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Trade in Health Services in the Presence of Consumption Efficiency Hypothesis

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Abstract

An attempt has been made in this paper to formulate a three-sector general equilibrium model where two sectors produce final traded goods whereas a third sector produces a non-traded final good. It has been referred to the third sector as a non-traded final good producing health sector. In such a set up it has been shown that a movement from a regime of international health capital immobility to a regime of international health capital mobility may lead to an expansion of the health sector in the presence of nutritional efficiency of workers. Apart from that it has also been shown that social welfare of our stylized small open economy will improve.

Keywords: Health sector, International health capital mobility, Nutritional efficiency and General Equilibrium,
JELClassification: I10,I15,F21

India is one of the fastest growing countries in the modern world as per as GDP is concerned as in recent years it is experiencing a GDP growth rate around 6 to 8 %. Apart from high growth rate of GDP Indian economy is not performing well in the path of economic development and one of the reasons behind it is poor infrastructural facilities especially in the social sector. Hence instruments of social sector (education, health etc.) should gain special emphasis from the policy makers. Health sector is gaining more importance among other growing sectors like IT, education etc because of its potentiality. Recently India's total expenditure on health care as percentage of GDP is close to 5-6 %, whereas it is 4.7% in China, 3.5% in Thailand, 4.2% in Malaysia and 3.4% in Saudi Arabia etc.

In recent past the recession in 2008 and recent economic slowdown since 2011 intensified by the Eurozone crisis and the slowdown in the US economy, have brought about a gloom in world economic growth projections. A recent report released by the United Nations (UN) shows that all developing economies will get affected by the slowdown. However, the good news is that East Asian and South Asian economies are increasingly being seen as growth drivers of the world as an outcome of which

the health sector has grown exponentially. A CII- Mckinsey report states that the Indian health sector has emerged as one of the largest service sectors with estimated revenue of around $30 billion constituting 5% of GDP and offering employment to around 4 million people. By 2025, the Indian population will touch 1.4 billion with about 45% constituting urban adults[1]. To cater to this demographic change, the health sector will have to be about $100 billion in size contributing nearly 8-10% of the future GDP. It will provide more incentive to the foreign investors to invest in the Indian health sector. It is to be noted that such type of foreign investment through foreign direct investment (FDI hereafter) may create some positive impact along with some negative impact. For example, while the emergence of corporate hospitals or foreign funding and tie ups in the hospital segment can have many positive implications, such as helping to improve physical infrastructure, standards, quality of healthcare, technology, and processes along with spill over benefits in areas such as medical devices, pharmaceuticals, outsourcing, and research and development, it may also result in higher costs of health care and greater segmentation between the public and private health sectors. India today allows 100 per cent FDI in the health sector, but the policy is being reviewed in the wake of fears over the takeover of these domestic companies by MNCs leading to the fact that essential medicines becoming costlier and thereby impacting public health programmes, including the universal immunisation programme[2].

It is very clear from the above mentioned facts that Indian private health care sector has played a crucial role in determination of GDP of India. Again the mismatch between demand and supply of healthcare services and infrastructure has triggered the emergence of private participation in the Indian health sector. Thus analysis related to health care become more important for a developing nation like India. From the above it is also clear that the role of FDI in Indian private health care is gaining more importance among economists. But a question still arises and it arises mainly from the view point of government that, are 100 % FDI in health care may affect the prices of health services more adversely? Not only that can it reduce the effective demand of private owning health care of India? Hence, it may affect the expansion of health sector along with the social welfare of our civic society. These questions and statements have motivated us to do something with the issues related to FDI and private health care. Apart from that reason we have also motivated from the fact that there exist almost no works related to health and FDI in a general equilibrium trade models[3] and hence we are trying to fill up this lacuna.

To examine the impact of FDI in Indian private health care we have structured a very simple three sector general equilibrium model. Here we have assumed the private health care sector as a non-traded final good producing sector. This is a rational assumption in the context of a developing economy like India. In this paper we want to show how the behaviour of health sector changes in the presence of finite change in foreign health capital. Here we want to correlate the issues related to international health capital mobility and health sector. Contrary to the conventional works here we discuss the implication of regime switch from no capital mobility to perfect capital mobility (in the form of health capital), thus

[1]Source: The Times of India, dated:2 nd February, 2012.

