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ABSTRACT

This paper shows the non-optimality of the free trade policy in a labor-surplus economy where multinational corporations operate in the importable sector with distortions in the capital market. It then examines the welfare implications of alternative trade intervention policies. The paper illustrates that (a) a tariff and a production subsidy to the importable sector reduce welfare, while (b) an export subsidy and a production subsidy to the exportable sector enhance welfare. The optimum subsidy rates necessary to implement the outward-looking trade policy are also derived in the paper.

I. INTRODUCTION

In recent years, there has been a remarkable growth in the literature on the economics of multinational corporations. The international attributes of the global firms and their implications for resource allocation and movement of capital across national borders have been examined in terms of the traditional trade models in Caves [1971] Batra and Ramachandran [1980], Koizumi and Kopecky [1977], Mansfield [1980], Root [1990] Stopford and Dunning [1983], Blomstrom and Persson [1983]. Lately, Batra (1986) has formulated a general equilibrium model to show the effects of the entry and subsequent expansion of multinational firms in a labor-surplus economy on employment and national income. This paper evaluates the welfare implications of alternative trade policies in the presence of multinationals in a less developed country where unemployment exists because of the downward rigidity of the real wage rate. The general equilibrium framework utilized by Batra is used in the analysis of this paper.

A labor-surplus economy is plagued by large-scale general unemployment. In this situation, the multinational firms introduce a highly capital-intensive superior technology embodied in a specific factor owned by them and compete with the national firms for capital in the local market.[1] The banking practices in the LDCs favor the global firms with interest rates lower than those paid by national firms. The capital-market distortion caused by the infiltration of multinationals is added to the already existing labor-market distortion. In the presence of these distortions in the domestic economy, the free-trade policy is not optimal and hence for the country trade intervention is needed. This paper explores the effects of various alternative trade intervention policies in this context.

The layout of the paper is as follows: Section II sets up the model . Section III provides the equilibrium solution for the endogenous variables in the model and shows the non-optimality of the free trade policy. Then Sections IV and V deal with interventions in the importable sector in the form of export subsidy and production subsidy. Similar interventions in the exportable sector in the form of export subsidy and production subsidy are considered in Sections VI and VII. Section VIII summarizes the main conclusions of the study. The mathematical derivations used in the text are put into two appendices.

II. SPECIFICATION OF THE MODEL

The model represents a labor-surplus host economy with two sectors of production, where multinational firms operate in the importable industry and local firms are concentrated in the exportable production. Capital and labor are the two local factors that are employed in both industries. The multinationals bring a special factor[2] in the host economy in the form of managerial and technical know-how, which is specific to the importable sector. There is large scale unemployment of labor in the economy due to the downward inflexibility of wages. Though capital is fully employed in the two sectors of production, there exists a distortion in the capital market in that the multinationals employ capital at a lower rental rate than that of the local firms. Perfect competition exists in other markets of the economy.

Let X and Y be the output quantities of the importable and exportable sectors, respectively. The two production functions in the economy are

$$X = X\,(K_x\,,\ L_x\,,\ S\,) \tag{1}$$

and,

$$Y = Y(K_y, L_y), \tag{2}$$

where K stands for capital, L for labor, S for the specific factor brought by the multinationals, and the subscripts x and y for the two sectors, importable and exportable, respectively. Both production functions exhibit constant returns to scale and diminishing marginal product of each factor. In addition, the production functions are concave and have positive cross partial derivatives with the following properties:[3]

$[X_{LL}X_{KK} - (X_{KL})^2] > 0$ and $[Y_{LL}Y_{KK} - (Y_{KL})^2] = 0$.

The stock of capital in the economy is fixed at $\bar{K}$ so that $[K_x + K_y] = \bar{K}$. The multinationals have brought a fixed amount of the specific factor, $\bar{S}$, which they continue to maintain in the economy. The employment of labor, $L = [L_x + L_y]$, depends on the demand for labor in the two sectors, because its supply is unlimited in the Lewis sense.[3]

Let P be the relative price of the importable in terms of the exportable, which is treated as the numeraire in the model. Because of the distortion in the capital market, the value of the marginal product of capital in the importable sector is less than that in the exportable. Then the employment of capital in the two sectors will satisfy the following equilibrium conditions:

$$\alpha P X_K = Y_K \tag{3}$$

where X_K and Y_K are the marginal products of capital in X and Y production, respectively, and $\alpha > 1$ is a parameter that represents the link between the rental rates of capital in the

two sectors. It should be noted that commercial banks and other financial institutions may prefer to charge the mulitnational corporations lower interest rates, so that $r_x < r_y$, however because of the intersectoral mobility of capital, there exist some link between the cost of capital in the two sectors, hence $\alpha\ r_x = r_y$ with $\alpha > 1$.

