GOVERNMENT POLICY TOWARD MNEs IN THE PRESENCE OF FOREIGN EXCHANGE SCARCITY

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INTRODUCTION

Control of foreign-owned firms in developing countries (LDCs) has been advocated on numerous grounds; the infant-industry argument is probably the most well-known.[1] The recent literature on strategic trade policy analyzes other justifications for restricting foreign firms. Restrictive policies have been explained as a means of promoting exports [Krugman, 1984], of transferring profits to domestic firms [Brander and Spencer, 1984], or both [Spence, 1984].[2] Papers by Davidson, Matusz and Kreinin [1985] and Herander and Thomas [1986] are mostly concerned with the effects of specific policies (export requirements and export-import linkages) on a given welfare function.[3] There is also a large theoretical literature on the effects of government tax policies on multinational enterprises (MNEs).[4]

None of these works study the effect of the tradability of the foreign firm's output good on government policy. In this paper it is shown that this issue is of crucial importance in ascertaining the effects of government policy on the foreign firm. In order to analyze this issue, the government's optimal policy is obtained under two alternative specifications of the output good. In the first case, the output has no market outside the host country—i.e., it is produced solely for domestic consumption. In the second, the good is tradable—i.e., it may be either sold domestically or exported. It is shown that the effects of government policy in these two scenarios are often radically different.

The models to highlight the government's options are based on three "stylized facts":

(1) The government's foreign exchange constraint is binding. In other words, the country faces a shortage of foreign exchange and cannot allow free currency movement.
(2) All labor used by the foreign firm is domestic; all capital used is imported.
(3) The firm is a Nash follower, taking the government's policy variables as parameters of its problem.

The models set up in this paper are characterized by the presence of constraints preventing the attainment of the optimal outcome, from the point of view of both the government and the foreign firm. Hence the equilibria studied exhibit several of the perverse features associated with second-best outcomes.

MODELING NON-TRADABLE AND TRADABLE OUTPUT

To simplify the notation, let the MNE be the monopoly supplier of a particular good or service. This assumption is not critical. Even if the firm were a member of an oligopoly, the results are qualitatively unchanged, as long as all firms play Nash strategies. It faces a domestic output demand curve:

(1) $$p = p(y), \quad p' < 0, \quad 2p' + p''y < 0,$$

which is assumed to be downward sloping and twice continuously differentiable. It is also assumed that the associated marginal revenue function is downward sloping. The firm has a twice continuously differentiable production function:

(2) $$y = f(L,K), \quad f_1 > 0, f_2 > 0, f_{11} < 0, f_{22} < 0, f_{12} = f_{21} > 0.$$

The firm employs labor, L, at a wage, w, (which may be assumed to be set through some type of migration mechanism), imports all its capital, K, which it pays for at the flow rate, r, (which may be assumed exogenous through a "small country" assumption)[5] and pays a tax on profits at the rate, t. The firm requires foreign exchange for two purposes: to pay for its capital imports and to repatriate its post-tax profits.

The two policy variables used by the government are a repatriation ceiling and a tax on profits. The former is considered on the basis of stylized fact (1) above. This formulation is based on actual restrictions in place in most LDCs [IMF, 1989]. The latter is considered on the basis of several empirical studies, which all agree that the profit tax rate is a critical determinant of MNE investment. Grubert and Mutti [1989] and Shah and Slemrod [1990] find such evidence for U.S. MNE investment in Canada and Mexico respectively. Mudambi [1990b] finds that the tax rate is the only government policy variable that is consistently significant in explaining the worldwide investment decisions of 1000 of the largest MNEs.

The Non-Tradable Model: A Fixed Constraint

The model set up in this section considers the case where the foreign firm produces a non-traded good — i.e., it has no export market. The firm therefore attempts to maximize post-tax profits subject to a fixed repatriation ceiling, π_o.

