Munich Personal RePEc Archive

Trade in Health Services and Globalization: The Role of Infinitesimal Changes of Trade Policy

Chatterjee, Tonmoy and Gupta, Kausik

Sidho-Kanho-Birsha University, Rabindra Bharati University

3 October 2013

Online at https://mpra.ub.uni-muenchen.de/57343/
MPRA Paper No. 57343, posted 16 Jul 2014 03:51 UTC

Trade in Health Services and Globalization: The Role of Infinitesimal Changes of Trade Policy

Tonmoy Chatterjee,
Department of Economics, Sidho-Kanho-Birsha University,
Purulia-723101, West Bengal, INDIA
Email: tonmoychatterjee.economics@gmail.com

and

Kausik Gupta,
Vice Chancellor,
West Bengal State University,
Kolkata-700126, West Bengal, INDIA
Email: kausik2k1@rediffmail.com

This Draft, October 2013

Address for correspondence:

Tonmoy Chatterjee
Department of Economics, Sidho-Kanho-Birsha University,
Purulia-723101, West Bengal, INDIA
E-mail: tonmoychatterjee.economics@gmail.com

Trade in Health Services and Globalization: The Role of Infinitesimal Changes of Trade Policy

Abstract : This paper attempts to integrate the issues related to health care, consumption efficiency hypothesis and international trade in the context of a developing economy. In this article we have framed a hybrid type of three sector general equilibrium trade model in the presence of a nutritional efficiency factor of health consumption, where first two sectors form a Heckscher-Ohlin nugget and the third one is a non-traded health service producing sector. Overall, we find little harm from trade, and potential gains from welfare aspect.

Key words: Health sector, Trade Policy, Social Welfare and General equilibrium.

JELClassification: I10, I15, F11, F21, D58

Trade in Health Services and Globalization: The Role of Infinitesimal Changes of Trade Policy

1. Introduction

In the literature on development economics we find that one of the main causes behind underdevelopment of an economy is the lack of advancement of the health sector. In recent years various policies regarding the health aspect are adopted by the policy makers of developing economies. It is a very commonly held view that poor health scenario of the country is due to the existence of poor infrastructural facilities in the economy as a whole[1]. It suggests that emphasis should be focused on infrastructural development in order to improve welfare. In the traditional literature on development economics, a developing economy is broadly classified into two sectors: an industrial sector and an export sector. But the presence of health sector along with import and export sectors, where the health commodity[2] is a non-traded final product, the traditional results may change. It thus creates interest among the policy makers in the context of the various polices undertaken by them for a developing economy. It is to be noted that in this study we have confined ourselves with trade related policies, for

[1] National Health Accounts (NHA) has Shown that in India public health expenditure as a share of GDP increased from 0.96 per cent in 2004-05 to just 1.01 per cent in 2008-09 as compared to 5 per cent for developed economies. The public health sector is characterized by economically inefficient along with poor physical infrastructure. The mismatch between demand and supply of healthcare services and infrastructure has triggered the emergence of private participation in the Indian health sector through FDI. Thus it is become crucial to us to examine the impact of FDI in the health sector.

[2] In a developing economy most of the health commodities are non-traded final commodities such as different types of hospital facilities as well as health facilities like availability of medicines, health check-up facilities etc.

instances foreign capital inflow to health sector[3] or in general, inflow of foreign capital and presence of import tariff etc.

In order to examine the impact of foreign health capital inflow in a developing economy we must start from the impact of foreign capital inflow in a developing economy. In fact health capital can also be in the form of foreign health capital. At the outset we start from the literature on the impact of foreign capital inflow[4] in a developing economy. It starts with the famous Brecher-Alejandro (1977) proposition which states that an inflow of foreign capital in a two-commodity, two factor full employment model with full repatriation of its earnings reduces social welfare if the import-competing sector is capital intensive and is protected by a tariff. However, in the absence of any tariff, the inflow of foreign capital with full repatriation of its earnings does not affect social welfare.

The main motivation behind this study generates from the fact that only a few empirical works deal with the issue of foreign health capital and welfare. In fact at the theoretical level almost no work in a general equilibrium structure has been done to examine the impact of foreign health capital inflow on welfare. The present study attempts to examine the impact of foreign (health) capital inflow on welfare in terms of a three-

---

[3] Funds such as ICICI Ventures, IFC, Ashmore and Apax Partners invested about US$ 450 million in the first six months of 2008-2009 compared to US$ 125 million during the same period of the previous year. Feedback Ventures expects private equity funds to invest at least US$ 1 billion during 2009-2013. 12 percent of the US$ 77 million venture capital investments in July-September 2009 were in the healthcare sector. GE plans to invest over US$ 3 billion on R&D, US$ 2 billion to drive healthcare information technology and health in rural and underserved areas, US$ 1 billion in partnerships, content and services, over the next six years. International clinic chain Asklepios International plans to invest US$ 100 -200 million in the Indian healthcare market. Gulf-based group Dr Moopen is planning to invest US$ 200 million for setting up hospitals and eye-care centres across India. Fortis is planning to invest US$ 55 million to expand its pan-India operations.

