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Tariffs, FDI with technology transfer and welfare in segmented factor markets

Soumyatanu Mukherjee[1]

[1]Assistant Professor, Department of Economics, Indian Institute of Management Kozhikode, IIMK Campus P.O, Kerala 673570, India, Email: *smukherjee@iimk.ac.in*, Phone Number (+91) 4952809107

Abstract:

This paper, using a three-sector full employment general equilibrium model with segmented domestic factor markets, shows that policy of import restriction using tariffs can be beneficial for a small, open developing economy compared to the policy of import liberalisation, opposite to the conventional results. Also inflows of foreign-owned capital to an export sector within the export processing zone (EPZ) of the economy coupled with labour-augmenting type technology transfer can lead to welfare amelioration, even without the existence of segmentation in labour market. So these seemingly counterintuitive theoretical results support recent empirical findings suggesting that trade restrictions can promote growth and attract FDI for the developing countries, even when foreign capital enters one specific export sector of the economy.

1. Introduction

The multilateral agreement and the formation of the World Trade Organization (WTO), resultant of the Uruguay round of discussions, has brought about revolutionary changes in liberalizing international trade across countries whether developed or developing. However it has been observed that some of the developing economies, notably the non-OECD countries, have not implemented tariff reforms to any significant extent, even after formally choosing free trade as their development strategy. Recent empirical evidence, such as Yanikkaya (2003) showed that trade barriers can be beneficial particularly for the developing economies. Popular explanations in favour of tariffs include reallocation of resources towards the goods in which the country has relatively less comparative advantage, infant industry argument for protection and strategic trade policies; along with the famous *tariff-jumping theory*[1] that suggests a positive correlation between the amount of FDI in a country and tariff rates imposed by it. So, the countries yearning for foreign capital may be reluctant to implement tariff reform seriously. Most importantly, a few recent theoretical works like Chaudhuri and Mukherjee (2002a) and Chaudhuri and Mukhopadhyay (2002b) have shown that some countries may endeavour tariff reforms slowly because tariff reductions may directly lead to deterioration of the welfare of these economies in presence of labour market distortion. But apart from the labour market distortion in the form of unionised organised sector labour market, capital market distortion in the unorganised (informal) sector is another most common form of distortion prevails in developing countries. The dominant feature of dualism in the capital market is the fragmented interest rate structure, featuring fewer allocation of loanable capital to the informal sector at a higher relative interest rate. The informal producers do not have access to credit from formal institutions and therefore, have to depend on the informal credit market, where rate of interest is exorbitantly high[2]. The possibility of having segmented capital market was ignored in the above mentioned papers. Also they have assumed domestic and foreign capital are perfect substitutes.

So this paper is going to fill the research gap by using a 3×3 Heckscher-Ohlin-Samuelson (HOS hereafter) model with segmented factor markets to analyse and compare the welfare[3]

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[1] See for example, Motta (1992) and Yanagawa (1990) for details.

[2] See Chaudhuri (2003), Mukhopadhyay (2008), Chaudhuri and Gupta (2014) etc.

[3] We shall consider the national income as a 'crude' indicator of economy's social welfare in this paper. It is true however that our consideration of national income (or per capita national income) as an indicator of welfare may sometimes be inappropriate, given the possibility of existence of high income inequality among different population-groups in the economy. In such cases the welfare measure of Sen (1974), defined as the per-capita

implications of a protectionist policy characterised by increase in tariff rate on the protected domestic import-competing sector and a tariff reform in the import-competing sector, when foreign capital is specific only to the export sector within the export processing zones (EPZ hereafter) of the economy. In particular, this paper finds contrary to the popular belief, restricted trade can be superior to the policy of free trade in a small, open economy with segmentations in domestic factor markets even when foreign capital is specific to the foreign-owned firms within the EPZ.

On the other hand, few theoretical studies (such as Hamada 1974, Hamilton and Svensson 1982, Beladi and Marjit 1992, Chaudhuri 2001, Din 1994 and Yabuuchi 2000) have carried out systematic investigation of the role of FDI directed to the foreign enclave (like an export processing zone) in developing economies, using a hybrid of both Ricardo-Viner and Heckscher-Ohlin structures. Among them, Beladi and Marjit (1992) showed inflow of FDI to the EPZ is bound to be immiserising: if (i) the corresponding theoretical set-up allows for a 3×3 full-employment model without any linkages (in terms of an intermediate input), (ii) this small-open developing economy is an importer of a capital-intensive commodity and (iii) this import-competing sector has tariff-protection.