The institutionally determined wage rate in terms of the exportable is fixed at W. The given wage rate is equated to the value of the marginal product of labor in the two sectors by the appropriate hiring of labor. Then the equilibrium conditions for the labor market are,

$$PX_L = W \tag{4}$$

and,

$$Y_L = W \tag{5}$$

where X_L and Y_L are the marginal products of labor in X and Y production, respectively.

The rental rate of the specific factor is determined by the value of its marginal product in the importable sector, so that,

$$\rho = PX_s \tag{6}$$

where ρ is the rental rate of the specific factor and X_S its marginal product in X production.

Full employment of capital and the specific factor yields the following two equations:

$$k_x L_x + k_y L_y = \bar{K} \tag{7}$$

and,

$$sL_y = \bar{S}, \tag{8}$$

where $k_x = (K_x / L_x)$, $k_y = (K_y / L_y)$ and $s = (S / L_y)$.

The production structure of the economy is completely described by equations (1) through (8) The consumption side of the model is specified by the following strictly concave social utility function:

$$U = U (D_x , D_y) , \tag{9}$$

where U is the utility level and D_x and D_y are the consumption of the importable and exportable, respectively. In order to determine the domestic consumption bundle, the utility function in equation (9) is maximized, subject to the domestic income constraint:

$$PD_x + D_y = PX + Y - \rho\bar{S}, \tag{10}$$

where $\rho = X_s$ and X_s is the marginal product of the specific factor so that, $\rho\bar{S}$ is the rental of the specific factor, appropriated by the multinationals and repatriated to the countries of their affiliation. The left-hand side of equation (10) is the value of the domestic consumption and its right-hand side is the Net National Product. The following marginal condition determines the consumption equilibrium in the economy:

$$(U_x / U_y) = P \tag{11}$$

where U_x and U_y are the marginal utilities of the consumption of the importable and exportable, respectively.

In an open economy, the domestic consumption plan is made consistent with the

domestic production plan through exports and imports. Let E_y be the export of Y and E_x be the export of X. Then net export and import quantities are,

$$E_y = [\, Y - D_y \,] \tag{12}$$

and,

$$E_x = [\, D_x - X \,] \tag{13}$$

The income constraint in equation (10) yields the following trade balance equation:

$$PE_x = [\, E_y - \rho\bar{S} \,] \tag{14}$$

where the exports net of the rental of the specific factor, taken out of the country by the where the exports net of the rental of the specific of the factor, taken out of the country by the multinational corporations,[5] pay for the imports.

III. EQUILIBRIUM SOLUTION AND FREE TRADE

In order to generate a set of determinate solutions for the endogenous variables in the model, it is assumed that the host country is a small open economy. Under this assumption, the domestic producers and consumers in the economy face a given relative price of the importable, P, which under free trade is equal to the international price, P^*.

The production structure of the economy, specified in equations (1) through (8), can be solved for X, Y, K_x, K_y, L_x, L_y, s and ρ in terms of $\bar{K}$, $\bar{S}$, P, W and α. The step-wise solution for the variables is described below. First, since the production functions in equations (1) and (2) are linearly homogeneous, the marginal productivity conditions in

equations (3), (4), and (5) can be solved for k_x, k_y and s, when P, W and α are given exogenously. Second, once k_x, k_y, and s are known in the first-step equations (7) and (8) can be solved for L_x and L_y, since $\bar{K}$ and $\bar{S}$ are given. Thus, when L_x and L_y are known the second step, the definitional equations, $k_x = (K_x / L_x)$ and $k_y = (K_y / L_y)$, can be used to determine K_x and K_y, since k_x and k_y are already known.