[2]Source: The Hindu- 3rd September,2011.

[3]Here‘usual’ foreign capital in this paper is referred to as ‘foreign capital’ and foreign capital related to health sector is referred to as ‘foreign health capital’. In this paper we shall refer to FDI in the health sector as changes in foreign health capital stock.

discussing the impact of finite changes in policies. This is more in line with contemporary literature on trade and capital flows such as Marjit and Kar (2005), Marjit and Gupta (2008) etc.

The paper is organized in the following manner. Section 2 considers the model. It is divided into three subsections. Subsection 2.1 considers international health capital immobility, subsection 2.2 considers international health capital mobility and subsection 2.3 considers the aspect of social welfare in the context of international health capital mobility. Finally, the concluding remarks are made in section 3.

The Model

International Health Capital Immobility

We consider a small open economy where international health capital is immobile[4] and it consists of three sectors in a Heckscher-Ohlin-Samuelson framework. One of the three sectors, is the agricultural sector(A), which produces its output using labour(L) and capital(K). Another sector is the manufacturing sector (M), which produces output by using labour and capital. This is the import competing sector while sector A is a sector that produces exportable products. The third sector is the health sector (H) which uses labour as well as health capital (N) which is specific to this sector. The health sector produces a non-traded final commodity[5]. 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. All these three sectors[6] use labour which is perfectly mobile among these three sectors. Health capital is specific to sector H while K is completely mobile between sectors A and M. It is to be noted that health capital consists of both domestic health capital (N_D) and foreign health capital (N_F), and we assume that N_D and N_F are perfect substitutes. Competitive markets, CRS technology, diminishing marginal productivity and full employment of factors of production are also assumed.

Additionally 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 (h) in our model. In this model nutritional efficiency function can be written as $h = h(X_H)$,given that, $h' > 0$ and $\varepsilon_h > 0$, where $\mathring{a}_h$ is the elasticity of nutritional efficiency function. The rationale is that as output of the health sector increases, better hospitalization facilities etc that are available to the workers improve their level of nutritional efficiency.

The notations used in the model are stated as follows:

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; N = economy's aggregate health capital stock; K = economy's aggregate capital stock; a_{ji} = quantity of the jth factor for producing

[4]International health capital immobility is a situation where domestic rate of return on foreign health capital (R) is greater than the rate of return on foreign health capital in the international market (R*) and there is restriction on the entry of foreign health capital to the domestic economy.

[5]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.

[6]All the three sectors produce final commodities in this model but one of them produces non-traded final commodity.

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one unit of output in the ith sector, j=L,K,N and i =A,M,H ; θ_{ji} = distributive share of the jth input in the ith sector; 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; Y = national income at domestic price; I = import demand for commodity M; σ_i = elasticity of factor substitution in sector i, i = A, M, H.

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

$$a_{NH}X_H = N_D + N_F = N \quad (4)$$

We assume for simplicity that a_{LH} is fixed[7].

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

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

Full employment of labour implies the following equation

$$a_{LA}X_A + a_{LM}X_M + a_{LH}X_H = Lh(X_H) \quad (6)$$

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

$$D_H = D_H(P_H, P_M, Y) \quad (7)$$

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

$$D_H(P_H, P_M, Y) = X_H \quad (8)$$

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

$$D_M = D_M(P_H, P_M, Y) \quad (9)$$

$$I = D_M(P_H, P_M, Y) - X_M \quad (10)$$

[7]In this paper we have assumed aLH as fixed coefficient. However, one can see the papers by Acharyya and Jones (2001) and Marj it, Beladi and Chakraborty (2004), etc. It is to be noted that the relaxation of the assumption, that is fixed a LH, will leave the conclusions of the model basically unchanged.