Chaudhuri (2001) demonstrated using a 2×3 specific factor model that if the FDI inflow to the export sector is coupled with a technology-transfer, then even immiserisation would be the most plausible outcome.

Din (1994) showed that an inflow of foreign capital with full repatriation of foreign capital income to the EPZ may raise the national income of the economy in a 3-sector full employment model, if (i) there is no tariff-protection in the import-competing sector; (ii) one domestic sector produces intermediate input and there exist backward linkages through the use of that intermediary by the EPZ. On the same token, Yabuuchi (2000) showed in case of a traded intermediate input, national income of the economy can go up if there are output-generated increasing returns in the EPZ and at least in one of the two domestic sectors.

However none of these papers considered the possibilities of having segmentations within domestic factor markets. At the same time if foreign capital inflow takes place, the host country gets benefitted from the superior technical know-how and skills of the investing

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income multiplied by one minus the Gini-coefficient of the income distribution, is an appropriate measure of welfare of the different groups of population. Keeping this limitation in mind we, however, continue to measure social welfare in terms of national income as our prime objective is not to focus on income inequality.

country. These new ideas lead to transfer of technology from the foreign producers to the citizens of the recipient country as a spill-over effect on it, known as 'contagion hypothesis'[4]. Empirical evidences (such as Mansfield 1961, 1968) support also the fact that technology transfer in developing countries takes place mainly through the FDI channel. Also the main motive behind the FDI by the multinational enterprises (MNEs) in the developing countries is that they get higher rate of return on their capital in these countries relative to the international market. So in line with Chaudhuri (2005), we shall also assume in this paper that supply of foreign capital in our small open economy is a positive function of the net rental to foreign capital in this recipient country. This exercise may be viewed as an extension of Chaudhuri (2005). However unlike Chaudhuri (2005) in this paper we are assuming a 3×3 production structure where FDI enters, by the means of reduction in tax-rate on foreign capital income, a specific export sector of the economy within the EPZ which uses foreign capital as a specific input; and the efficiency enhancement of labour is associated with the labour force employed in that sector. Our analysis reveals that contrary to the existing theoretical results, if FDI to the EPZ is accompanied by labour-augmenting technology transfer in this small open developing economy with segmented domestic factor markets, welfare can improve although foreign capital does not enter the tariff-protected import-competing sector. In order to obtain these counterintuitive results we *do not need* to assume the presence of external economies in any of the sectors or the existence of intermediate inputs in the EPZ and associated linkage-effects.

The next section incorporates these two cases within a general equilibrium set-up and implications of these policies on the national income of a small, open economy while the last section briefly describes the concluding remarks and the policy implications of the derived results.

2. The model

Consider a small open developing economy consisting of a domestic zone and a 'foreign enclave' like an export-processing zone (EPZ). Within the domestic zone, there are two sectors: sectors 1 and 3. Sector 2 is exclusively within the EPZ using foreign capital as a specific input. We assume that sector 1 and sector 3 use labour and domestic capital to produce X_1 and X_3 respectively. So X_2 is produced by sector 2 producers using labour and

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[4] One can see, for example, Koizumi and Kopecky (1977, 1980), Findlay (1980).

foreign capital. Sector 3 is the import-competing sector of the economy, protected by an import tariff[5]. Labourers in sector 1 earn competitive wage while earning a unionised wage in sector 3. Both sector 1 and sector 2 are in close vicinity and labour is perfectly mobile between these two sectors. So the workers who do not get a job in sector 3 will be absorbed either in sector 1 or in sector 2 at a competitive wage. So there is no unemployment of labour in this model[6]. Now sector 1 (unorganized/informal domestic sector) faces imperfection in credit market, with the rental of domestic capital being higher than that in the organized import-competing sector (sector 3). In this world of final commodities, all goods are traded internationally and their prices are internationally given owing to small open economy assumption. The product markets are perfectly competitive and production functions follow constant returns to scale technology (CRS).

The following notations are used:

W = competitive informal wage rate for labour;

W^* = Unionised wage rate in domestic formal manufacturing sector;

r_D = return to domestic capital ($\overline{K}_D$) in sector 3;

R_D = return to domestic capital in informal credit market of sector 1;

r_F = return to foreign capital (K_F);

a_{ji} = amount of the jth factor used to produce 1 unit of the ith good. Note that $a_{ji} = a_{ij}(W, r_D)$ for $i = 1,3$ and $j = L, K$. But $a_{j2} = a_{j2}(W, r_F; X_2)$ for $= L, K$;

X_i = output of sector i;

P_i^* = international price of good i; ($i = 2,3$);

P_1 = domestic price of the intermediate input;

t = ad-valorem rate of tariff;

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[5] We assume ad-valorem equivalence of any quantitative or other restrictions on imports, such as quotas.
[6] So our paper is different from the standard Harris-Todaro (1970) type model, featuring rural-urban migration with the existence of urban unemployment. This description fits well with the typical developing country like India, where rate of unemployment among the unorganised workers is very low, since they cannot survive without jobs. So this is the 3×3 extension of the models in Beladi et al. (2012), Chaudhuri (2005) etc.

