade values attributed to the elimination of tariffs and NTBs could be calculated making use of equations (1) and (2). The overall effect of the elimination of tariffs and NTBs is shown by the areas $AP_{f2}P_0G$ [1] and $Q_2 GEQ_0$ [2]. The effect due to the tariff elimination is shown by the areas $AP_{f2}\ P_{f1}\ B$ and Q_2BCQ_1 respectively. Therefore the NTB effect may be calculated as a residual (i.e. from the first two areas we subtract the second two areas) making use of equations (1) and (2), which may be reformulated as follows :

$$\Omega_1 = \frac{e_m}{e_m - e_s} \quad \frac{TE_2}{1 + TE_2} \ V \tag{3}$$

$$\Omega_2 = e_s \frac{e_m}{e_m - e_s} \quad \frac{TE_2}{1 + TE_2} \ (V + \Omega_1) \tag{4}$$

where :

$TE_2 = t + t_N$, t = tariff rate, t_N = tariff equivalent of NTB. $\Omega = \Omega_1 + \Omega_2$ is the overall effect due to the elimination of tariffs and NTBs. e_m, e_s, Ω_1, Ω_2 and V are the same as in equations (1) and (2).

The increase in the trade value attributed to the increase in foreign price following a tariff and a NTB elimination for the commodity in question is given by equations (3a) and (3b) respectively.

$$\Omega_{11} = \frac{e_m}{e_m - e_s} \quad \frac{t}{1 + t + t_N} \ V \qquad (3a) \quad \text{tariff effect}$$

$$\Omega_{12} = \frac{e_m}{e_m - e_s} \quad \frac{t_N}{1 + t + t_N} \ V \qquad (3b) \quad \text{NTB effect}$$

where :

$\Omega_{11} + \Omega_{12} = \Omega_1$

Ω_{11} corresponds with the area $AP_{f2}\ P_{f1}\ B$, and

Ω_{12} corresponds with the area $P_{f1}\ P_0DC$.

Likewise, the increases in trade values attributed to the expanded quantities (i.e. from Q_2 to Q_1 and from Q_1 to Q_0) following a tariff and a NTB elimination are given by equations (4a) and (4b) respectively.

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1. i. e. increase in the value of exports because of a higher price.

2. i. e. increase in the value of exports due to increases in the quantity exported (i. e. from Q_2 to Q_0), and to the price of exports (i. e. from F_{f2} to p_0).

$$\Omega_{2\,1} = e_s \frac{e_m}{e_m - e_s} \frac{t}{1 + t + t_N} (V + \Omega_{1\,1}) \qquad (4a) \quad \text{tariff effect}$$

$$\Omega_{2\,2} = e_s \frac{e_m}{e_m - e_s} \frac{t_N}{1 + t + t_N} (V - \Omega_{1\,2}) \qquad (4b) \quad \text{NTB effect}$$

where :

$\Omega_{2\,1} + \Omega_{2\,2} = \Omega_2$

$\Omega_{2\,1}$ corresponds with the area Q_2BCQ_1

$\Omega_{2\,2}$ corresponds with the area Q_1DEQ_0.

Or else :

The overall tariff effect is given by equations (3a) and (4a) (i.e. the areas $AP_{f2}\,P_{f1}\,B$ and Q_2BCQ_1), whereas the overall NTB effect is given by equations (3b) and (4b) (i.e. the areas $CP_{f1}\,P_0D$ and $Q_1\,DEQ_0$).

A comparison of equations (1) and (2) with equations (3a) and (4a) indicates that the impact of tariff reduction or elimination estimated by (1) and (2), tends to be biased upwards [1] if the commodity in question faces both tariffs and NTBs. Furthermore, the aforementioned formulae show that the error in the measurement of changes in trade values is directly related to the import demand elasticity [2].

Since the demand for imports has been assumed to be equivalent to the excess demand and that domestic goods and importables are perfect substitutes, the elasticity of demand for imports depends on the elasticities of domestic demand and domestic supply [3].

$$e_m = \frac{D}{M}(e_d - e_s) + e_s \qquad (5)$$

where :

e_m = demand elasticity for imports for commodity X.

D = aggregate domestic demand for commodity X.

M = total quantity of imports for commodity X.

e_d = elasticity of domestic demand for commodity X.

e_s = elasticity of domestic supply for commodity X.