[4] Foreign capital inflow also refers to Foreign Direct Investment (FDI).

sector general equilibrium model and hence attempts to fill up the lacuna in this line of work. Moreover most of the works in trade literature that deal with health aspect have immensely ignored the role of export sector as well as import sector (other than health sector) of a developing economy. In this study we are trying to fill up this gap also.

The present model is an extension of Beladi-Marjit(1992) as in this model a third sector, a non-traded health sector, has been introduced[5]. It attempts to examine the effects of liberalization in the form of foreign health capital inflow on the price of health commodity, returns to the various inputs and on welfare in a developing economy. Though Chaudhuri(2007) has considered the impact of foreign capital inflow in the presence of non-traded agricultural final commodity in a general equilibrium structure, our analysis is quite different because we assume health commodity as a non-traded final good and foreign health capital is specific to that sector.

The paper is organized in the following manner. Section 2 considers the basic model. The analysis related to the drive towards trade liberalization is explained in section 3. The price effect of trade liberalization and output effect of trade liberalization have considered in subsection 3.1 and 3.2 respectively. Section 4 the impact of trade liberalization on social welfare. Finally, the concluding remarks are made in section 5.

2. The Basic Model

We consider a small open economy consisting of three sectors in a Heckscher-Ohlin-Samuelson framework. Out of the three sectors, one is an export sector(A), which produces its output using labour(L) and capital(K), the second sector is a import

---

[5] In the three-sector models on foreign capital and welfare the third sector may either be an export processing zone as in the work of Beladi-Marjit(1992) or it may be the urban informal sector as in the works of Grinols(1991), Gupta(1997) etc or it may be intermediate goods producing sector as in the works of Marjit and Beladi(1997) and Marjit, Broll and Mitra (1997).

sector(M), which produces output by using labour and capital. This second sector is the import competing sector while the first sector, that is, sector A, is the export sector of the economy. Sector M is protected by tariff(t). Here K consists of domestic capital (K_D) and foreign capital(K_F) and we assume that K_D and K_F are perfect substitutes. K is perfectly mobile between sectors A and M. The third sector is the health sector. Health capital (N) has been considered as specific to the health sector(H). This sector also uses the labour input(L) to produce a non-traded final health commodity. All these three sectors[6] use labour which is perfectly mobile among them. Health capital consists of both domestic health capital(N_D) and foreign health capital(N_F), and we assume N_D and N_F are perfect substitutes.

Here sector A produces its output X_A, sectors M and H produce output X_M and X_H respectively. We assume that the export sector is more labour-intensive compared to the import sector. The export product is considered as the numeraire its price is set equal to unity. We assume that both foreign capital income and foreign health capital income are fully repatriated. Production functions of each sector exhibit constant returns to scale with diminishing marginal productivity for each factor. The following notations are used in this model.

X_i = product produced by the ith sector, i = A,M,H; P^*_A = world price of commodity A; P_A = domestic price of commodity A, we assume $P_A = P^*_A = 1$; P^*_M = world price of good M; $P_M = P^*_M(1+ t)$ = domestic price of good M; P_H = domestically determined price of good H; L = fixed number of workers in the economy; N_D = domestic health capital stock of the economy; N_F = foreign health capital stock of the economy; N = economy's aggregate health capital stock ($N = N_D + N_F$); K_F = foreign capital stock; K_D = domestic capital stock; K = economy's aggregate capital stock ($K = K_D + K_F$); a_{ji} = quantity of the jth factor for producing one unit of output in the ith sector, j=L,K,N and i =A,M,H; θ_{ji} =

[6] All the three sectors produce final commodities in this model.

distributive share of the jth input in the ith sector; λ_{ji} = proportion of the jth factor used in the production of the ith sector; t = ad-valorem rate of tariff on the import of commodity M; W = competitive wage rate; r = rate of return to capital, R = rate of return to health capital; D_i = consumption demand for the ith final commodity, i = A,M,H; E^H_{PH} =own price elasticity of demand for commodity H; E^H_Y = income elasticity of demand for commodity H; U = social utility; Y = national income at domestic price; m_M = marginal propensity to consume for commodity M; I = import demand for commodity M; σ_i = elasticity of factor substitution in sector I, i = A, M, H; ^ = proportional change

The equational structure of the model is as follows.

The competitive equilibrium conditions in the product market for the three sectors give us the following equations.

$$a_{LA}W + a_{KA}r = 1 \quad (1)$$

$$a_{LM}W + a_{KM}r = P_M^*(1+t) \quad (2)$$

$$a_{LH}W + a_{NH}R = P_H \quad (3)$$

Sector specificity of health capital is given by the following equation

$$a_{NH}X_H = N_D + N_F = N$$

(4)

Perfect mobility of capital between sectors A and M can be expressed as

$$a_{KA}X_A + a_{KM}X_M = K_D + K_F = K \quad (5)$$

Here we assume that the output of the health sector has some effects on labour endowment. This effect can be analyzed by the introduction of nutritional efficiency factor (e) in our basic model. In this model nutritional efficiency function can be written as $e = e(X_H)$,given that, $e^{/}>0$ and $\varepsilon_e>0$, where ε_e is the elasticity of nutritional efficiency function. The rational is that as output of the health sector increases, better hospitalization facilities etc are available to the workers which improves their level of nutritional efficiency.