The Equilibrium of the Firm in the Non-tradable Model. The problem of the foreign firm is to maximize it post-tax profits, $(1 - t)[p(\cdot)f(\cdot) - wL - rK]$, subject to the fixed repatriation ceiling. The constraint may be written as

(3) $$(1 - t)\pi + rK \leq \pi_o.$$

Using stylized fact (1) above, the constraint (3) is assumed to hold with equality.[6] Denoting the firm's profits by π, its Lagrangian is

(4) $$\pounds(\mu,L,K) = (1 - t)\pi + \mu[\pi_o - (1\text{-}t)\pi - rK],$$

where μ is the shadow price of the foreign exchange repatriation constraint. The first order conditions for maximum may be written as

(5a) $$\pounds_\mu = \pi_o - (1 - t)\pi - rK = 0$$

(5b) $$\pounds_L = (1 - t)(1 - \mu)[f_1(p + p'f) - w] = 0$$

(5c) $$\pounds_K = (1 - t)(1 - \mu)f_2(p + p'f) - r[1 - t(1 - \mu)] = 0$$

The equilibrium value of μ is between zero and unity because a unit increase in the repatriation ceiling increases profits, but by less than a unit since some of the increase must go towards increasing the input of capital. Using equations (5b-c),

(6) $$f_1 / f_2 = [(1 - t)(1 - \mu) / 1 - t(1 - \mu)](w/r)$$

which may be considered a proxy for the technology used by the firm. As it rises, it indicates that the adopted technology is becoming more capital-intensive.

The second order conditions for maximum are always met, subject to the requirements in equations (1) and (2).[7]

The Effects of Policy in the Non-tradable Model. The first order conditions (5a-c) represent the firm's Nash equilibrium choices of inputs in implicit form. The simultaneous solution to the conditions (5a-c) yields the firm's explicit best-response factor-demand functions, $L^*(\pi_o,t)$ and $K^*(\pi_o,t)$, and the equilibrium value of the shadow price of foreign exchange, $\mu^*(\pi_o,t)$. By appropriately selecting the policy variables, the government can manipulate the firm's factor demands.

Totally differentiating conditions (5a-c) with respect to the policy variables π_o and t and solving the resulting system yields[8]

(7a) $$d\mu^*(\cdot)/d\pi_o = -[\pounds_{LL}\pounds_{KK} - \pounds_{LK}^2] / |H| < 0;$$

(7b) $$dL^*(\cdot)/d\pi_o = -(1 - \mu)\pounds_{LK}/r\pounds_{LL};$$

(7c) $$dK^*(\cdot)/d\pi_o = (1 - \mu)/r > 0;$$

(8a) $$d\mu^*(\cdot)/dt = -\{\pi[\pounds_{LL}\pounds_{KK} - \pounds_{LK}^2] / |H|\} - \mu(1 - \mu)/(1\text{-}t) < 0;$$

(8b) $$dL^*(\cdot)/dt = -[\pi(1 - \mu)\pounds_{LK}]/r\pounds_{LL};$$

(8c) $$dK^*(\cdot)/dt = \pi(1 - \mu)/r > 0$$

where $|H|$ is the Hessian of equation (4). Using equations (6) and (8a) yields

(8d) $$d(f_1 / f_2)/dt = (w/r)(1 - t)\pi[\pounds_{LL}\pounds_{KK} - \pounds_{LK}^2]/|H|[1 - t(1 - \mu)]^2 > 0.$$

Noting that $dy^*(\cdot)/dx = [f_1 dL^*(\cdot)/dx] + [f_2 dK^*(\cdot)/dx]$, equations (7b) and (7c) may be combined to show that $dy^*(\cdot)/d\pi_o$ is positive. Similarly, equations (8b) and (8c) may be combined to show that $dy^*(\cdot)/dt$ is positive.

The effects of π_o on μ and K are unsurprising. Lowering the repatriation ceiling tightens the constraint on the firm (raising μ), and it responds by decreasing the use of the restricted input, namely capital. These effects are captured in equations (7a) and (7c).

The effects of t are more interesting. Lowering the tax rate raises the amount of repatriable profits. Thus, the foreign exchange constraint on the firm is *tightened* (raising μ) and as above, the firm responds by lowering the input of capital. These

effects are captured in equations (8a) and (8c). Along with a decrease in the absolute capital input, the firm decreases the marginal rate of substitution as seen in equation (8d). This can be interpreted as a shift to a less capital-intensive production process. Thus lowering the tax rate (an encouragement to the foreign firm) has the same effect as lowering the repatriation ceiling (a discouragement to the foreign firm). This perverse impact of tax policy stems from the second-best nature of the original equilibrium.