Finally, ρ is determined by equation (6) and the output quantities are determined by equations (1) and (2), when the factor employments are known in the respective equations.

The consumption bundle of the economy along with its trade pattern is determined by equations (10) through (13). Equations (10) and (11) determine D_x and D_y since X, Y, and ρ have already been determined and P and $\bar{S}$ are exogenously given. Then E_y and E_x are determined by equations (12) and (13).

In order to evaluate the optimality of the free trade policy, a distortion in the domestic price of the importable is introduced so that P is different from P^*. A change in social welfare is represented by the differential of U in equation (9). Then total differentiation of equation (9) and substitution from the consumption equilibrium condition yield the following expression for the change in social welfare:

$$(dU/U_y) = [PD_x + dD_y]. \qquad (15)$$

It may be noted that in a small open economy, trade occurs at the international price, P^*. Then the total differential of the trade balance equation, $E_y = [P^*E_x + \rho\bar{S}]$, is

$dE_y = P^* dE_x$. From equations (12) and (13), it follows that $dD_y = [\, dy - d\bar{E}_y \,]$ and $dD_x = [dE_x + dX]$. It is shown in Appendix A that $[dY + PdX\,] = [\, WdL + r_x(1-\alpha)\, dK_x]$, where r_x is the rate of rental of capital in the importable sector. Now, successive substitution of these results in equation (15) finally yields,[6]

$$(dU/U_y) = (P-P^*)\, dE_x + WdL + r_x(1-\alpha)\, dK_x \qquad (16)$$

The change in welfare shown in equation (16) can be used to examine the effects of alternative trade policies. When welfare is maximized, dU = 0. Under free trade, $P = P^*$, and then the first term in the right-hand side of equation (16) is zero, but the sum of the other two terms is now necessarily equal to zero. Then free trade is not the optimum policy in a labor-surplus economy where the presence of multinationals in the importable sector creates another distortion in the capital market. Since $\alpha > 1$, a decrease in K_x and an increase in L will make the sum of the last two terms in equation (16) positive. Thus a deviation from the free trade situation, leading to an increase in the employment of labor in the economy and a decrease in the employment of capital in the importable will improve the level of welfare in the domestic economy. Welfare implications of alternative trade policies are examined in the following sections.

IV. TARIFF ON IMPORTS

If the host country imposes a tariff at rate t on its imports, the domestic price of the importable, faced by both producers and consumers, changes to $P = (1+t)P^*$. Then

$(P - P^*) = tP^*$ and $dt = (dP/P^*)$. Using these results in equation (16), the change in welfare with respect to the tariff can be written as,

$$\left(\frac{dU/dt}{U_y}\right) = P^*\left[W\frac{dL}{dP} + r_x(1-\alpha)\frac{dK_x}{dP}\right] \tag{17}$$

where t = 0, initially. Equation (17) gives a measure of the welfare change caused by the imposition of a small tariff in a free-trade situation. Since the tariff leads to an increase in the relative price of the importable in the domestic economy, the domestic production of the importable increases. Then capital is drawn from the exportable sector to the importable one. It is shown in Appendix B that $(dK_x / dP) > 0$. Since $\alpha > 1$, the second term in the right hand side of equation (17) is negative in sign. The expansion of the importable sector causes an increase in the employment of labor in that sector, but the consequent contraction of the exportable sector, caused by the transfer of capital, leads to a fall in labor employment in exportable production. The net effect on the employment of labor depends on the capital-labor ratios of the two sectors and the elasticities of the marginal products of labor and capital with respect to the specific factor in the importable sector. The sufficient conditions for the negative sign of (dL/dP) are derived in Appendix B. As shown in Appendix B, if the capital-labor ratio in the importable sector is higher than that in the exportable sector, and if the elasticity of the marginal product of labor in importable production with respect to the specific factor is greater than or equal to that of the marginal product of capital, the total employment will ambiguously decline with the increase in the relative price of the importable.7 Then the first term on the right-hand side of equation (17) is also negative in

sign. Thus it follows that the trade intervention in the form of a tariff cannot improve the level of domestic welfare. An inward looking trade policy will lead to a negative welfare change.