Full employment of labour implies the following equation

$$a_{LA}X_A + a_{LM}X_M + a_{LH}X_H = e(X_H)L \tag{6}$$

The demand for the non-traded final commodity is given by

$$D_H = D_H(P_H, P_M, Y) \tag{7}$$

We assume that commodity H is a normal good with negative and positive own price elasticity and income elasticities of demand, respectively, that is ,$E^H_{PH}<0$ and $E^H_Y>0$. The cross price elasticity is positive, that is, $E^H_{PM}>0$.

The demand –supply equality condition for commodity H is

$$D_H(P_H, P_M, Y) = X_H \tag{8}$$

The demand for commodity M and the volume of import are given by the following equations respectively.

$$D_M = D_M(P_H, P_M, Y) \tag{9}$$

$$I = D_M(P_H, P_M, Y) - X_M \tag{10}$$

The national income of the economy at domestic prices is given by

$$Y = X_A + P_M X_M + P_H X_H - rK_F - RN_F + tP_M^* I$$

(11.1)

or

$$Y = We(X_H)L + RN_D + rK_D + tP_M^* I$$ (11.2).

The working of the model is as follows. There are eleven endogenous variables in the system: W, r, R, P_H, X_A, X_M, X_H, D_M, D_H, I and Y. Here we have eleven independent equations(equations (1) to(11)) to solve for eleven unknowns. We can find out the value of W and r from equations (1) and (2). From equation (3) we can express R as a function of P_H. Thus it is an indecomposable structure[7]. Hence from equation (4) a_{NH} can be expressed as a function of P_H. For given N ,X_H can be expressed as a function of P_H also. So, from equations (5) and (6) X_A and X_M are expressed in terms of P_H. From equation (11.2) we can express Y as a function of P_H. So equation (7) is expressed as a function of P_H. To complete the working the model we have to consider the following lemmas.

Lemma 1: *An increase in the price level of the non-traded heath services,* P_H, *has a negative effect on the demand of output level of the corresponding health care if* $RN_D / \theta_{NH} + tP^*_{PM} P_H (\partial D_M / \partial P_H) < -tP^*_{PM} X_M \lambda_{KA} Q / |\lambda|$, $E^H_Y B_7 / VY > E^H_{PH}$ *and* $\hat{N}_F = \hat{K}_F = 0$.

Proof of Lemma 1: Simply by differentiation of equation (8) we can derive (see Appendix A for detail derivation)

$$\left.\frac{dP_H}{dD_H}\right|_{DD} = (P_H VY / E^H_Y B_7 + E^H_{PH}) < 0$$

Lemma 2: *An increase in the price level of the non-traded heath services,* P_H, *has a positive effect on the supply of output level of the corresponding health care if* $\hat{N}_F = \hat{K}_F = 0$.

Proof of Lemma 2: Simply by differentiation of equation (8) we can derive (see Appendix A for detail derivation)

$$\left.\frac{dP_H}{dX_H}\right|_{SS} = (P_H \theta_{NH} / \theta_{LH} \sigma_H X_H) > 0$$

Thus equation (8), lemma 1 and lemma 2 help us to determine the value of P_H.

[Figure -1 here]

[7] If the factor prices are determined independently of factor endowments we refer to the structure as a decomposable structure.

Once P_H is known X_A, X_M, Y and X_H are also known. Thus equations (7) and (9) help us to determine the values of D_H and D_M respectively. Finally using equation (10) we get the value of I.

The demand side of the model is represented by a social utility function. Let U be the social utility function and it is shown as,

$$U = U(D_A, D_M, D_H) \tag{12}$$

With $U_A > 0$, $U_M > 0$, $U_H > 0$, $U_{AA} < 0$, $U_{MM} < 0$, $U_{HH} < 0$

The balance of trade equilibrium requires that

$$D_A + P_M D_M + P_H D_H = X_A + P_M X_M + P_H X_H - rK_F - RN_F + tP_M^* I \tag{13}$$

Note sector H is a non-traded final good producing sector and its price is determined endogenously from the system.

3. Drive towards Trade Liberalization in the presence of a Health Care

3.1 Price effects of Trade Liberalization

Here we want to examine the impact of an inflow of foreign capital as well as of foreign health capital on the level of social welfare of a developing economy. To do these at first we want to find out separately the impact of K_F and N_F on the price level of the health sector (P_H). The return to capital (r) and the wage rate (W) are not affected through a change in the price of a non-traded final good, P_H , but the factor price ,R ,is affected through a change P_H. Differentiating equation (3) and by using the corollary of Shepherd lemma we get ,

$$\hat{R} = (1/\theta_{NH})\ \hat{N}_F \tag{3.1}$$

Using the above result and differentiating equations (4), (5) and (6)we can get[8]

$$\hat{X}_H = \mu\, \hat{N}_F + \left(\frac{\theta_{LH}}{\theta_{NH}} \sigma_H\right) \hat{P}_H \qquad (4.1)$$

$$\lambda_{KA}\, \hat{X}_A + \lambda_{KM}\, \hat{X}_M = \gamma \qquad \hat{K}_F \qquad (5.1)$$

$$\lambda_{LA}\hat{X}_A + \lambda_{LM}\hat{X}_M = -\,[(\lambda_{LH} - \varepsilon_h)\mu\hat{N}_F + Q\hat{P}_H] \qquad (6.2.1)$$

where, $Q = [(\lambda_{LH} - \varepsilon_{e})\frac{\theta_{LH}}{\theta_{NH}}\sigma_H + \lambda_{LH}\sigma_H] > 0$, and we assume $\lambda_{LH} > \varepsilon_e$.