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1. The magnitude of the bias depends on the value of t_N (i. e. the higher the value of t_N the larger the bias). See Appendix B, (2).

2. i. e. the higher the elaticity of demand the greater the error.

3. For the derivation of equation (5) sec Appendix B, (3).

Since econometric evidence concerning elasticities of import demand functions estimated directly at the product level is rather limited, [1] equation (5) may be used for the derivation of the value of e_m given the values of e_d and e_s.

III. Infinitely foreign elasticity

Under the assumption of infinitely elastic import supply curve [2] the foreign (world) price P_f remains constant (i.e. Ω_1 in equation (1) is equal to zero) whereas equation (2) is reformulated as follows [3]:

$$\Omega = - e_m V \frac{\Delta t}{1 + t} \qquad (6)$$

where :

Ω = the increase in the trade value attributed to the expanded quantity from Q_2 to Q_1 (i.e. area Q_2ABQ_1 in figure 3).

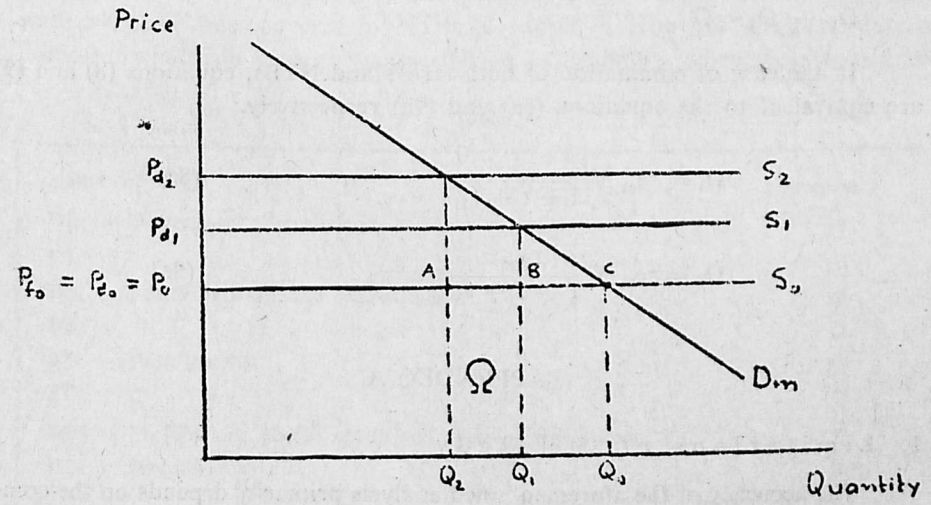

FIGURE 3.

1. See Appendix C, (2) and (4).

2. It has been argued that the assumption of an infinitely elastic supply curve is realistic even for major producing countries in periods of excess productive capacity or when the changes in exports account for a small share of total output or when the changes in trade flows attributed to the change in trade barriers take place over a long period of time, (see Appendix C, (3).

3. For the derivation of equation (6) see Appendix B, (4).

e_m, e_s, Δt and V are the same as in equation (2). When the commodity in question faces both tariffs and NTBs, equation (6) may be rewritten as follows :

$$\Omega = -e_m V \frac{\Delta TE}{1 + TE} \qquad (7)$$

where :

$TE = t + t_N$ (i.e.t = tariff rate, t_N = tariff equivalent of the NTB). By substituting $(t + t_N)$ for TE in equation (7) we obtain equations (8) and (9)

$$\Omega_1 = -e_m V \frac{\Delta t}{1 + t + t_N} \qquad (8) \quad \text{tariff effect}$$

$$\Omega_2 = -e_m V \frac{\Delta t_N}{1 + t + t_N} \qquad (9) \quad \text{NTB effect}$$

where :

$\Omega_1 + \Omega_2 = \Omega$

In the case of elimination of both tariffs and NTBs, equations (8) and (9) are equivalent to the equations (8a) and (9a) respectively.