θ_{ji} = cost share of factor j in the production of good i;

λ_{ji} = share of sector i in the total employment of factor j;

$\wedge$ = proportional change.

Under perfect competition we have the usual zero-profit conditions (price-unit cost equality)

$$Wa_{L1} + R_D a_{K1} = P_1 \tag{1}$$

$$Wa_{L2} + r_F a_{K2} = P_2 \tag{2}$$

$$W^* a_{L3} + r_D a_{K3} = P_3(1+t) \tag{3}$$

Sector 3 faces a unionised labour market. Assuming that each firm of the organised sector has a separate labour union, the unionised wage function may be derived[7] as a solution to the Nash-bargaining game between the representative firm and the representative union in the industry (Chaudhuri (2005, 2003), Norback (2001) etc.) which may be simplified as

$$W^* = \Phi(W, U) \tag{4}$$

Where U denotes bargaining strength of the labour unions in sector 3 and $\Phi(.)$ obeys the following properties: $W^* = W$ for $U = 0$; and $W^* > W$ for $U > 0$; $\Phi_1, \Phi_2 > 0$. Therefore taking into account the fact that labour unions in sector 3 have at least some bargaining power over wages[8], we can consider $W^* > W$.

We assume the following functional relationship between R_D and r_D;

$$R_D = \rho r_D \text{ with } \rho > 1. \tag{5}$$

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[7] This function is derived in Chaudhuri and Mukhopadhyay (2010).

[8] Several empirical studies (such as Bhalotra (2002), Besley and Burgess (2004)) have noted that in India, organised workers in the large firms are often keeping wages higher than the supply price of labour due to strong labour regulations through collective bargaining (offer of negotiations, strikes etc.) and restricted mobility of the labour in the organised sectors through various labour laws (such as Industrial Disputes Act, 1947). This makes Indian policymakers, after the economic reform, to seriously think over to reformulate labour laws to curb union power so that unions' power to mark up wages over the supply of labour would decrease and as a consequence unionised wage would fall. Therefore, this assumption of existence of labour market distortion in the organised/formal sector seems relevant for developing countries like India. For similar treatment in theoretical models, see Mukherjee (2012), Beladi et al. (2012) etc.

Here ρ represents the degree of distortion in the unorganised/informal credit market. The informal moneylenders generally borrow funds from the domestic formal sector (sector 3) at the market rate of return r_D, re-lends it to the domestic informal borrowers and by this way maximises net interest income. Therefore it is realistic to assume that informal rental return in sector 1 is positively related to and steeply higher than the return in sector 3. The lower the number of alternative sources of credit to the borrowers in the informal sector, the higher is the degree of imperfection of the informal credit market and thereby the power of the informal sector lenders to mark up informal rental return over return in sector 3; i.e., greater value of ρ. Thus the informal return increases if either or both (i) the degree of imperfection in the domestic informal credit market rises, (ii) return to capital in sector 3 rises[9].

We also assume that amount of credit allocated to the informal sector is a positive function of the return differential between the two capital markets. Therefore as long as $\rho > 1$, informal capital market exists and thus the dichotomy between the two credit markets exists[10].

$$K_1 = K_1(R_D - r_D) = K_1\{r_D(\rho - 1)\}. \text{ So when } (R_D - r_D) \geq 0, K_1'(.) \geq 0. \quad (6)$$

So full utilisation of informal credit implies:

$$a_{K1}X_1 = K_1\{r_D(\rho - 1)\} \quad\quad\quad (7)$$

Sector 3 uses the formal credit. The equilibrium in the formal credit market ensures that

$$a_{K3}X_3 = \overline{K}_D - K_1\{r_D(\rho - 1)\} \quad\quad\quad (8)$$

Similarly, for foreign capital

$$a_{K2}X_2 = K_F \quad\quad\quad (9)$$

Full-employment condition for labour implies (normalising total labour endowment to unity)

$$a_{L1}X_1 + a_{L2}X_2 + a_{L3}X_3 = 1 \quad\quad\quad (10)$$

We measure domestic welfare of the economy by national income at world prices, given by

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[9] For details, see Chaudhuri (2003), Mukhopadhyay (2008) etc.