Solving the above equations by Cramer's rule and simplifying we get

$$\hat{X}_A = \frac{1}{|\lambda|}[B_1\hat{K}_F + B_2\hat{N}_F + B_3\hat{P}_H]$$

(20) $$\hat{X}_M = \frac{1}{|\lambda|}[B_4\hat{K}_F + B_5\hat{N}_F + B_6\hat{P}_H]$$

(21)

where,

$\mu = (N_F / N)$;

$\gamma = (K_F / K)$;

$B_1 = (\gamma\lambda_{LM}) > 0$;

$B_2 = [\mu\lambda_{KM} (\lambda_{LH} - \varepsilon_e)] > 0$;

$B_3 = (\lambda_{KM}Q) > 0$;

$B_4 = (-\gamma\lambda_{LA}) < 0$;

$B_5 = [-\mu\lambda_{KA} (\lambda_{LH} - \varepsilon_e)] < 0$;

$B_6 = [-\lambda_{KA}\, Q] < 0$;

$B_7 = [RN_D/\theta_{NH} + tP_M^*P_H(\delta D_M/\delta P_H) - tP_M^*X_M\frac{1}{|\lambda|}B_6]$;

$B_8 = (-tP_M^*X_M\frac{1}{|\lambda|}\, B_4) < 0$;

$B_9 = [\, WLh/X_H\mu - tP_M^*X_M\frac{1}{|\lambda|}A_5] < 0$;

$B_{10} = [\, \mu - E^H{}_Y\, (1/VY)B_9] > 0$;

$B_{11} = [-E^H{}_Y(1/VY)B_8] > 0$;

[8] See Appendix A.1 for detailed derivation.

$B = [E^{H}_{PH} + E^{H}_{Y}(1/VY)B_7 - \frac{\theta_{LH}}{\theta_{NH}}\sigma_H] < 0;$

$V = [1 - \frac{t}{1+t} m_M]$;

$m_M = [P_M(\delta D_M/\delta Y)]$ and $1 > m_M > 0$.

We now want to define IλI. Here ,IλI = $(\lambda_{KA}\lambda_{LM} - \lambda_{KM}\lambda_{LA}) < 0$, because sector A is more labour intensive relative to sector M (by assumption).

Using equations (3.7), (3.8), (3.9), (3.10) and (3.4.1) we can obtain

$$\frac{\hat{P}_H}{\hat{N}_F} = (1/B)B_{10} \tag{18.1}$$

And $$\frac{\hat{P}_H}{\hat{K}_F} = (1/B)B_{11} \tag{18.2}$$

So, from (18.1) it follows that $\hat{P}_H < 0$ when $\hat{N}_F > 0$ as, $B<0$, $B_{10}>0$. Again from (3.1) we find that $\hat{R} < 0$ when $\hat{N}_F > 0$. These are summarized in the form of the following proposition. As, $B<0$, $B_{10}>0$ if $[tP_M^{*}X_M\frac{1}{|\lambda|}\lambda_{KA}(\lambda_{LH} - \varepsilon_e) > WLh/X_H]$ and hence we can conclude that $\frac{\hat{P}_H}{\hat{N}_F} < 0$.

Proposition 1: *An inflow of foreign health capital leads to: (i) a decrease in the price of the output of non-traded health sector if* $tP_M^{*}X_M\frac{1}{|\lambda|}\lambda_{KA}(\lambda_{LH} - \varepsilon_e) > WLe/X_H$ and $\lambda_{LH} > \varepsilon_e$*; (ii) a decrease in the return to health capital.*

Proof of Proposition 1: The above proposition can be explained as follows. From equation (4.1) we find that an inflow of foreign health capital leads to an increase in the production of health sector, for given price, that is P_H. It implies that the supply curve of the health sector will shift rightward. Again for given P_H, and hence for given R and also for given a_{NH} and a_{LH} we find that an increase in N_F causes an increase in X_H. It leads to an increase in both of $a_{LH}X_H$ and $Le(X_H)$. Thus $[Le(X_H) - a_{LH}X_H]$ will decline if an increase in $Le(X_H)$ due to an expansion of the health care dominates over the rise in $a_{LH}X_H$ due to the same reason , that is from equation (6) we can say, labour availability to sectors A and M will fall. It creates a *Rybczynski type effect,* resulting in contraction of sector A and expansion of sector M. This is because A is more labour intensive relative to sector M. So we find an inflow of foreign health capital leads to an increase in X_M. For given P_H and for given t, an increase in X_M implies a decrease in import, since I =D_M – X_M, which again implies a decrease in tariff revenue. So, other things remaining same, the national income at domestic prices falls, which leads to a decrease in the demand for commodity H and, therefore, creates a downward shift of demand curve. So, for given P_H, a decrease in demand and an increase in supply create excess supply situation in health sector. It means that P_H is no longer given. This excess supply creates downward pressure on health price, that is, a decrease in P_H. From equations (3) and (3.1) it is very clear that the movement of R is only depends upon the movement of P_H. Thus, we can argue that R will fall as a result of fall in P_H.