$$\Omega_1 = -e_m V \frac{t}{1 + t + t_N} \qquad (8a)$$

$$\Omega_2 = -e_m V \frac{t_N}{1 + t + t_N} \qquad (9a)$$

APPENDIX A

1. Limitations of the study

The accuracy of the aforementioned analysis primarily depends on the comparability of wholesale domestic prices and the estimated c.i.f. import unit values. National sources concerning wholesale and retail prices on developed market economy countries, are usually disaggregated at the commodity level by type of product and specified brand, whereas their level of aggegation of import unit values computed from import-exports sources, is often higher. Therefore, the mere comparison of domestic prices with import unit values in the case of great qualitative differences among the imported items having the same commodity classification is meaningless. However, comparable tariff equivalents of NTBs could be obtained by a proper price sampling technique. The UNCTAD NTB inventory (which is not exhaustive) could be used as a starting point, first by focussing on those tariff lines which are covered by known NTBs, and second on

particular[1] tariff lines which are not covered by NTBs. A proxy of the foreign (world) price could be established, for the items which are found in the domestic market, either by computing the c.i.f. import unit value for each particular item (if additional information on values and quantities exist) or by taking into account the domestic prices on the major exporting countries, making necessary adjustments for transportation costs, insurances, etc. The established price differences[2] (provided that the problem of product homogeneity is overcome) in relation with the import demand and supply elasticities will be good indicators of the restrictiveness of NTBs.

II. The case of Japan-An empirical example

Having in mind the theoretical limitations of the partial equilibrium analysis and the practical limitations which have been discussed to some extent, an attempt was made to measure the restrictive effect of NTBs in the case of Japan, making use of equations (8a) and (9a).

According to the UNCTAD inventory of NTBs on the case of Japan there were 140 tariff lines covered by NTBs (see table I). However, available data on domestic wholesale prices[3] was restricted to 80 items which were considered

Table 1

Name of NTB	Frequency
DL = Discretionary lincensing	99
DL* = » »	* 16
HS = Health and sanitary requlations	13
HS* = » » »	* 2
ST = State trading	15
ST* = » »	* 2
PHS = Prohibitions due to health and sanitary regulations	2
P = Prohibitions	1
Total	150

a) There were 10 tariff lines with two NTBs.

b) The star at the rigth hand side of the NTB means that the NTB applies only to a part of the tariff line.

as important on the cost of living. Unfortunately, only 7 of these items (6 tariff lines) were found to be covered by the NTBs listed in the UNCTAD inventory (see table 2).

1. These tariff lines may include for instance main export items of developing countries.
2. Domestic price - foreign (world) price.
3. See Appendix C (5).

Table

BTN Tariff Line	Tapanese Code No.	Product description	t 1971 tariff rate (per cent)	V 1971 c. i. f. value of imports in 1000 yen
(1)	(2)	(3)	(4)	(5)
0301-22	031-144	Salmon fresh, chilled, frozen	10	2,348,929
	031-141	Sea breams, fresh, chilled, frozen	10	479,418
	031-154 -155 -156	Tuna fish, fresh, chilled, frozen	10	5,715,607
0303-21	031-314	Cuttle fish, fresh chilled, frozen	10	843,743
	031-316	Octopus fresh, chilled, frozen	10	11,495,340
(a) 0402-21	022-221	Powdered milk for school children	0	1,337,605
(b) 0402-23	022-223	Powdered milk n.e.s.	45.0	619,582
(c) 0402-25	022-210	Powdered milk excluding skim milk	40.0	1,488
0402 (a, b, c)	(a, b, c)	Powdered milk for human consumption	14.3*	1,958,675
1908 ⊥	048-421	Biscuits, cookies and crackers sugared	40.0	732,039

$$*t = \frac{\Sigma t_i \; v_i}{\Sigma v_i}, \quad \bar{P}_t = \frac{\Sigma P_{fi} \; v_i}{\Sigma v_i}$$

2

Q 1971 quantily of imports kg	P_f Unit value in yen	P^d Average domestic wholosale price	t_N Ad. val. tariff equivalent of NTB (per cent)	$\frac{t_N}{1+t_N+t}$	$\frac{t}{1+t+t_N}$	$= -e_m V \left(\frac{t_N}{1+t_N+t}\right)$ 1971 NTB effect in 1000 yen	$= -e_m V \left(\frac{t}{1+t_N+t}\right)$ 1971 tariff effect in 1000 yen	NTB
(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
5,685,703	413	387	-16	—	—	—	—	DL*
2,209,809	217	820	278	0.716	0.026	167,780	6,219	DL*
26,573,044	219	462	101	0.479	0.047	1,366,508	131,459	DL*
3,158,306	267	293	0	0	0.090	0	37,968	DL
64,445,060	178	360	92	0.455	0.050	2,609,896	287,383	DL*
10,699,615	125	—	—	—	—	—	—	ST
5,925,664	105	—	—	—	—	—	—	ST
5,896	252	—	—	—	—	—	—	ST
16,641,175	119*	658	439	0.794	0.025	1,551,188	48,967	ST
1,352,423	541	2,782	474	0.771	0.065	643,462	54,171	HS