[10] It is worth to mention that Chaudhuri (2003) has considered the dualism in capital/credit market in the same fashion to consider the welfare implications of different liberalisation policies. However that paper considered a Harris-Todaro type economy and assumed perfect substitutability between domestic and foreign capital. This paper, on the other hand, has considered a full-employment model with segmentation in labour market as well; also in our model foreign capital is specific to a particular export sector of the economy within the EPZ. The justification for considering full-employment structure with segmented labour market has been discussed in footnote 6.

$$Y = W + (W^* - W)a_{L3}X_3 + r_D\overline{K}_D + (R_D - r_D)K_1 - tP_3X_3 \tag{11}$$

Let us consider that the income from foreign capital is completely repatriated back to the source country.

We have seven endogenous variables $W, W^*, r_D, r_F, X_1, X_2, X_3$ in this system. r_D is determined from Equation (3) given the unionised wage and exogenous price of the importable. Substituting r_D in Equation (1.1), given ρ, one can obtain W. Finally from Equation (2) r_F is found given W. Once factor prices are known, factor-coefficients a_{ji}s are also known. Now using the value of r_D and given ρ, we can find $K_1(.)$ from Equation (6). Then simultaneously solving Equations (8), (9) and (10) we get X_1, X_2 and X_3.

2.1 Welfare implication of protectionist policy versus import liberalisation policy

Without any loss of generality, we reasonably assume that the protected import-competing manufacturing sector (sector 3) is more capital-intensive relative to the informal agricultural sector (sector 1) in physical and value sense; i.e.

$$\frac{a_{K3}}{a_{L3}} > \frac{a_{K1}}{a_{L1}} \Leftrightarrow \lambda_{L1}\lambda_{K3} > \lambda_{L3}\lambda_{K1}$$

$$\Leftrightarrow \theta_{L1}\theta_{K3} > \theta_{K1}\theta_{L3}.$$

Totally differentiating Equations (1.1), (2)-(3), applying envelope conditions and using Cramer's rule one obtains

$$\widehat{W} = -(T\hat{t}\theta_{K1}/\theta_{L1}\theta_{K3}) \tag{12}$$

$$\widehat{r_D} = (T\hat{t}/\theta_{K3}) \tag{13}$$

$$\widehat{r_F} = (T\hat{t}\theta_{K1}\theta_{L2}/\theta_{L1}\theta_{F2}\theta_{K3}) \tag{14}$$

Where $T = (t/1 + t) > 0$.

Assuming production functions in all sectors are of Cobb-Douglas type[11], total differentiation of (8) and using Equations (12)-(14), we obtain

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[11] This is a simplifying assumption. It implies that elasticity of substitution between factors of production in each sector is unity.

$$\widehat{X_3} = \{T\hat{t}(\theta_{L3} - r_D(\rho - 1)K_1'(.)/a_{K3}X_3)\}/\theta_{K3} \tag{15}$$

Differentiating Equation (11) with respect to t, we get the following:

$$dY/dt = (1/\theta_{K3})[(T\lambda_{L3}/t)\{(W^* - W)(1 - r_D(\rho - 1)K_1'(.)/a_{K3}X_3) + r_D(a_{K1}/a_{L1})\} +$$

$$TrDtKD+\rho-1K1.+\rho-12rDK1'(.)-aK1aL1-P3X31+T(\theta L3-rD\rho-1K1'.aK3X3) \tag{16}$$

A little bit of simplification yields,

$$dY/dt = \left(1/(1+t)\theta_{K3}\right)\begin{bmatrix} X_3\left\{\left(W^* - W\right)a_{L3}\theta_{K3} - tP_3\right\}\left\{1 + (\theta_{L3} - r_D(\rho-1)K_1'(.)/a_{K3}X_3)\right\} + r_D \\ \left\{\left(\overline{K}_D + (\rho-1)K_1(.) + (\rho-1)^2 r_D K_1'(.)\right) - (a_{K1}/a_{L1}) + \lambda_{L3}(a_{K1}/a_{L1})\right\} \end{bmatrix} \tag{17}$$

We have $dt > 0$ when a protectionist policy is adopted in the import-competing sector 3 and $dt < 0$ under the policy of trade-liberalisation in sector 3.