Inserting the values of B, B_{11} into equation (18.2), we get,

$$\frac{\hat{P}_H}{\hat{K}_F} = \frac{1}{B}\,[-E^H{}_Y(1/VY)\,(-tP_M{}^*X_M\frac{1}{|\lambda|} - \gamma\lambda_{LA})] \qquad (18.2.1)$$

From (18.2.1) it follows that $\hat{P}_H < 0$, when, $\hat{K}_F > 0$. This leads to the following proposition.

<u>Proposition 2 :</u> *An inflow of foreign capital leads to: (i) a decrease in the price of the output of non-traded health sector if [* $E^H{}_{PH} + E^H{}_Y(1/VY)B_7 - \frac{\theta_{LH}}{\theta_{NH}}\sigma_H] < 0$ and $(\lambda_{LM}/\lambda_{KM} - \lambda_{LA}/\lambda_{KA}) < 0$ *; (ii) a decrease in the return to health capital.*

Proof of Proposition 2: An inflow of foreign capital creates a *Rybczynski effect* leading to an expansion of import- competing sector (M) and contraction of the exportable sector(A). This is because sector M is more capital intensive than sector A. For given P_H, an increase in X_M implies a decrease in import, which again implies a decrease in tariff revenue. So, the national income at domestic prices falls, which leads to a downward shift of demand curve for non-traded health commodity. Using (3.4.1) we can say that, for given P_H, an inflow of foreign capital leads to no change in X_H. So, the supply curve of this sector will remain unaffected. However, P_H will remain no longer given as a reduction in demand for health, with given supply, creates an excess supply in the health sector which causes downward pressure on price of the health sector, that is, a reduction in P_H.

3.2 Output effects of Trade Liberalization

So far we have considered the impact of trade liberalization, in the form of foreign health capital inflow and also inflow of 'usual' foreign capital, on the rate of return on health capital and also on the price of the good of the health sector. An analysis remains incomplete if the impact of trade liberalization on the output levels of various sectors are not analyzed. Now we focus on the impact of inflow of foreign health capital as well as impact of inflow of 'usual' foreign capital on the output levels of the three sectors that we have considered in our study.

First we consider the impact of inflow of foreign health capital on the output levels and for this we use equations (4.1), (15), (16), (18.1.1) and after simplifying we get [see appendix A.1]

$$\frac{\hat{X}_H}{\hat{N}_F} = \mu + \left(\frac{\theta_{LH}}{\theta_{NH}}\sigma_H\right)\frac{\hat{P}_H}{\hat{N}_F} \tag{4.1.1}$$

$$\frac{\hat{X}_A}{\hat{N}_F} = \frac{1}{|\lambda|}\left[B_2 + B_3\frac{\hat{P}_H}{\hat{N}_F}\right] \tag{15.1}$$

$$\frac{\hat{X}_M}{\hat{N}_F} = \frac{1}{|\lambda|}\left[B_5 + B_6\frac{\hat{P}_H}{\hat{N}_F}\right] \tag{16.1}$$

From equation (4.1.1) we can say that first term on the right hand side of that equation, that is, μ is positive and hence creates a positive impact on X_H due to an inflow of foreign health capital. We call it infrastructural development force due to inflow of foreign health capital. As $\frac{\hat{P}_H}{\hat{N}_F}$ is negative and hence creates a negative impact on X_H. We call it price force. If we assume that price force dominates over infrastructural development force due to an inflow of foreign health capital it leads to a fall in X_H. Similarly, we can argue that $\frac{\hat{X}_A}{\hat{N}_F} > 0$ and $\frac{\hat{X}_M}{\hat{N}_F} < 0$, if we assume that price force dominates over infrastructural development force due to an inflow of foreign health capital.

We now consider the impact of 'usual' foreign capital on the sectoral output levels. As the algebra is similar to that of the earlier ones, we just state that $\frac{\hat{X}_i}{\hat{K}_F}$ is less than zero when i = M, H and greater than zero when i = A, if we assume that price force dominates over infrastructural development force due to an inflow of foreign capital.

Proposition 3: *An inflow of foreign health capital (or, foreign capital) leads to contraction of the output level of both health care and the import sector if* $[-\mu\lambda_{KA} (\lambda_{LH} - \varepsilon_h)] < 0$ and $(\lambda_{LH} - \varepsilon_h)\frac{\theta_{LH}}{\theta_{NH}}\sigma_H > - \lambda_{LH}\sigma_H$ *on one hand, and an expansion of the export sector on the other hand if* $(\lambda_{LH} - \varepsilon_h) > 0$ and $[(\lambda_{LH} - \varepsilon_h)\frac{\theta_{LH}}{\theta_{NH}}\sigma_H + \lambda_{LH}\sigma_H] > 0$.