The effects of the policy variables on the firm's labor input depend on the sign of $£_{LK}$. It is clear that both π_o and t will be related inversely to labor input if $£_{LK}$ is negative and directly if it is positive. If the production function exhibits weak factor complementarity and/or the output demand curve of the firm is very inelastic, $£_{LK}$ will be negative,[9] and lowering either the repatriation ceiling or the tax rate will cause the firm to increase its employment. If the production function exhibits strong factor complementarity and/or the output demand curve of the firm is very elastic, the effects of the policy instruments will be reversed.[10]

However, regardless of the effects of the policy variables on labor input, equations (7b-c) and (8b-c) can be used to show that the relationship between the policy variables and output is a direct one. Thus, lowering either of the policy variables lowers final output and consequently raises output price.

The Tradable Model: A Flexible Constraint

The assumption of a strict ceiling on repatriation is now dropped. Instead, the firm may pay for part of its foreign exchange needs through exporting a proportion, α, of its output. This is essentially an import-export linkage.

It is assumed that the country is "small", so that the firm is a competitor in the world market for its output, and hence considers the world price, p_f, to be fixed. The exchange rate, e, is also assumed fixed, so that $p_o = ep_f$ is taken as a parameter of its problem.

The Equilibrium of the Firm in the Tradable Model. The firm now has three choice variables: its capital, its labor inputs and the share of its output which is exported. The domestic output demand curve is now a function of $(1-\alpha)y$. The firm's post-tax profit is

$$(1-t)\pi = (1-t)\{[(1-\alpha)p(\cdot) + \alpha p_o]\, f(\cdot) - wL - rK\},$$

while its constraint may be written as

$$(1-t)\pi + rK - \alpha p_o f(\cdot) \leq \pi_o. \tag{9}$$

Again, using stylized fact (1) from the introduction to assume that the constraint holds with equality,[11] the Lagrangian of equation (9) is

$$\$(\sigma,\alpha,L,K) = (1-t)\pi + \sigma[\pi_o + \alpha p_o f(\cdot) - (1-t)\pi - rK]. \tag{10}$$

The first order conditions for maximum are

$$\$_\sigma = \pi_o + \alpha p_o f(.) - (1-t)\pi - rK = 0, \tag{11a}$$

$$\$_L = f_1\{(1-t)(1-\sigma)(1-\alpha)[p+(1-\alpha)p'f] + [1-t(1-\sigma)]\alpha p_o\} - w(1-t)(1-\sigma) = 0, \tag{11b}$$

$$\$_K = f_2 f(1-t)(1-\sigma)(1-\alpha)[p+(1-\alpha)p'f] + [1-t(1-\sigma)]\alpha p_o] - r[1-t(1-\sigma)] = 0, \text{ and} \tag{11c}$$

$$\$_\alpha = f\{[1-t(1-\sigma)]p_o - (1-t)(1-\sigma)[p+(1-\alpha)p'f]\} = 0. \tag{11d}$$

Equations (11b) and (11c) are used to solve for the technology proxy:

$$f_1 / f_2 = \{(1-t)(1-\sigma) \,/\, [1-t(1-\sigma)]\}(w/r). \tag{12}$$

The constraint forces a wedge between the marginal revenue obtained in the domestic market and that obtained in the world market. This is illustrated in equation (11d).[12] The constraint forces the firm to export more and to cut back on domestic production relative to the unconstrained equilibrium. Thus, the domestic marginal revenue exceeds that on exports,[13] and the constraint drives up the domestic output price.

The second order conditions for maximum are always met subject to the conditions in equations (1) and (2).

The Effects of Policy in the Tradable Model. In addition to the government's two policy variables from the non-tradable model, the repatriation ceiling and the tax rate, there is a third exogenous variable in the firm's problem, the world price p_o. This last variable can be influenced through either changes in the exchange rate, e, or the world price, p_f. The effects of exogenous changes in p_f are considered. These illustrate the role of the foreign firm as a conduit through which external disturbances are channelled into the domestic economy.