V. PRODUCTION SUBSIDY ON IMPORTABLE

If the production in the importable sector is subsidized by the government at the rate s_x, the relative price of the importable, faced by the producers, will increase to $P_s = P^*(1+s_x)$, while the consumers will face the same international price, P^*. Then $(P - P^*) = (P_s - P^*) = s_x P^*$ and $ds_x = \left(dP_s / P^* \right)$. Since the price faced by the consumers does not change, the consumption will not change, and so, $dE_x = -dX$. Using these results in equation (16), the change in welfare with respect to the rate of subsidy can be expressed as,

$$\left(\frac{dU/ds_x}{U_y}\right) = P^*\left[W\frac{dL}{dP} + r_x(1-\alpha)\frac{dK_x}{dP} - s_x\frac{dX}{dP}\right], \qquad (18)$$

where $dP_s = dP$. If initially $s_x = 0$, the welfare change caused by a small subsidy is captured by the first two terms in the right-hand side of equation (18). Thus production subsidy to the importable sector will reduce the domestic welfare level. So, import substitution is welfare-reducing in its effect.

VI. EXPORT SUBSIDY

If the exports of the country are subsidized, the relative price the importable, faced by the domestic producers and consumers, will go down. Let e be the rate of export subsidy. Then $P^* = P(1+e)$, $(P - P^*) = -eP$, and $de = -(1+e)dP/P$. Using these results in equation (16), the welfare change with respect to the export subsidy can be written as

$$\left(\frac{dU/de}{U_y}\right) = \frac{P}{1+e}\left[eP\,\frac{dE_x}{dP} - W\frac{dL}{dP} - r_x(1-\alpha)\,\frac{dK_x}{dP}\right]. \qquad (19)$$

If the export subsidy is initially zero, the welfare change is captured by the last two terms in the right hand side of equation (19). As noted earlier, $(dK_x / dP) > 0$ and $(dL / dP) > 0$. Then the welfare change is positive in sign. Thus the introduction of an export subsidy leads to an unambiguous welfare gain in the domestic economy. The production of the exportable, encouraged by the export subsidy, draws capital from the importable sector. The capital transfer partially corrects the capital-market distortion that exists in the economy. At the same time, the increase in the employment of labor leads to an increase in domestic income. The correction of the capital-market distortion and the increase in labor employment are the two sources of the welfare gain in the economy.

The optimum rate of export subsidy can be derived from equation (19) by setting its right-hand side equal to zero and then solving for e. The optimum export subsidy rate, e^*, is then expressed as,

$$e^* = \left(\frac{1}{dE_x / dP}\right)\left[X_L\frac{dL}{dP} + X_K(1-\alpha)\,\frac{dK_x}{dP}\right] \qquad (20)$$

Since $(dE_x / dP) > 0$, if the importable is not an inferior good in consumption, and $(dL / dP) < 0$, $(dK_x / dP) > 0$ and $\alpha > 1$, it is clear from equation (20) that there exists a positive export subsidy rate, e^*, at which the level of domestic welfare is maximized.

The export subsidy, however, creates a consumption distortion in the economy, because the relative price faced by the consumers is also changed. The consumption distortion caused by the export subsidy can be avoided by a production subsidy on the exportable. This policy intervention is considered in the next section.

VII. PRODUCTION SUBSIDY ON EXPORTABLE

If the production in the exportable sector is subsidized by the government, the relative price faced by the producers will change, but the consumers will continue to face the same international price as before. Let s_y be the rate of production subsidy granted to the exportable sector. Then the relative price faced by the producers is $P_s = \left[P^* / (1+s_y) \right]$. Now, $(P - P^*) = (P_s - P^*) = -s_y P_s$ and $ds_y = \left[-(1+s_y) dP_s / P_s \right]$. Since there is no change in consumption, $dE_x = -dX$. Using these results in equation (16), the change in welfare with respect to the production subsidy can be written as,

$$\left(\frac{dU/ds_y}{U_y} \right) = -\frac{P_s}{1+s_y} \left[s_y P_s \frac{dX}{dP} + W \frac{dL}{dP} + r_x(1-\alpha) \frac{dK_x}{dP} \right] \qquad (21)$$

where $dP_s = dP$. Again, if the production subsidy is initially zero, the welfare change is determined by the last two terms in the right-hand side of equation (20). As noted earlier, this expression is unambiguously positive in sign. Thus the production subsidy on the exportable sector leads to a welfare gain for the reason mentioned in Section VI.