Proof of Proposition 3: See discussion above and also see the proof of propositions 1 and 2.

4. Impact of Foreign Capital Inflow and Foreign Health Capital Inflow on Social wellbeing

Using (12) and (13) we obtain[9] [For details see Appendix 3.B]

$(1/U_A)(dU/dN_F) = (Wh/L)(dX_H/dN_F) – N_F(dR/dN_F) + tP_M^*(dI/dN_F)$

(3.19.2)

[9] For detailed derivation of (dI/dN_F) see equation (3.10.1.B) of appendix 3.B.

where, $(dR/dN_F) <0$ and the sign of (dI/dN_F) may be either positive or negative[10]. An inflow of foreign health capital with full repatriation of its earnings produces two effects on welfare. First, an inflow of foreign health capital leads to a decrease in the rate of return to health capital, since return to health capital and price of health good has a positive relationship between them. A decrease in return to health capital implies less repatriation of foreign capital, which improves social welfare. We call it factor price effect due to repatriation. Secondly, an inflow of foreign health capital may lead to a decline or an increase in import. This is because, an increase in foreign health capital leads to a decrease in price of health commodity as there is an exogenous increase in supply of health commodity, given P_H. This increase in supply leads to a fall in price of health commodity. Fall in price of health sector implies a decrease in demand for the goods of the import sector due to positive cross price effects. Again fall in P_H leads to a fall in R and hence a decline in national income, which creates a downward pressure on demand for import goods. Similarly, an increase in N_F leads to a decrease in X_M[11]. If fall in D_M dominates over fall in X_M, we get a decline in imports. Thus reduction in imports reduces tariff revenue and hence reduces social welfare. We call it negative tariff revenue effect. On the other hand we can get an increase in imports if fall in X_M dominates over fall in D_M and hence we get a positive tariff revenue effect. The net result of factor price effect due to repatriation and negative tariff revenue effect may be positive if former dominates over the latter otherwise it will be negative, that is, social welfare may fall due to an increase in foreign health capital. On the other hand if we consider the factor price effect and positive tariff revenue effect then the net result of these forces may creates a positive impact on social welfare. Here, $dI/dN_F >0$ if we

---

[10] Detailed derivation of (dI/dN_F) has been shown in equation (10.1.A) in appendix A.3. Using equation (18.1) we can obtain, $dR/dN_F = (1/a_{NH})(dP_H/dN_F) <o$.

[11] Here $(dX_M/dN_F) <0$, because we assume that price force dominates over infrastructural development force. It is to be noted that in equation (18), $\widehat{P}_H$ also includes $\widehat{N}_F$.

assume that the fall in X_M dominates over fall in D_M, we call it positive tariff revenue effect. Consideration of positive tariff revenue effect and factor price effect due to repatriation creates a positive effect on welfare whereas fall in h/ due to fall in X_H leads to a fall in social welfare. This can be referred to as the nutritional efficiency effect. If the combined effect of positive tariff revenue effect and factor price effect due to repatriation on welfare dominates over the negative nutritional efficiency effect on welfare, then national welfare definitely improves. In particular, if we have a situation of full liberalization so that the tariff rate is zero then welfare definitely improves. Thus the following proposition can now be established.

$(1/U_A)(dU/dK_F) = (Wh/L)(dX_H/dK_F) - N_F(dR/dK_F) + tP_M^*(dI/dK_F)$

(19.3)

Similarly welfare can improve as positive effects on welfare due to an inflow of foreign capital dominates over negative effect on welfare due to inflow of foreign capital.

<u>Proposition 4</u>: *In the presence of nutritional efficiency factor, an inflow of foreign health capital as well as an inflow of foreign capital, with full repatriation of their earnings, improves social welfare under some reasonable conditions.*

***Proof of Proposition** 3:* See the above discussion**.**

5. Concluding Remarks

This paper attempts to infer the impact of infinitesimal changes of trade policies on the volume of a non-traded health care of a developing economy. In this article we have developed a hybrid type of three sector general equilibrium trade model, where first two sectors (export sector and import sector of our small open economy) form a Heckscher-Ohlin nugget and the third one is a non-traded health service producing sector. From such type of a set up we have shown that an inflow of foreign health capital (or, usual foreign Capital) leads to contraction of both import and non-traded health sectors and expansion of the export sector even in the presence of nutritional efficiency factor of health care. Apart from output aspect in this study, we have also examined the gains from trade aspect of infinitesimal changes of trade policies and we have shown that in the trade liberalization in the form of foreign health capital (or, Usual foreign capital) inflow is welfare improving when consumption efficiency hypothesis has been satisfied and social welfare of our stylized economy will definitely improve in the absence of tariff.

References

Beladi, H. and Marjit, S. (1992): "Foreign Capital and Protectionism", *Canadian Journal of Economics*, 25: 233-238.