As in the non-tradable model, the simultaneous solution to the conditions (11a-d) yields the firm's explicit best-response functions, $L^{**}(t,p_o,\pi_o)$, $K^{**}(t,p_o,\pi_o)$ and $\alpha^{**}(t,p_o,\pi_o)$, and the equilibrium value of the shadow price of foreign exchange, $\sigma^{**}(t,p_o,\pi_o)$. The best-response function, $\alpha^{**}(\cdot)$, may be substituted out of the system (11a-d), reducing it by one dimension. Denote this system by $[C] \equiv [C_\sigma, C_L, C_K]'$, and its Hessian by $|C|$. Differentiation yields

$$d\sigma^{**}(\cdot)/d\pi_o = -(C_{LL}C_{KK} - C_{LK}^2)/|C| < 0, \tag{13a}$$

$$dL^{**}(\cdot)/d\pi_o = C_{KK}C_{L\sigma} / |C| < 0, \text{ and} \tag{13b}$$

$$dK^{**}(\cdot)/d\pi_o = -C_{KL}C_{L\sigma} / |C| < 0. \tag{13c}$$

Re-substituting from equation (13) and denoting $2p' + p''y$, the slope of the domestic marginal revenue function, by R, it follows that

$$d\alpha^{**}(\cdot)/d\pi = [(1-\alpha)C_{L\sigma}(f_1 C_{KK} - f_2 C_{LK})] / [f|C|] + [p_o(C_{LL}C_{KK} - C_{LK}^2)] / [f(1-t)(1-\sigma)^2 R|C|] < 0. \tag{13d}$$

And using equations (2) and (13b-c) it follows that

(13e) $$dy^{**}(\cdot)/d\pi_o = [C_{L\sigma}(f_1 C_{KK} - f_2 C_{LK})] \;/\; |C| < 0,$$

(14a) $$d\sigma^{**}(\cdot)/dt = -\{\pi - (\sigma/R)[p_o/(1-t)(1-\sigma)]^2\}/[C_{LL}C_{KK} - C_{LK}^2] + C_{KK}C_{L\sigma}[\sigma p_o f_1/(1-t)] < 0,$$

(14b) $$dL^{**}(\cdot)/dt = C_{KK}C_{L\sigma}\pi/|C| < 0, \text{ and}$$

(14c) $$dK^{**}(\cdot)/dt = -C_{KL}C_{L\sigma}\pi/|C| < 0.$$

Together, equations (13d) and (13e) imply that total exports, αy, are inversely related to π_o and also that total output sold in the domestic market, $(1-\alpha)y$, is directly related to π_o. This can be seen from the fact that

(14d) $$d\{[1-\alpha^{**}(\cdot)]y^{**}(\cdot)\}/d\pi_o = \{[1-\alpha^{**}(\cdot)]dy^{**}(\cdot)\}/d\pi_o - y^{**}(\cdot)d\alpha^{**}(\cdot)/d\pi_o > 0.$$

The tax rate t has the same qualitative effect on α, y, total exports αy and domestic sales $(1-\alpha)y$ as on the repatriation ceiling π_o. The intuition is that higher taxes lower repatriable profits and weaken the foreign exchange constraint, just like an increase in π_o.

The effect of the tax rate on the technology proxy is obtained by differentiating equation (12) and using equation (14a),

(14e) $$d(f_1/f_2)/dt = (w/r)(1-t)\pi/|C|[1-t(1-\mu_i)]^2 > 0.$$

The relationship is shown to be a direct one.

Interestingly enough, while it can be shown that $d\sigma^{**}(\cdot)/dp_o$ is negative, the signs of $dL^{**}(\cdot)/dp_o$ and $dK^{**}(\cdot)/dp_o$ are ambiguous. Thus, while the world price is inversely related to the shadow price of foreign exchange, its relationship to the other endogenous variables cannot be determined analytically.

Comparing equations (7a) and (8a) with equations (13a) and (14a), it is seen that the effects of π_o and t on σ are the same as in the non-tradable model—i.e., lowering the repatriation ceiling or the tax rate tightens the constraint on the firm and raises σ. Comparing equations (7c) and (8c) with equations (13c) and (14c), however, demonstrates that their effects on K in the tradable model are reversed relative to their effects in the non-tradable model.

The reason that this reversal occurs is that in the tradable model there are two methods of financing foreign exchange requirements: using the government's quota, π_o (as in the non-tradable model) and generating foreign exchange through exports. As π_o is lowered, the first means of finance is curbed, and this lowers the input of capital (the restricted input). However, the lowering of π_o also increases the marginal value of exports. The firm therefore increases its exports which requires an increased use of inputs (including capital). The combination of these two effects on the capital input of the firm is captured in equation (13c). It shows that as π_o is lowered, the overall effect is to increase the input of capital.

Lowering t has the same effect as lowering π_o, except that it works through repatriable profits. As t is lowered, repatriable profits rise, increasing the marginal value of foreign exchange (and hence of exports). This causes the input of capital to rise, as captured in equation (14c).