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

$$Y = X_A + P_M X_M + P_H X_H - rK_F - RN_F + tP_M^* I \qquad (11.1)$$

or

$$Y = Wh(X_H)\, L + RN_D + rK_D + tP_M^* I \qquad (11.2).$$

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. Hence 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. Thus equation (8) helps us to determine the value of P_H. Once P_H is known X_A ,X_M , Y and X_H are also known. Thus equations (7) and (9) helps us to determine the values of D_H and D_M respectively. Finally using equation (4) and (10) we get the values of R and I respectively.

International Health Capital Mobility

Here we assume that in the presence of international health capital immobility we have $R > R^*$, where R^* is the given return on foreign health capital in the international market. In such a situation we have no foreign health capital inflow. If R falls to $\tilde{R}$, where, $R > \tilde{R} > R^*$, we find that there is some amount of inflow of foreign health capital (N_F) and at last we will reach at the equilibrium level[8] of N_F where, $R = R^*$.

Here, we assume that N_D is exogenous whereas N_F is assumed to be an endogenous variable and we use $R = R^*$ in our basic model. By using equations (1) and (2) we can solve for W and r. Once W and R are known a_{NH} is also known. Using $R = R^*$ in our basic model we find that equation (3) gives us the value of P_H. Hence from equation (4) we can express X_H as a function of N_F and hence by using equations (5) and (6) we can express X_A and X_M in terms of N_F. From equation (9) D_M can be expressed as a function of Y only, since P_H and P_M are given. Thus I can be expressed in terms of Y and N_F. Using this fact in equation (11.2) we can express Y as a function of N_F. Thus from equation (7) one can express D_H in terms of N_F and hence N_F can be determined from equation (8). Once N_F is known, then X_A, X_M, X_H, D_H, D_M, I are also known. In order to examine the impact of an increase in N_F on R we need to explore the relationship between P_H and R on one hand and X_H and N_F on the other hand. To find out the relationship between P_H and R we establish the following lemma.

Lemma 1 *A fall in R leads to a fall in P_H iff $\sigma_H < 1$.*

Proof of lemma 1: Differentiating equation (3) and by using $da_{LH} = dW = 0$, we get,

$$\theta_{NH}\,(\hat{R} + \hat{a}_{NH}) = \hat{P}_H$$

[8]At R=R*, we have the equilibrium level of foreign health capital inflow due to equilibrium in the international health capital market.

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By definition $\sigma_H = (\hat{a}_{NH} - \hat{a}_{LH})/(\hat{W} - \hat{R})$

Using the envelope result $Wda_{LH} + Rda_{NH} = 0$ and by inserting = 0 in the expression of σ_H one obtain

$\hat{a}_{NH} = - \hat{R}\ \sigma_H$

Using the value of in the expression of we can write

or, $= [1/ \theta_{NH}(1- \sigma_H)]\ \hat{P}_H$

or, $= \theta_{NH}(1- \sigma_H)\ \hat{R}$

Hence < 0 implies < 0, iff $\sigma_H < 1$.

We thus find that the lemma holds if the production function for the health sector is non-Cobb-Douglas.

Similarly, the relationship between N_F and X_H can be established by the following lemma.

Lemma 2 *Under the assumption that that* $-\frac{\mu}{\sigma_H}\ \hat{N}_F < \hat{R} < 0$, *where* $\mu = (N_F/N)$; *an increase in* N_F *leads to an increase in* X_H.

Proof of lemma 2: To prove this lemma we have to first of all show that > 0, when> 0. Differentiation of equation (4) gives us

$\hat{a}_{NH} + \hat{X}_H = \mu \hat{N}_F$

By definition $\sigma_H = = (\hat{a}_{NH} - \hat{a}_{LH})/(\hat{W} - \hat{R})$

By using the envelope result $Wda_{LH} + Rda_{NH} = 0$ and by inserting = 0 in the expression of σ_H one obtain

$\hat{a}_{NH} = - \hat{R}\ \sigma_H$

Thus $\hat{X}_H$ can be written as $\hat{X}_H = \mu\ \hat{N}_F + \hat{R}\ \sigma_H$

Hence we can say that $\hat{X}_H > 0$, when $\hat{N}_F > 0$ iff $\hat{R} > -\frac{\mu}{\sigma_H}\ \hat{N}_F$.