Brecher, R. A. and Alejandro, C. F. D. (1977): "Tariff, Foreign Capital and Immiserising Growth", *Journal of International Economics*, 7: 317-322.

Chanda, R. (2001): "Trade in Health Services", Working Paper, No 70, *Indian Council for Research on International Economic Relations (ICRIER)*, India.

Chaudhuri, S. (2001): "Foreign Capital Inflow, Technology Transfer and National Income", *The Pakistan Development Review*, 40(1) spring: 49-56.

Chaudhuri, S. (2003): "How and How Far to Liberalize a Developing Economy with Informal Sector and Factor Market Distortions", *Journal of International Trade and Economic Development*, 12(4): 403-428.

Chaudhuri, S. (2007): "Foreign Capital, Welfare and urban unemployment in the presence of export dualism", *Japan and the World Economy*, 19: 149-165.

Chaudhuri, S. and Mukhopadhyay, U. (2002): "Removal of Protectionism, Foreign Investment and Welfare in a Model of Informal Sector", *Japan and the World Economy*, 14(1): 101-116.

Grinols, E. L. (1991): "Unemployment and Foreign Capital: The relative opportunity cost of Domestic Labour and Welfare", *Economica*, 57: 107-122.

Gupta, K. and Gupta, M.R. (2010): "Foreign Capital and Economic Development: A Brief Survey", in A. Dhar, (ed), "*Some Contemporary Issues on Development and Growth Economics*", Allied Publishers; Kolkata.

Gupta, M. R. (1994): "Foreign capital, income inequality and welfare in a Harris-Todaro model", *Journal Development Economics*, 43: 407-414.

Gupta, M. R. (1997): "Foreign capital and Informal Sector: Comments on Chandra and Khan", *Economica*, 64: 353-363.

Jones, R. W. (1965): "the structure of Simple General Equilibrium Models", *Journal of Political Economy*, 73: 522-557.

Khan, M. A. (1982): "Tariff, Foreign Capital and immiserizing Growth with Urban Unemployment and Specific Factors of Production", *Journal of Development Economics*, 10: 245-256.

Lahiri, K. (2012): "FDI in India's Healthcare Sector: an Assessment", Paper Presented at Annual Seminer, Rabindra Bharati University, Kolkata.

Marcella, A. David, E. B. and David, C. (2005): "The effect of Population Health on Foreign Direct Investment Inflow to Low and Middle-Income countries", *World Development*, 34(4): 613-630.

Marjit, S. and Beladi, H. (1997): "Protection and the Gainful Effects of foreign Capital", *Economics Letters*, 53: 311-326.

Marjit, S. Broll, U. and Mitra, S. (1997): "Targeting Sectors for Foreign Capital Inflow in a Developing Economy", *Review of International Economics*, 5: 101-106.

Marjit, S. and Gupta, K. (2008): "International Capital Mobility and Child Labour", paper presented at 4th Annual Conference on Economic Growth and Development, *Indian Statistical Institute*, New Delhi.

Outreville, J. F. (2007): "FDI in the Health Care Sector and Most Favoured Location in Developing Countries", *European Journal of Health Economics*, 8(4): 305-312.

Appendix A. **Detailed derivations of different expressions of the model**

Differentiation of equation (3.6.2) gives us

$\lambda_{LA}\hat{X}_A + \lambda_{LM}\hat{X}_M = -(\mu\lambda_{LH} - \mu\varepsilon_h)\hat{N}_F - [(\lambda_{LH} - \varepsilon_h)\frac{\theta_{LH}}{\theta_{NH}}\sigma_H - (\frac{\lambda_{LH}}{\theta_{NH}}\sigma_H)]\hat{P}_H$

$\lambda_{LA}\hat{X}_A + \lambda_{LM}\hat{X}_M = -[(\lambda_{LH} - \varepsilon_h)\mu\hat{N}_F + Q\hat{P}_H]$ (3.6.2.1)

Using (3.5.1) and (3.6.2.1) we can obtain

$$\begin{bmatrix}\lambda_{KA} & \lambda_{KM}\\ \lambda_{LA} & \lambda_{LM}\end{bmatrix}\begin{bmatrix}\hat{X}_A\\ \hat{X}_M\end{bmatrix} = \begin{bmatrix}\gamma\hat{K}_F\\ -[(\lambda_{LH} - \varepsilon_h)\mu\hat{N}_F + Q\hat{P}_H]\end{bmatrix}$$

Solving the above by Cramer's rule and simplifying we can get

$\hat{X}_A = \frac{1}{|\lambda|}[(\gamma\lambda_{LM})\hat{K}_F + \{\mu\lambda_{KM}(\lambda_{LH} - \varepsilon_h)\}\hat{N}_F + (\lambda_{KM}Q)\hat{P}_H$

$= \frac{1}{|\lambda|}[B_1\hat{K}_F + B_2\hat{N}_F + B_3\hat{P}_H]$

$\hat{X}_M = \frac{1}{|\lambda|}[(-\gamma\lambda_{LA})\hat{K}_F + \{-\mu\lambda_{KA}(\lambda_{LH} - \varepsilon_h)\}\hat{N}_F + (-\lambda_{KA}Q)\hat{P}_H]$