Comparing equations (7b) and (8b) with equations (13b) and (14b) indicates that the ambiguities in the effects of π_o and t on L in the non-tradable model are resolved in the tradable model. This is because as either π_o or t is lowered, even if the domestic output demand curve for the firm is very inelastic, the increased marginal value of exports ensures that the overall effect on the marginal revenue product (MRP) of labor is positive. Thus, as either π_o or t is lowered, the overall effect is to increase the input of labor. These effects are captured in equations (13b) and (14b).

Comparing equation (8d) with equation (14e) illustrates that the effect of the tax rate on the technology proxy is the same in both models — i.e., lowering the tax rate causes the firm to select a more labor-intensive technology.

The share of total output that is exported, α, varies inversely with the instruments π_o and t. These effects stem from the fact that the quota, π_o, and the tax rate, t, are inversely related to the marginal value of exports. As π_o or t is lowered, the share of output exported rises in response. The effect of π_o is captured in equation (13d) and that of t can be derived from equations (14a-c).

A direct implication of the inverse relationships between π_o and t and the inputs of capital and labor is that their relationship with total output is also inverse. Thus, as either π_o or t is lowered, the firm's output rises. Again, the effect of π_o is captured in equation (13e) while that of t can be derived using equations (14b-c). The quota, π_o, and tax rate, t, are also inversely related to exports. As the marginal value of exports rises, total exports rise.

The relationships between the policy instruments π_o and t and the quantity of output sold domestically are composed of two opposing effects: that on the share of output sold domestically and that on total output. As seen above, the first effect is positive, while the second is negative. It can be shown that the overall relationship is a direct one—i.e., as either π_o or t is lowered, the quantity of output sold domestically falls. The demonstration merely requires substituting equations (13d) and (13e) into equation (14d). This implies that lowering the levels of either of these policy variables causes the domestic price to rise.

Finally, the effects of changes in the world price of the output good, p_o, are considered. As this price rises, one would intuitively expect that it would call forth an increased supply of output. It is interesting to note that this is not necessarily the case. The reason for this result is that p_o affects the firm in two ways. As p_o rises, its direct effect is to increase the marginal value of exports because as the (fixed) price at which exports are sold, p_o is the marginal revenue associated with exports. But as part of the foreign exchange constraint, p_o has an inverse relationship with the shadow price of foreign exchange. Thus, its indirect effect is to loosen the foreign exchange constraint and decrease the marginal value of exports.

If the direct effect dominates, then an increase in p_o would lead to an increase in inputs of both capital and labor and therefore an increase in total output. Collecting the partial effects, this would also increase the share of output exported and hence the total quantity of exports. However domestic sales would fall, leading to a rise in the domestic price of output.

In short, if the direct effect dominates, an increase in p_o would act like a decrease in π_o or t. Similarly, if the indirect effect dominates, then an increase in p_o would act like an increase in π_o or t.

GOVERNMENT OBJECTIVES

Often, the output good of the foreign firm may have little weight in the government's overall objective function, and any surplus associated with its consumption may be deemed irrelevant. Hence the government's objective function may be quite different from the "sum of consumer surplus and tax revenue" concept used in much of the literature [Brander and Spencer, 1984]. A rather populist alternative welfare objective is considered.

The government in an LDC may have many specific objectives which it wishes to address through its policy with regard to foreign firms. At the most non-tradable level, the foreign firms are providers of employment in a capital-scarce, labor-abundant domestic economy. At another level, they are sources of tax revenue to the government.

Based on these considerations the welfare generated by the foreign firm is made up of two components: total employment of the foreign firm weighted by the wage it pays and total tax revenue. In the non-tradable model, the LDC objective function is

$$U^* = wL^*(\pi_o,t) + t\pi^*[L^*(\pi_o,t),K^*(\pi_o,t),\mu^*(\pi_o,t)]. \tag{15}$$

At the solution to equation (5) it can be shown that both $\partial\pi^*/\partial\mu$ and $\partial\pi^*/\partial L$ are zero while $\partial\pi^*/\partial K$ is positive.[14] Now using equations (7) and (8), it follows that if $\pounds_{LK}$ is negative, then the government may have an interior solution. Such a solution would involve balancing the negative effects of the policy variables on employment with the positive effects on tax collections.