In the same way as in Section VI, the optimum rate of the production subsidy can be derived from equation (21) by setting its right-hand side equal to zero and then solving for s_y. The optimum production subsidy rate, s_y^* is then expressed as,

$$s_y^* = \left(\frac{1}{dX/dP}\right)\left[X_L \frac{dL}{dP} + X_k(1-\alpha)\frac{dK_x}{dP}\right].$$

Again, it is clear from equation (22) that there exists a positive production subsidy rate, s_y^*, at which the domestic welfare level is maximized.

VIII. CONCLUDING REMARKS

The two-sector general equilibrium model of this paper shows that the free trade policy is not optimum in a labor-surplus economy where the capital market is distorted in favor of the multinationals operating in the importable sector. Import restricting policies of many less developed countries, their cheap labor and favorable tax policies have attracted multinationals firms in the importable sectors of these economies. The multinationals employ their specific factors in the form of superior technology and managerial know-how. They, however, bring very little general capital in the form of direct foreign investment. The uncertainty about expropriation in the future might be the reason behind their reluctance to direct capital investment. Instead, they raise capital from the local market through their

subsidiaries in competition with the local firms. In this venture, the multinationals are favored by lower interest rates than those faced by the local firms. Their superior technology is more capital-intensive than that of the local firms. The technological superiority embodied in the specific factor is more labor-saving than capital-saving.

In this situation, free trade is not the best policy for the host country. However, trade intervention in the form of a tariff and a production subsidy to the importable sector will lead to a further deterioration of the level of domestic welfare. Such policies will aggravate the employment condition and accentuate the capital market distortion. A better policy intervention is in the form of export subsidy and production subsidy to the exportable sector. These policies will generate welfare gains through the correction of capital market distortion and the increase in the employment of labor. A subsidy to the exportable production , however, is better than export subsidy, since it does not create the consumption distortion that is caused by the latter. A comparison of the results in Sections IV and V with those in Sections VI and VII clearly shows that the outward looking trade policy leading to the increase in trade at the fixed price international promotes domestic welfare.

APPENDIX A

Total differentiation of the production functions in equations (1) and (2) of Section II yields the following equations:

$$dX = X_K dK_x + X_L dL_x \tag{A.1}$$

and,

$$dY = Y_K dK_y + Y_L dL_y, \tag{A.2}$$

respectively, since dS = 0. As $dK_y = -dK_x$ and $dL_y = dL - dL_x$, equation (A.2) becomes

$$dY = -Y_K dK_x - Y_L dL_x + Y_L dL. \tag{A.3}$$

Then substitution from equations (3), (4), and (5) of Section II in equation (A.3) yields

$$\begin{aligned} dY &= -\alpha P X_K dK_x - P X_L dL_x + W dL \\ &= -P(X_K dK_x + X_L dL_x) + (1-\alpha) P X_K dK_x + W dL \end{aligned} \tag{A.4}$$

Using equation (A.1) and writing $r_x = PX_K$, equation (A.4) can be written as,

$$dY = -P dX + r_x(1-\alpha) dK_x + W dL, \tag{A.5}$$

which gives the expression,

$$dY + P dX = r_x(1-\alpha) dK_x + W dL. \tag{A.6}$$

Equation (A.6) has been used to replace $dY + PdX$ in equation (16) of Section II.

APPENDIX B

The marginal productivity conditions in equations (3), (4), and (5) of Section II are written as,

$$\alpha P X_K(L_x, K_x, \bar{S}) - Y_K(L_y, \bar{K}, -K_x) = 0, \tag{B.1}$$

$$P X_L(L_x, K_x, \bar{S}) = W, \tag{B.2}$$

and,

$$Y_L(L_y, \bar{K}-K_x) = W, \tag{B.3}$$

where α, P, W, $\bar{S}$, and $\bar{K}$ are exogenously given and L_x, K_x, and L_y are endogenous variables. In order to examine the effects of a parametric change in P on the endogenous variables, equations (B.1) (B.2) and (B.3) are totally differentiated with to P and the results are written in the following matrix form:

$$\begin{bmatrix} \alpha P X_{KL} & \alpha P X_{KK} + Y_{KK} & -Y_{KL} \\ P X_{LL} & P X_{KL} & 0 \\ 0 & -Y_{KL} & Y_{LL} \end{bmatrix} \begin{bmatrix} dL_x / dP \\ dK_x / dP \\ dl_y / dP \end{bmatrix} = \begin{bmatrix} -\alpha X_K \\ -X_L \\ 0 \end{bmatrix} \tag{B.4}$$