In fact when $\hat{N}_F > 0$, we have $\hat{R} < 0$.

Thus, $\hat{X}_H > 0$, iff $-\frac{\mu}{\sigma_H}\ \hat{N}_F < < 0$

So let us start with an increase in N_F. An increase in N_F implies a fall in R. Given a_{LH}, from equation (3) we can say that P_H will also fall due to fall in R (see lemma 1). On the other hand from equation (4) we

can argue that there will be an increase in X_H due to an inflow of N_F (see lemma 2). An increase in X_H implies an increase in $a_{LH}X_H$ and hence creates a negative impact on labour availability to rest of the sectors. Thus A fall in the labour endowment available to sectors A and M causes a Rybczynski effect as a result of which X_M increases and X_A falls, given that sector A is more labour intensive than sector M. We call it Labour Employment Effect (LEE) of the health sector. Again increase in X_H implies an increase in $h(X_H)L$ and hence creates a positive impact on labour availability to rest of the sectors. As a result of which labour endowment availability will go up to sectors A and M and causes a Rybczynski effect as a result of which X_M decreases and X_A increases. We call it Labour Productivity Effect (LPE) of the health sector. An increase in X_H implies an increase in both of $a_{LH}X_H$ and $h(X_H)L$, as a_{LH} is fixed and hence the movement of $(h(X_H)L - a_{LH}X_H)$ will be indeterminate. If we assume that Labour Employment Effect (LEE) dominates over Labour Productivity Effect (LPE), output levels of sector M will go up where as output of sector A will go down.

Proposition 1: If $(\lambda_{LH} - \varepsilon_h) > 0$ and $(\lambda_{KM} - \lambda_{LM}\lambda_{KA}/\lambda_{LA}) > 0$, *a* shift from international health capital immobility regime to an international health capital mobility regime leads to:(i) a decrease in the rate of return to health capital and a decrease in the price of the output of the health sector; ii) increase in the levels output of both health and manufacturing sector and a reduction in the level of output of the agricultural sector.

Proof of Proposition 1: See discussion above.

International Health Capital Mobility and Social Welfare

An increase in N_F leads to a fall in R. Thus fall in R implies a fall in Y. We call it Factor Price Effect (FPE). From (11.2) we can express Y as a function of P_H and I. Using this fact in equation (10) we can express I in terms of P_H and hence we can express Y in terms of P_H only. Thus D_M is expressed in terms of P_H. An increase in N_F leads to a fall in P_H and an increase in X_M. Here a fall in P_H leads to a fall in D_M. Thus increase in X_M and decrease in D_M leads to a reduction in I. Hence reduction in I leads to a fall in Y. We call it Tariff Revenue Effect (TRE). Thus from the above discussion we can say that an increase in N_F leads to a fall in Y, due to FPE and TRE. So far we have analyzed the traditional effects (FPE and TRE) of trade liberalization on the level of social welfare[9]. Interestingly here we get another effect on Y due to nutritional efficiency effect of health sector. Thus an increase in X_H due to an increase in N_F may lead to an expansionary effect on social welfare, that is, the first term of equation (11.2) ($Wh(X_H)L$) will rise. We call it Nutrition Induced Wage Income Effect (NIWIE). If the NIWIE dominates over composite effect of FPE and TRE, social welfare of our stylized economy may improve.

Proposition 2: If and *A shift from international health capital immobility regime to an international health capital mobility regime leads to an improvement in the level of social welfare of a small open economy.*

Proof of Proposition 2: See the above discussion.

[9]In case of a small open economy, in the absence of change in tariffs one can assume national income as a measure of social welfare. For details see Gupta and Gupta (2010).

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Concluding Remarks

We have started from the fear point of the government that trade liberalization through foreign health capital inflow may increase the price level of health sector along with contraction of domestic private health care. However, from the above explanations we can conclude that all the relevant variables like price of health services, output levels of health care and national income of the small open economy will move towards their desirable directions and hence government may allow FDI in the private health care fearlessly.

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