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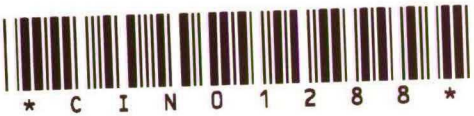

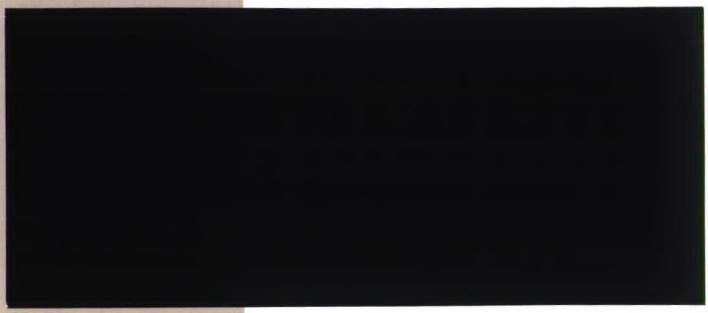

TILBURG UNIVERSITY

No. 8934

NATIONAL TAX POLICIES TOWARDS PRODUCT-INNOVATING MULTINATIONAL ENTERPRISES

by Harry Huizinga

July, 1989

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Abstract:

This paper examines source and host country taxation towards multinational enterprises that engage in product development. National tax policies are interdependent as they influence the range of products that the multinational enterprise develops worldwide. The optimal tax policy of the source country involves more or less than a full credit of foreign source taxation towards domestic taxes. The host country is shown to capture more tax revenues from the multinationals' host country operations than the source country. For the case where private and public goods are perfect substitutes, the source country optimally provide a tax credit and does not capture any tax revenue from the multinational's host country operations.

1. Introduction

Various authors have stressed the role of intangible or invisible assets such as marketing, management and technology in the formation of multinational enterprises.[1] However, the theory of the taxation of the multinational has so far ignored the importance of taxation for the multinational's investment in intangibles. Instead, the previous theory such as in Feldstein and Hartman [1979] has primarily viewed the multinational as an agent of international capital mobility, and has focused on the multinational's physical capital export and import decision. The existing theory then is an application of the theory of optimal taxes on international capital flows. This paper examines the link between taxation and the multinational's investment in research and development of new products, which is no doubt an important intangible. The paper shows that depending on the parameterization of the private sector's preferences the source country should provide more or less than a full domestic tax credit towards income taxes paid abroad. However, for the in-between case where private and public goods are perfect subsitutes we show the source country optimally provides a tax credit and captures no tax revenues from the multinational's foreign operations, as is approximately the case for the United States at present.[2]

This paper builds on the static models of trade in differentiated products of Krugman [1979a], Dixit and Norman [1980] and Feenstra and Judd [1982] and others. In particular, the model assumes the economy produces a traditional good, and several varieties of manufactures in a monopolistically competitive market setting. The production of manufactures consists of an initial development stage, and a subsequent production stage.

At the development stage, firms can create a new product at a fixed cost per product. Once the initial development effort has been undertaken, the good can be produced anywhere at constant marginal cost.

Consumers in all countries stand to benefit from the introduction of additional manufactures, and thus product development takes on the characteristics of an international public good. The number of varieties of the manufactured good that will be produced depends on the multinationals' ability to generate after-tax profits in each of the potential markets, as affected by tax policy. Thus national tax policy towards multinational enterprises affects the development of manufactures worldwide, even if national tax authorities ignore the implications of national tax policy for the introduction of new products abroad.

The paper focuses on the tax policies of a single source and a single host country. Tax policy in either country represent a trade-off between the objectives of raising national income by way of additional tax revenues, and of providing multinationals with adequate incentives to develop new manufactures. Generally the host country is shown to capture more tax revenues associated with the multinational's host country's operations than the source country. Underlying this result is the institutional asymmetry where the host country has a first right to tax host country income, leaving the source country to tax income after host country taxes. However, the source country stands to benefit from the foreign operations of its multinationals, even if it receives little or no direct tax benefits from a multinational's foreign operations, because multinationals that venture abroad will invest more in product innovation to the benefit of domestic consumers.

The remainder of this paper is organized as follows. Section 2 sets up the model, and analyses the decisions of consumers and firms. Section 3 turns to the governments' taxation decision and to international tax interdependence. Section 4 concludes the paper.

2. The model

The model describes national taxation policies towards multinational enterprises that market their products in each of two countries. The existence of multinational firms that develop products in a source country and subsequently manufacture these products in both the source and host countries can be rationalized on the basis of the costs of licensing information and of transportation.[3] As our focus is on tax policy towards the multinational enterprise we will take the existence of the multinational as given. Assuming a residence-based tax system, there is the institutional asymmetry where the source country can tax the multinational's source country income and after-host-country-tax host country income, while the host country can only tax the multinational enterprise's income generated within host country borders. Otherwise, the countries are entirely symmetric.

Labor, denoted L, is the only factor of production. It can be used to produce three categories of goods: a traditional good, called wheat and denoted W, produced by a competitive agricultural sector; a pure public good, P; and manufacures, M, produced by the multinational industrial sector. Wheat and the public good are produced with constant returns to scale production technologies, and units are chosen such that one unit of labor is required to produce one unit of either wheat or the public good.

The production of manufactures, which exhibits increasing returns to scale, requires an initial research and development effort undertaken in the source country followed by production in either country. At the research stage, a fixed resource cost r is incurred per variety of the manufacture. At the production stage, units are again chosen such that one unit of labor produces one unit of manufacture.

We now first characterize the consumer's choice problem and derive his demand for wheat and manufactures. The derived goods demand functions and the tax environment together determine the firm's decision of investment into research and development and the subsequent production decisions. Section 3 of the paper turns to the two countries' taxation policies given consumer and firm behavior.