Equations in (B.4) are solved for ,

$$(dL_x / dP) = \alpha P/D \left[Y_{LL} (X_L X_{KK} - X_K X_{KL}) \right] \tag{B.5}$$

$$(dL_y / dP) = \alpha P/D \left[Y_{KL} (X_K X_{LL} - X_L X_{KL}) \right] \tag{B.6}$$

and,

$$(dK_x / dP) = \alpha P/D \left[Y_{LL} \left(X_K X_{LL} - X_L X_{KL} \right) \right], \tag{B.7}$$

where $D = -\alpha P^2 Y_{LL} \left[X_{KK} X_{LL} - (X_{KL}^2) \right] > 0$. It may be noted that,

$(dL_x / dP) > 0$, $(dL_y / dP) < 0$, and $(dK_x / dP) > 0$.

The effect of a change in P on the total employment of labor is given by ,

$$\begin{aligned} (dL / dP) &= \left[dL_x / dP + dL_y / dP \right] \\ &= \alpha P/D \left[Y_{LL}(X_L X_{KK} - X_K X_{KL}) + Y_{KL}(X_K X_{LL} - X_L X_{KL}) \right]. \end{aligned} \tag{B.8}$$

The sign of the expression in the right-hand side of equation (B.8) can be evaluated by using the following results:

$$X_{LL} = -X_{KL} \left(K_x / L_x \right) - X_{LS} \left(S / L_x \right), \tag{B.9}$$

$$X_{KK} = -X_{KL} \left(1 / K_x \right) - X_{KS} \left(S / K_x \right), \tag{B.10}$$

and

$$Y_{LL} = -Y_{KL} K_y / L_y , \tag{B.11}$$

derived from the condition that the marginal product functions are homogeneous of degree zero in the respective variables, because the production functions are linearly homogeneous. Substitution of these in equation (B.8) yields

$$(dL/dP) = \alpha P/D \left[Y_{KL} X_{KL} (X_L/k_x + X_K) (k_y - k_x) + \frac{Y_{KL} X_L X_{KS} S}{K_x} (k_y - \frac{E_{X_L, S}}{E_{X_K, S}}) k_x \right], \tag{B.12}$$

where $E_{X_L, S} = \dfrac{\partial X_L}{\partial S} \dfrac{S}{X_L}$ and $E_{X_K, S} = \dfrac{\partial X_K}{\partial S} \dfrac{S}{X_K}$.

It follows from equation (B.12) that the sufficient conditions for dL/dP to be negative in sign are $k_x > k_y$ and $E_{X_L,S}$ $E_{X_R,S}$.

FOOTNOTES

1. The underdeveloped world has been the recipient of superior technology without much direct foreign investment. See Barnet and Muller [1974].

2. The technological superiority of the multinationals is embodied in their specific factor.

3. As correctly pointed out by the referee, in the absence of specific factor in the importable sector with general rigidity in the real wage, the two-sector, two-factor model generates a linear transformation curve or constant average cost in each industry. This framework has its limitations because it leads a trading country to complete specialization.

4. See Lewis [1954]. Also see Batra and Beladi [1988, 1990] and Yu [1982].

5. If the multinationals spend a part of their rental for the maintenance of the specific factor, their net monopoly profit is reduced by this amount. This, however, does not affect the Net National Product of the host country.

6. It is interesting to note that all profits accrued to the multinationals are repatriated to the source country, $\rho\bar{S} = X_s \bar{S}$ is taken out of the country as can be seen in equations (10) and (14), however, as pointed out by an anonymous referee, the repatriating of profits are not central to the results.

7. Even when the elasticity condition is not satisfied, a sufficiently high capital-labor ratio in the importable sector will cause a decrease in total employment.

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