Case (I): $dt > 0$. Then we have from Equations (12) – (14):

$\widehat{W} < 0, \widehat{r_D} > 0$ and $\widehat{r_F} > 0$. So from Equation (15), we have $\widehat{X_3} > 0$ under the sufficient condition $1 > \theta_{L3} > \{r_D(\rho - 1)K_1'(.)/a_{K3}X_3\}$. In Equation (16) we find that the sign of the term $\{(\overline{K_D} + (\rho - 1)K_1(.) + (\rho - 1)^2 r_D K_1'(.)) - (a_{K1}/a_{L1})\}$ is positive. This is because given our assumption that sector 3 is more capital-intensive than sector 1, (a_{K1}/a_{L1}) should be less than the ratio of aggregate stock of domestic capital to labour in the economy[12]. Therefore from Equation (17) it follows that $(dY/dt) > 0$ if $(W^* - W)a_{L3}\theta_{K3} > tP_3$. This leads to following proposition:

Proposition 1. *A protectionist policy in the form of increase in the ad-valorem rate of tariff on the importable can lead to welfare amelioration of a small open economy if (i) $\theta_{L3} > \{r_D(\rho - 1)K_1'(.)/a_{K3}X_3\}$ and (ii) $(W^* - W)a_{L3}\theta_{K3} > tP_3$ hold simultaneously.*

As t increases, the domestic price of the importable rises. So given the pegged wage W^* interest rate in sector 3, r_D, rises. To satisfy the zero-profitability condition for sector 1, competitive wage, W, will fall. As r_D rises, the formal-informal interest differential, $(R_D - r_D)$ rises too. So credit allocated to sector 3, $\{\overline{K_D} - K_1(.)\}$, will fall. Therefore two opposite effects on X_3 are now operating. Due to rise in r_D capital-output ratio in sector 3, a_{K3}, will

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[12] Note that aggregate labour endowment of the economy has been normalised to unity.

fall and hence X_3 will rise for a given supply of credit, $\{\overline{K_D} - K_1(.)\}$. On the other hand, given a_{K3} lowering the availability of credit to sector 3 will put a downward pressure on X_3.

However if the sufficient condition $\theta_{L3} > \{r_D(\rho - 1)K_1'(.)/a_{K3}X_3\}$ is satisfied, sector 3 will expand. So the aggregate wage-income of the workers are affected due to (i) fall in W, and (ii) expansion of the higher wage-paying sector 3 and the consequent flow of the workers to sector 3. Also as r_D rises, the presence of credit market imperfection in sector 1 would make the rise in aggregate rental income from domestic capital more likely. From Equation (16), aggregate domestic factor income will rise as $\{(\overline{K_D} + (\rho - 1)K_1(.) + (\rho - 1)^2 r_D K_1'(.)) - (a_{K1}/a_{L1})\} > 0$. But the cost of tariff protection will also rise since X_3 rises under the sufficient condition $\theta_{L3} > \{r_D(\rho - 1)K_1'(.)/a_{K3}X_3\}$. This will negatively affect welfare. However from Equation (17) it follows that welfare can still improve if $(W^* - W)a_{L3}\theta_{K3} > tP_3$. It is evident that the existence of distortions in capital and labour markets will make the improvement in the economy-wide national income more likely, since in the absence of factor market distortions welfare would almost surely deteriorate[13]. Therefore we can state the following proposition:

Proposition 2. *In a small open economy with segmented factor markets, a protectionist policy can be welfare improving as long as certain degrees of distortions exist in the domestic formal sector labour market and informal capital market.*

Case (II): when $dt < 0$. Then we have from Equations (12) – (14):

$\widehat{W} > 0, \widehat{r_D} < 0$ and $\widehat{r_F} < 0$. The fall in r_D will induce the sector 3 producers to use more capital per-unit of production, which means a_{K3} will now rise and so given the supply of capital to sector 3, X_3 will fall. But since $(R_D - r_D)$ falls, $\{\overline{K_D} - K_1(.)\}$ rises as well. This will encourage sector 3 producers to use more capital. However if $1 > \theta_{L3} > \{r_D(\rho - 1)K_1'(.)/a_{K3}X_3\}$ holds, $\widehat{X_3} < 0$. From Equation (16), we find that aggregate factor income will fall since the sign of the term $\{(\overline{K_D} + (\rho - 1)K_1(.) + (\rho - 1)^2 r_D K_1'(.)) - (a_{K1}/a_{L1})\}$ would still be positive as the capital-labour ratio used in per-unit of production in the relatively less domestic capital-intensive sector of the economy (i.e., sector 1) should always be less than the ratio of aggregate stock of domestic capital to labour in the economy. However, distortionary costs of tariff protection in sector 3 will also fall.

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[13] The sufficient condition for welfare deterioration would then be $(a_{K1}/a_{L1}) < 1$, which is almost certain in our framework, since sector 1 is the relatively less capital-intensive sector in the domestic zone.