However, if $\pounds_{LK}$ is positive, the government has no interior solution, since equation (15) is always increasing in the policy variables. Then maximizing equation (15) involves raising the repatriation ceiling and the tax rate to the extent possible.[15]

The LDC objective function in the tradable model is

$$V^{**} = wL^{**}(t,\pi_o) + t\pi^{**}[L^{**}(t,\pi_o),K^{**}(t,\pi_o),\sigma^{**}(t,\pi_o)]. \tag{16}$$

At the solution to equation (11), it can be shown that $\partial\pi^{**}/\partial\sigma$ is zero, $\partial\pi^{**}/\partial L$ is negative and $\partial\pi^{**}/\partial K$ is positive.[16] Now using equations (13) and (14), it follows that the government may have an interior solution in t to the problem of maximizing equation (16). Such a solution involves balancing the direct positive effects through increased tax collections on a given level of profits with the indirect negative effects on the level of profits and employment.

However, the government does not have an interior solution in π_o. This is because equation (16) is monotonically decreasing in π_o.[17] Thus the government's optimal policy in this case would be to lower the repatriation ceiling to the extent possible. Depending on the sign of $\pounds_{LK}$, it is possible that the effects of π_o may be reversed relative to the non-tradable model.

CONCLUSIONS

In this paper, the analysis has been focused on the repatriation and tax policies for the government of a "small" developing country which faces a binding foreign exchange constraint in dealing with a foreign firm. The effects of output tradability have been considered in detail.

It is shown that whether the output good is non-tradable or tradable, the policy variables have the same qualitative effect on domestic sales and therefore on domestic output price and that the tax rate has a direct relationship with the marginal rate of factor substitution (used as a proxy for the adopted technology). However, the effects of these policy variables on the inputs of labor, capital and total output in these two models are very different. In the non-tradable model, the relationships of the policy variables to the capital input are direct while their relationships to the labor input are ambiguous. In the tradable model, the relationships of the policy variables to both capital and labor inputs are inverse. Thus, in evaluating the effects of policy on input use, whether or not the output good is tradable is a crucial consideration.

In the tradable model, it is also shown that the policy variables have inverse relationships with total exports and the share of total output that is exported. Hence lowering the repatriation ceiling is likely to have a stronger beneficial effect on the country's foreign exchange reserves than would be expected by considering only the direct impact.

If the firm's output is considered by the government to be of little importance (say, a luxury good), then the impact of policy on factor use and on government revenue will be the criterion used in decision making. While the policy instruments have the same effect on output price in both models, the opposing effects on factor use would acquire great importance. In this context, it is interesting to note that lowering the tax rate induces the firm to adopt a more labor-intensive technology, an effect the government may well consider beneficial.

Finally, a government objective function which does not consider output use is examined. The parameters of the model which determine the government's optimal policy are identified. Under some circumstances, the effects of policy on the government's objective function are different in the two models. These results suggest that the tradability of the output good is part of the explanation of the differing repatriation and tax policies adopted by various developing countries towards foreign firms.

NOTES

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1. A short list of works from this voluminous literature includes Nurkse [1953], Baldwin [1969], Clemhout and Wan [1970] and more recently Mayer [1984] and Grossman and Horn [1987].
2. For a recent survey of the literature, see Greenaway [1987].
3. In addition, the Herander and Thomas paper restricts attention to the case of competitive firms.
4. See for example Batra and Ramachandran [1980], Jones and Dei [1983] and Gang and Gangopadhyay [1985].
5. Here r is measured in domestic currency. The underlying assumption is that of a fixed exchange rate, e. Thus, if the (fixed) flow price of capital in foreign exchange units is r_f, then $r=er_f$.
6. Underlying the constraint is the latent assumption that the firm repatriates all of its post-tax profits. I am grateful to a referee for pointing this out to me. However, even if the firm repatriates a fraction β of its

post-tax profits, and thus the constraint becomes (3a) $\beta(1-t)\pi + rK \leq \pi_{0,}$, none of the policy effects discussed in the paper are qualitatively affected.