For the tariff lines 0301-22 and 0303-21 was assumed that $em = -0.5$
For the tariff line 0402-21, 21, 23, 25 » » » $em = -1.0$
For the tariff line 1908-10 » » » $em = -1.14$

Although the comparability of domestic wholesale prices with calculated c.i.f. import unit values [1] is viewed with caution due to possible variations in the quality of the products, in 5 out of the 7 cases the domestic prices were much higher from the corresponding unit values. The effect of tariff and NTB elimination on trade flows was calculated mainly for illustrative purposes, by assuming an infinitely import supply curve. The NTB effect (col. 12) was much larger than the tariff effect (col. 13) due to the extremely high value of t_n.

Since the number of items covered by known NTB's is not expected to be very large (i.e. 140 tariff lines) it would be necessary to establish a list of the corresponding domestic and foreign prices, by the method which has been described in broad terms, for the purpose of obtaining a more representative sample.

APPENDIX B

(1) $P_d = F(q)$ (1) demand for imports

$P_f = h(q)$ (2) supply of imports

$P_p = P_f(1+t)$ (3)

(1), (3) $\Rightarrow P_f(1+t) = F(q)$ (4)

(4) $\Rightarrow P_f + (1+t)\frac{dp_f}{dt} = F'\frac{dq}{d_t}$ (5)

(2) $\Rightarrow \frac{dp_f}{dt} = h'\frac{dq}{d_t}$ (6)

Solving (5), (6) for $\frac{dp_f}{dt}$ AND $\frac{dq}{dt}$

$\Rightarrow \frac{dp_f}{dt} = \frac{P_f h'}{f'-(1+t)h'}$ (7a), $\frac{dq}{dt} = \frac{P_f}{f'-(1+t)h'}$ (7b)

$\frac{dP_f}{P_f} = \frac{h' d_t}{f'-(1+t)h'}$ (8)

$\frac{dP_f}{P_f} = \frac{\frac{q}{P_f} h' d_t}{\frac{q}{P_f}F' - \frac{q}{P_f}(1+t)h'}$ (9)

1. See Appendix C (6).

$$\frac{dP_t}{P_f} = \frac{\frac{q}{P_f} h' d_t}{(1+t)\frac{q}{P_d} f' - \frac{q}{P_f}(1+t)h'} \quad (10)$$

$$\frac{dP_f}{P_f} = \left(\frac{e_m}{e_m + e_s}\right)\frac{d_t}{1+t} \quad (11)$$

From figure (1) we have :

$$\Omega = (P_{f1} = P_{f2})\ Q_2 = \Delta P_f\ Q_2 = \frac{\Delta P_f}{P_f}\ Q_2 P_f \quad (12)$$

(11), (12) $\Rightarrow$ $\Omega_1 = \left(\frac{e_m}{e_m - e_s}\right)\frac{\Delta_t}{1+t}\ V$ equation (1) in the text

From (7b) $\Rightarrow$ $d_q = \frac{d_t \cdot P_f}{f' - (1+t)\ h'}$ (13)

$$dq = \frac{\left[\frac{q}{P_f}\right] dt \cdot Pt}{\frac{q}{P_f} \cdot f' - \frac{q}{P_f}(1+t)\ h'} \quad (14)$$

$$dq = \frac{qdt}{\frac{(1+t)q}{P_d} f' - \frac{q}{P_t}(1+t)\ h'} \quad (15)$$

$$dq = \frac{dt}{1+t}\ e_s\ \frac{e_m}{e_m - e_s}\ q \quad (16)$$

From figure (1) we have :

$$\Omega_2 = (Q_1 - Q_2)\ P_{f1} = \Delta_Q\ P_{f1} \quad (17)$$

(16), (17) $\Rightarrow$ $\Omega_2 = e_s\ \frac{e_m}{e_m - e_s}\ \frac{\Delta t}{1+t}\ q\ P_{f1}$ (18)

$$\Omega_2 = e_s\ \frac{e_m}{e_m - e_s}\ \frac{\Delta t}{1+t}\ [V + \Omega_1]$$ eguation (2) in the text.