Hence welfare will fall if the positive effect of reduction in costs of tariff protection, measured by the term $P_3 X_3 \{1 + T(\theta_{L3} - r_D(\rho - 1)K_1'(.)/a_{K3}X_3)\}$, is not significantly higher to outweigh the fall in aggregate factor income due to reduction in tariff. In fact, under the same sufficient condition following from Equation (17.2) $(W^* - W)a_{L3}\theta_{K3} > tP_3$, welfare will now deteriorate as a consequence of a tariff reform in the protected import-competing sector. So in presence of distortions in domestic factor markets and sector-specific foreign capital, removal of protectionism may not be the first-best policy to adopt. Therefore this theoretical exercise re-establishes the claim:

In a small open economy with distortions in domestic factor markets, restricted trade (in the form of increase in tariff protection on importable) is superior than free-trade (removal of protectionism).

It should be pointed out that *even when one measures welfare using a quasi-concave social welfare function*, which captures demand side and supply side distortions, the qualitative results of the paper would be *unaffected*.

2.2 FDI to the EPZ with technology transfer

In this set-up we shall use some of the following additional symbols:

h = efficiency of each labourer;

b = ad-valorem rate of tax on income from foreign capital;

And as per our assumption

$$K_F = K_F\{r_F(1 - b)\} \qquad K_F'(.) > 0 \tag{18}$$

FDI inflow to sector 2 (foreign enclave) is now associated with efficiency gain of each worker employed in sector 2, given as:

$$h = h[K_F\{r_F(1 - b)\}] \qquad h' > 0 \tag{19}$$

So the zero-profit condition for sector 2 now becomes:

$$Wh(.)a_{L2} + r_F a_{K2} = P_2 \tag{20}$$

So full-employment condition for labour now becomes:

$$a_{L1}X_1 + h(.)a_{L2}X_2 + a_{L3}X_3 = h[K_F\{r_F(1-b)\}] \tag{21}$$

Where after normalising physical units of labour endowment to unity, $h(.)$ would become the efficiency units of labour endowment of the economy.

In this decomposable structure a foreign capital inflow to the EPZ, brought about by a reduction in tax-rate, will not alter the input prices. Therefore r_D and R_D will not change and so there will be no change in capital allocation within the domestic zone. Therefore we can express the full utilisation condition of domestic capital as:

$$a_{K1}X_1 + a_{K3}X_3 = K_D \tag{22}$$

Full-utilisation condition for foreign capital now implies:

$$a_{K2}X_2 = K_F\{r_F(1-b)\} \tag{23}$$

National income at world prices will now be expressed as:

$$Y = Wh(.) + (W^* - W)a_{L3}X_3 + r_D K_D + r_D a_{K1}X_1(\rho - 1) + br_F K_F(.) - tP_3X_3 \tag{24}$$

Where $br_F K_F(.)$ is the tax revenue collected from the foreign capital income.

Note that now we have fully decomposable price system, where the factor prices, including rental to foreign capital (r_F), are determined in terms of internationally given commodity prices alone. So a foreign capital inflow to the export sector of the economy (i.e., the EPZ), brought about by a reduction in the tax rate on foreign capital income, will not alter the factor prices faced by the competitive producers.

Total differentiation of Equations (21) – (24) and simple manipulations will give us the following results[14]:

$$\widehat{X_3} = -\frac{\lambda_{K1}br_F K_F'}{|\lambda|}\hat{b}\left[\frac{h'(1-\lambda_{L2})}{h} - \frac{\lambda_{L2}}{K_F}\right] \tag{25}$$

$$\widehat{X_1} = -\frac{\lambda_{K3}br_F K_F'}{|\lambda|}\hat{b}\left[\frac{\lambda_{L2}}{K_F} - \frac{h'(1-\lambda_{L2})}{h}\right] \tag{26}$$

$$dY/db = -r_F[Wh'K_F' + (br_F K_F' - K_F(.))] - (r_F K_F' X_3/|\lambda|)[\lambda_{K1}\{(W^* - W)a_{L3} - tP_3\} - \rho - 1rDaK1X1\lambda K31 - \lambda L2h'/h - \lambda L2KF \tag{27}$$

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[14] See Appendix.

Where $|\lambda| = (\lambda_{L3}\lambda_{K1} - \lambda_{L1}\lambda_{K3}) < 0$ since we retain the assumption that sector 3 is relatively capital-intensive vis-à-vis sector 1 in value and physical sense.