7. For the derivation see Mudambi [1990a].
8. See Mudambi [1990a] for detailed derivations.
9. If $£_{LK}$ is negative the factors would be "non-cooperant" in Hicksian terminology. Similarly, if $£_{LK}$ is positive, the factors would be "cooperant".
10. See Mudambi [1990a] for an explicit derivation of $£_{LK}$.
11. The comments in Note 6 are also true for the tradable model.
12. However, the "shadow marginal revenue", which takes into account the effects of the foreign exchange constraint, is the same in both markets. In fact, this is the equality captured in condition (11d).
13. Unsurprisingly, if the constraint does not bind, (σ=0), the firm equates the domestic and export marginal revenues, i.e. $p_0 = p+(1-\alpha)p'f$.
14. Using (5c), it can be shown that at the solution to problem (4), $\partial\pi^*/\partial K$ is equal to $[\mu/(1-\mu)]r$, which is positive.
15. As the government raises the tax rate, it can raise output only up to a point. This is because the rising tax rate will eventually reduce repatriable profits to the point where the firm can import enough capital to reach its unrestricted profit-maximizing output level. Further increases in the tax rate will have no further effect on factor inputs and hence on output.
16. Using equation (11b), it follows that at the solution to equation (11), $\partial\pi^{**}/\partial L = -[\sigma/(1-\sigma)]\alpha p_0 f_1 < 0$. Similarly, using equation (11c), at the solution to equation (11), $\partial\pi^{**}/\partial K = [\sigma/(1-\sigma)](1-\alpha)p_0 f_2 > 0$.
17. The critical step is to note that $w+t[\partial\pi^{**}/\partial L] = f_1\{(1-\alpha)[p+(1-\alpha)p'f]+[\alpha/(1-\sigma)]\} > 0$, by substituting for w from equation (11b).

REFERENCES

Baldwin, R.E. The Case Against Infant-Industry Protection. *Journal of Political Economy*, May/June 1969, 295-305.

Batra, R.N. and Ramachandran, R. Multinational Firms and the Theory of International Trade and Investment. *American Economic Review*, June 1980, 278-90.

Brander, J. and Spencer, B. Tariff Protection and Imperfect Competition, in *Monopolistic Competition and International Trade* edited by H. Kierzkowski. Oxford: Clarendon Press, 1984.

Clemhout, S. and Wan, H. Y. Learning-by-Doing and Infant-Industry Protection. *Review of Economic Studies*, 37(1), 1970, 33-56.

Davidson, C., Matusz, S. J. and Kreinin, M. E. Analysis of Performance Standards for Direct Foreign Investments. *Canadian Journal of Economics*, November 1985, 876-90.

Gang, I. N. and Gangopadhyay, S. Multinational Firms and Government Policy. *Economics Letters*, 17, 1985, 395-9.

Greenaway, D. The New Theories of Intra-Industry Trade. *Bulletin of Economic Research*, 39(2), 1987, 95-120.

Grossman, G. M. and Horn, H. Infant-Industry Protection Reconsidered: The Case of Informational Barriers to Entry. NBER Working Paper #2159, 1987.

Grubert, H. and Mutti, J. Financial Flows versus Capital Spending: Alternative Measures of U.S.-Canadian Investment and Trade in the Analysis of Taxes. Mimeo, The World Bank, Washington D.C., 1989.

Herander, M.G. and Thomas, C. E. Export Performance and Export-Import Linkage Requirements. *Quarterly Journal of Economics*, August 1986, 591-607.

International Monetary Fund. *Exchange Arrangements and Exchange Restrictions: Annual Report*, Washington D.C., 1989.

Jones, R.W. and Dei, F. International Trade and Foreign Investment: A Simple Model. *Economic Inquiry*, (30), 1983, 449-64.

Krugman, P. R. Import Protection as Export Promotion: International Competition in the Presence of Oligopoly and Economies of Scale, in *Monopolistic Competition and International Trade*, edited by H.Kierzkowski. Oxford: Clarendon Press, 1984.

Mayer, W. The Infant-Export Industry Argument. *Canadian Journal of Economics*, 17, 1984, 249-69.

Mudambi, R. Government Policy in the Presence of Foreign Exchange Scarcity. Martindale Center Discussion Paper 3/90, Lehigh University, 1990a.

_____. Factors Governing the Location of MNE Investment. Mimeo, Lehigh University, 1990b.

Nurkse, R. *Problems of Capital Formation in Underdeveloped Countries*, Oxford: Basil Blackwell, 1953.

Shah, A. and Slemrod, J. Tax Sensitivity of Foreign Direct Investments: An Empirical Assessment. Policy, Research and External Affairs Working Paper #434, The World Bank, Washington D.C., 1990.

Spence, A.M. Industrial Organization and Competitive Advantage in Multinational Industries. *American Economic Review*, May 1984, 356-60.