(2) (a) Bias in the estimation of Ω_1 in the case of tariff elimination.

$$\Omega_1^* = \frac{e_m}{e_m - e_s}\ \frac{t}{1+t}\ V \quad (1)$$

If, however, the tariff equivalent tn of the NTB is taken into account equation (1) should be rewritten as follows.

$$\Omega_1 = \frac{e_m}{e_m + e_s} \quad \frac{t}{1 + t + t_n} \; V \tag{2}$$

then the bias b1 is equal to

$$b_1 = \frac{\Omega_1^* - \Omega_1}{\Omega_1} = \frac{t_n}{1 + t} \tag{3}$$

equation (3) shows that the bias is directly related with the value of t_n -

(b) Bias in the estimation of Ω_2 in the case of tariff elimination

$$\Omega_2^* = e_s \frac{e_m}{e_m - e_s} \quad \frac{t}{1 + t} \left(V + \Omega_1^* \right) \tag{4}$$

$$\Omega_2 = e_s \frac{e_m}{e_m - e_s} \quad \frac{t}{1 + t + t_n} \left(V + \Omega_1 \right) \tag{5}$$

$$\text{from (3)} \Rightarrow \quad \Omega_1^* = \frac{1 + t + t_n}{1 + t} \Omega_1 \tag{6}$$

$$\Omega_1^* = \lambda \Omega_1$$

$$\text{where } \lambda = \frac{1 + t + t_n}{1 + t} \tag{7}$$

the bias b_2 is equal to :

$$b_2 = \frac{\Omega_2^* - \Omega_2}{\Omega_2} \tag{8}$$

$$\text{from (4), (5), (6), (8)} \Rightarrow \quad b_2 = \frac{(V + \lambda\Omega_1)\,(1 + t + t_n)}{(1 + t)\,(V + \Omega_1)} - 1 \tag{9}$$

The overall bias b is equal to

$$b = b_1 + b_2 \tag{10}$$

(3) Derivation of the import demand elasticity

$$M\,(P) = D\,(P) - S\,(P) \tag{1}$$

where $M = M(P)$ = import demand

$D = D(P)$ = aggregate domestic demand

$S = S(P)$ = aggregate domestic supply

$$(1) \Rightarrow \quad \frac{dM}{dP} = \frac{dD}{dP} - \frac{dS}{dP} \tag{2}$$

$$\frac{dM}{dP}\frac{P}{M} = \frac{dD}{dP}\frac{P}{D}\frac{D}{M} - \frac{dS}{dP}\frac{P}{S}\frac{S}{M} \tag{3}$$

$$e_m = e_d \frac{D}{M} - e_s \frac{S}{M} \tag{4}$$

$$e_m = e_d \frac{D}{M} - e_s \frac{D - M}{M} \tag{5}$$

$$e_m = \frac{D}{M}\left(e_d - e_s \right) + e_s \tag{6}$$

(4) An infinitely import supply (i.e. $e_s = \infty$) implies that the world (foreign) price remains constant. Therefore, Ω_1 in the text is equal to zero.

$$\lim \Omega_1 = \lim_{e_s \to \infty} \frac{e_m}{e_m - e_s} \frac{\Delta t}{1 + t} V = 0 \tag{1a}$$

equation (2), however, may be reformulated as follows :

$$\lim \Omega_2 = \lim_{e_s \to \infty} \frac{e_s e_m}{e_m - e_s} \frac{\Delta t}{1 + t} \left(V + \Omega_1 \right) \tag{2a}$$

$$\lim \Omega_2 = \lim_{e_s \to \infty} \frac{e_m}{\frac{e_m}{e_s} - 1} \frac{\Delta t}{1 + t} V \tag{3a}$$

$$\Omega = \lim \Omega_2 = -e_m \frac{\Delta t}{1 + t} V \tag{4a}$$

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