$= \frac{1}{|\lambda|}[B_4\hat{K}_F + B_5\hat{N}_F + B_5\hat{P}_H]$

Using equation (3.10) and differentiating (3.11.3)

$\hat{Y} = (\frac{1}{VY})[\{WLh/X_H\frac{\lambda_{LH}}{\theta_{NH}}\sigma_H + RN_D/\theta_{NH} + tP_M^*P_H(\delta D_M/\delta P_H) - tP_M^*X_M\frac{1}{|\lambda|}B_6\}\hat{P}_H + \{-tP_M^*X_M\frac{1}{|\lambda|}B_4\}\hat{K}_F + \{WLh/X_H\mu - tP_M^*X_M\frac{1}{|\lambda|}A_5\}\hat{N}_F]$

$\hat{Y} = (\frac{1}{VY})[B_7\hat{P}_H + B_8\hat{K}_F + B_9\hat{N}_F]$ (3.11.2.B)

So, by using $\hat{N}_F = \hat{K}_F = 0$ we have

$\frac{\hat{Y}}{\hat{P}_H} = (\frac{1}{VY})B_7$ (3.11.3.B)

Using (3.11.2.B) in equation (3.A.5) we get

$\frac{\hat{D}_H}{\hat{P}_H}$ = $E^H{}_{PH}$+ $E^H{}_Y(\frac{1}{VY})$ B_7 (3.7.3)

From equation (3.4.1) we get, when $\hat{N}_F = \hat{K}_F = 0$

$\frac{\hat{X}_H}{\hat{P}_H}$ = (θ_{LH} σ_H/θ_{NH}) (3.4.2)

Substituting the expressions for $\frac{\hat{D}_H}{\hat{P}_H}$ and $\frac{\hat{X}_H}{\hat{P}_H}$ from (3.7.3) and (3.4.2) into (3.A.4) one obtains

[$E^H{}_{PH}$+ $E^H{}_Y(\frac{1}{VY})$ B_7 - (θ_{LH} σ_H/θ_{NH})] < 0

Or B = [$E^H{}_{PH}$+ $E^H{}_Y(\frac{1}{VY})$ A_7 - (θ_{LH} σ_H/θ_{NH})] < 0 (3.B.4.1)

Differentiating (3.8), and simplifying we get

$E^H{}_{PH}\hat{P}_H$ + $E^H{}_Y\hat{Y}$ = $\mu\hat{N}_F$ + (θ_{LH} σ_H/θ_{NH}) $\hat{P}_H$

$E^H{}_{PH}\hat{P}_H$ + $E^H{}_Y$ [($\frac{1}{VY}$){$B_7\hat{P}_H$+$B_8\hat{K}_F$+$B_9\hat{N}_F$}] = $\mu\hat{N}_F$ + (θ_{LH} σ_H/θ_{NH}) $\hat{P}_H$

[$E^H{}_{PH}$+ $E^H{}_Y(\frac{1}{VY})$ B_7 - (θ_{LH} σ_H/θ_{NH})] $\hat{P}_H$ = $B_{10}\hat{\ }_F$+ $B_{11}\hat{\ }_F$

$\hat{\ }_H$= (B_{10}/B)$\hat{\ }_F$+ (B_{11}/B)$\hat{\ }_F$ (3.17.B)

By differentiating production functions and using (3.4), (3.5) and (3.7), we get

[$dX_A + P_MdX_M + P_HdX_H – rdK_F – RdN_F – N_FdR$] + X_HdP_H

= ($F_L{}^AdL_A + F_K{}^AdK_A$) + P_M ($F_L{}^MdL_M + F_K{}^MdK_M$) + P_H ($F_L{}^HdL_H + F_N{}^HdN_H$) – rdK_F – RdN_F – N_FdR + X_HdP_H

=(Wh/L)dX_H - N_FdR + N dR

(3.B.6)

Here, [$dX_A + P_MdX_M + P_HdX_H – rdK_F – RdN_F – N_FdR$]

= (Wh/L)dX_H - N_FdR

(3.B.7)

Using (3.B.6) in equation (3.11.1.A) we get

$dY = (Wh/L)dX_H + N_D dR + tP_M^* dI$ (3.11.B)

Differentiating equation (3.10), simplifying and using (3.11.B) we get

$dI = (\delta D_M/\delta P_H)\, dP_H + (\delta D_M/\delta Y)\, dY - dX_M$

$dI = (1/V)\, [\, (\delta D_M/\delta P_H) + (m_M N_D/P_M\, a_{NH})]dP_H + (1/V)\, [m_M Wh/L/P_M]dX_H - (1/V)\, dX_M$ (3.10.2)

Here, $dI/dN_F = (1/V)[(\delta D_M/\delta P_H) + (m_M N_D/P_M a_{NH})](dP_H/dN_F) - (1/v)dX_M/dN_F + (1/V)[m_M/P_M(Wh/L)](dX_H/dN_F)$ (3.10.1.B)

By using the above expression and (3.10.2) from (3.13.2) we can get

$(1/U_A)dU = (Wh/L)dX_H - N_F dR + tP_M^* dI$ (3.19.B)