Therefore, $(\widehat{X_3}/\hat{b}) \lesseqgtr 0$ and $(\widehat{X_1}/\hat{b}) \gtreqless 0$ if $(h'K_F/h) \lesseqgtr \{\lambda_{L2}/(1-\lambda_{L2})\}$ and $\left(dY/db\right) \leq 0$ if

(i) $\qquad [\lambda_{K1}\{(W^* - W)a_{L3} - tP_3\} - (\rho - 1)r_D a_{K1}\lambda_{K3}][\{(1-\lambda_{L2})h'/h\} - (\lambda_{L2}/K_F)] \leq 0$

and/or (ii) $\left(br_F K_F' - K_F(.)\right) \geq 0$. This leads to the following proposition:

<u>Proposition 3</u>. *An FDI inflow to the EPZ brought about by a fall in the tax-rate on income from FDI may be beneficial for the recipient country if either/both of (i) and (ii) holds*.

Following an FDI inflow to sector 2 (EPZ), brought about by a tax-cut on foreign capital income, will raise the labour demand by this sector. But at the same time, it enhances efficiency of the workers tied to this sector, and raises the effective labour-endowment of the economy. Now the direction of the Rybczynski effect in the Heckscher-Ohlin Subsystem (HOSS hereafter) formed by the two domestic sectors – sector 1 and sector 3, will be depending on what will happen to the net demand for labour by the EPZ and thereby to the net availability of labour in the domestic zone. However the relatively capital-intensive protected import-competing formal sector will expand (does not change) (contract) according to the direction of this Rybczynski effect; i.e., if $(h'K_F/h) \lesseqgtr \{\lambda_{L2}/(1-\lambda_{L2})\}$[15]. Therefore the distortionary cost of tariff-protection in the import-competing formal sector increases (remains unchanged) (falls). We call it the 'output effect' (of the formal sector).

Due to the presence of labour-market imperfection in the formal sector we have positive wage-differential between the two domestic sectors. Now given the effective labour endowment, the aggregate wage-income depends on the direction of change in output-composition in the domestic zone following a 'labour-reallocation effect'. As the higher wage-paying formal sector expands (remains same) (contracts), the aggregate wage-income of all labourers in the economy rises (remains unchanged) (falls).

However the presence of credit market imperfection in sector 1 would impose a downward pressure on rental income from domestic capital if sector 1 contracts following the direction of the Rybczynski effect.

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[15] Note also that the direction of change in output-composition in the domestic zone will depend only on one Rybczynski effect in the domestic zone; which would be either in favour of the formal sector (when net availability of labour in the domestic zone decreases) or against the formal sector (when net availability of labour in the domestic zone increases) or there would not be any Rybczynski effect (when net availability for labour in the domestic zone does not change).

So the combination of the above three forces on welfare will be positive (zero) if and only if (i) holds.

Also the rise in the effective labour endowment of the economy implies another favourable impact on welfare, captured by the term $[-Wh'K_F'r_F db] > 0$.

And finally the FDI inflow took place by a fall in tax on income from FDI which would have a favourable impact (no impact) on economy-wide national income through the increase (no change) in tax-revenue if $(br_F K_F' - K_F(.)) > 0$ or $= 0$.

Even when we ignore this tax-revenue effect (i.e., consider the case when $br_F K_F' = K_F$), *in the absence of any labour-market imperfection in the formal sector* welfare may still improve in this set-up. The efficiency gain in labour force engaged in sector 2 (due to the labour-augmenting nature of technology transfer) will make the direction of the Rybczynski effect in the domestic zone (i.e., within the HOSS) ambiguous. So even when the wage-gap between the two domestic sectors does not exist the distortionary cost of tariff-protection may fall (remain unchanged) and sector 1 may expand (remain unchanged) in case of which capital market imperfection in sector 1 may not work unfavourably on domestic income if net availability of labour in the domestic zone is positive (zero). On the top of that this efficiency gain in the labourers working in sector 2 will be transmitted to an increase in effective labour-endowment of the economy, which unambiguously improves welfare. Even when the protected import-competing sector expands when net availability of labour in the domestic zone falls, welfare may improve when the gain following the increase in effective labour-endowment more than offsets the combined negative impacts of fall in aggregate income from domestic capital (due to the presence of credit market imperfection in sector 1, which is contracting) and the increase in distortionary cost of tariff-protection[16].

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[16] One can check that all these results in Propositions 2 would have been valid under the presence of external economies in sector 2 as well. In the presence of output-generated external economies in sector 2 r_F would go up following FDI inflow to sector 2 leading to another round of fresh inflow of foreign capital, by raising the net return. As a result of increase in r_F producers would demand more labour from the domestic zone, while the efficiency gain in labour in sector 2 would reduce the net demand for labour in sector 2. So there will be another Rybczynski effect in the domestic zone. So now what would happen to the output-composition in the domestic zone, will really depend on the direction of the net Rybczynski effect (net of the two Rybczynski effects in the domestic zone: the first due to inflow of FDI by reduction in tax-rate, and the second is due to another round of FDI inflow brought about by a rise in r_F). The direction of change in welfare, would then also be ambiguous: however there will be positive impacts on tax-revenue collected from FDI income since r_F goes up which leads to further increase in K_F; this will positively affect welfare.

Now it is evident in this extended model that a protectionist policy in the form of tariff in the import-competing sector will lead to increase in returns to both domestic and foreign capital, which would encourage fresh inflows of foreign capital to the EPZ. But an import-liberalisation policy characterised by a tariff reform in sector 3, will have exactly opposite implications and therefore will act as a deterrent to foreign capital for this small, open economy.

3. Concluding remarks

This analysis shows in a 3×3 full-employment structure with segmentations in factor markets a policy of restricted trade in the form of increase in tariff rate on importable will be superior to the policy of import-liberalisation, in terms of their impact on the economy's per capita income. At the same time if the foreign capital enters the export sector of the economy within the EPZ with labour-augmenting type technology-transfer, welfare of this small, open economy can improve even in the presence of segmented domestic factor markets. Also since efficiency of the workers in sector 2 will increase, the resultant Rybczynski effect in the domestic zone may not lead to an expansion of the tariff protected import-competing sector. So even with perfect labour market in sector 3 (i.e., with no 'labour-reallocation effect') welfare amelioration is possible following an influx of foreign capital in the EPZ, brought about by a reduction in the tax-rate on foreign capital income, if FDI is accompanied by a labour-augmenting type technology transfer. This result is in sharp contrast to the existing theoretical literature and suggests that government may adopt investment liberalization policy and a policy of labour market reform simultaneously in the presence of technology transfer. Also note that a protectionist policy in the domestic import-competing sector (increase in tariff rate on importable) in this set-up will lead to an increase in the return to foreign capital which will encourage FDI to the export sector of the economy within the EPZ. So this paper has served to provide an explanation, in a more convincing way than the standard 'tariff-jumping theory', why the developing countries are reluctant to adopt trade reform policies for the last decade compared to the developed nations.

Appendix

Now total differentiating Equations (21) – (23) and arranging them in matrix form we get:

$$\begin{pmatrix} \lambda_{L1} & \lambda_{L2} & \lambda_{L3} \\ \lambda_{K1} & 0 & \lambda_{K3} \\ 0 & \lambda_{K2} & 0 \end{pmatrix} \begin{pmatrix} \hat{X}_1 \\ \hat{X}_2 \\ \hat{X}_3 \end{pmatrix} = \begin{pmatrix} -(1 - \lambda_{L2})\{(h'K_F'r_F b\hat{b})/h\} \\ 0 \\ -\{(K_F'r_F b\hat{b})/K_F\} \end{pmatrix} \qquad (A1)$$

Solving Equation (A10) using Cramer's rule we get $\hat{X}_3$ and $\hat{X}_1$ as in Equations (25) and (26) respectively.

Now differentiating Equation (24) with respect to b we get

$$(dY/db) = -Wh'K_F'r_F + (W^* - W)a_{L3}(dX_3/db) + (\rho - 1)r_D a_{K1}(dX_1/db) + r_F K_F(.) - br_F^2 K_F' - tP_3(dX_3/db) \qquad (A2)$$

Using Equations (25) and (26) in Equation (A2) and a little bit of simplification would yield Equation (27), from which proposition 3 is imminent.

Totally differentiating Equations (1.1), (20) and (3); applying Envelope conditions and solving by Cramer's rule it is easy to obtain:

$$\hat{r}_F = \{\theta_{K1}\theta_{L2}T\hat{t}/\theta_{L1}\theta_{K3}(\theta_{F2} + H\theta_{L2})\}$$

Where $H = \{h'K_F'r_F(1 - b)/h\} > 0$. Therefore as $\hat{t} \lessgtr 0, \hat{r}_F \lessgtr 0$. ∎

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Research Office

Indian Institute of Management Kozhikode

IIMK Campus P. O.,

Kozhikode, Kerala, India,

PIN - 673 570

Phone: +91-495-2809238

Email: research@iimk.ac.in

Web: https://iimk.ac.in/faculty/publicationmenu.php