The consumer

Consumer income is equal to the inelastic labor supply L_i in country i. As we will assume the manufacturing sector is characterized by monopolistic competition, there will be no profits returned to consumers. The representative consumer spends his wage income L so as to maximize the following utility index

$$U(W_i, M_i^1, M_i^2, \ldots, M_i^N, P_i) = W_i^{1-\alpha}\left(\sum_{j=1}^{n} (M_i^j)^{\beta}\right)^{\alpha/\beta} + \frac{1}{\gamma} P_i^{\gamma} \qquad (1)$$

$$i = s,h \quad j = 1,n \quad 0 < \alpha < 1, \quad \beta,\gamma > 0$$

where n is the number of manufactures, subscripts refer to the source and host countries, and superscripts to different manufactures.

As is well known, the above utility specification gives rise to the following demand relationships for wheat and each of the n manufactures

$$W_i = (1 - \alpha)L_i \quad , \quad i = s,h \tag{2}$$

$$M_i^j = \alpha \frac{L_i}{np} \quad , \quad i = s,h \quad , \quad j = 1,\ldots,n \tag{3}$$

where p is the price of any manufacture in terms of wheat.

The firm

Firms are interested in maximizing worldwide after tax profits. This implies they will introduce new produces to the point where at the margin worldwide after-tax profits just cover the initial research and development outlay of an additional variety of the manufacture. Let π_s^j and π_h^j be the pre-tax profits associated with product j earned in the source and host countries respectively. Also let τ_i^j be the tax levied by country i (i = s,h) on profits generated in country j (j = s,h). Thus τ_s^s and τ_h^h are the source country tax on source country income and the host country tax on host country income respectively. τ_s^h is the souce country tax applicable to (after host country taxes) host country income. As the host country can not tax the multinational's income generated in the source country, we have $\tau_h^s = 0$. With a monopolistically competitive market structure, the number of goods n is determined by the requirement that after-tax worldwide profits per good are exactly equal to the cost of development.[4] Given the previous notation this requirement can be written as

$$(1 - \tau_s^s)\pi_s^j + (1 - \tau_s^h)(1 - \tau_h^h)\pi_h^j = r \quad , \quad j = 1,\ldots,n \tag{4}$$

where again $\pi_s{}^j$ and $\pi_h{}^j$ are the maximal pre-tax profits net of the research and development costs that the firm can achieve given that n varieties are produced and given the demand functions (3).

Profits π_i^j are given by

$$\pi_i^j = M_i^j(p - c) \quad , \quad i = s,h \quad , \quad j = 1,\ldots,n \tag{5}$$

where p is the price of any manufacture in terms of wheat and c is the cost of production. Given our technological assumptions, the cost of production c is simply equal to 1 in terms of wheat.

Optimally the price p is set such that

$$p(1 - \frac{1}{\sigma}) = 1 \tag{6}$$

where $\sigma = \frac{1}{1 - \beta}$ is the elasticity of demand.[5]

Substituting for M_i^j and p from (3) and (6) into (5), we can now write pre-tax profits π_i^j as

$$\pi_i^j = \frac{\alpha L_i}{n\sigma} \quad , \quad i = s,h \quad , \quad j = 1,\ldots,n \tag{7}$$

Clearly, pre-tax profits per manufacture j decrease with the total number of manufactures n on the market. Now we can substitute for π_i^j from (7) into (4) and solve for the number of varieties n that will be produced by the manufacturing sector. Solving for n yields

$$n = \frac{\alpha}{r\sigma}\left[(1 - \tau_s^s)L_s + (1 - \tau_s^h)(1 - \tau_h^h)L_h\right] \tag{8}$$

The above expression indicates that the number of manufactures n increases with the share of income α spent on manufactures and with source and host country disposable incomes L_s and L_h. It decreases with the

demand elasticity σ, the development cost r and, not surprisingly, the tax rates τ_s^h and τ_h^h.

3. National taxation policies and tax interdependence

In this section we turn to the determination of tax rates in the source and host countries. As both countries' tax rates affect the number of varieties produced in the manufacturing sector, tax rates are interdependent. For each of the two countries, we first determine how domestic taxation optimally depends on foreign taxation. Then we determine how tax rates are set noncooperatively for a special case of the consumer's utility specification.

Source country tax policy

The source country's government has to set the tax rates τ_s^s and τ_s^h applicable to the multinational's domestic income and after-host-country-taxes host country income respectively. It is probably reasonable to assume that the domestic tax rate τ_s^s is exogenous to host country taxation of multinational enterprises and fixed at τ_s^{s*}.[6] The source country government then is left to determine τ_s^h. Public revenue - and also the provision of the public good in the source country - P_s is related to the tax rate τ_s^h as follows

$$P_s = \tau_s^{s*} n\pi_s^j + \tau_s^h(1 - \tau_h^h) n\pi_h^j \qquad (9)$$

Subsituting for π_h^j from (7), we see that P_s equals

$$P = [\tau_s^{s*} \frac{\alpha L_s}{\sigma} + \tau_s^h(1 - \tau_h^h) \frac{\alpha L_h}{\sigma}] \qquad (10)$$

The government sets the tax rate τ_s^h so as to maximize the

representative consumer's welfare. Formally, the source country government maximizes $U(W_s, M_s^1, M_s^n, \ldots, M_s^n, P_s)$ given by (1) subject to the private sector's behavioral relationships (2), (3), (4) and (10). Subsituting for W_s, M_s^j and P_s from (2), (3) and (10) into (1), we can write the government's objective function as

$$\max_{\tau_s^h} \left(\frac{\alpha(\sigma-1)}{\alpha}\right)^{\alpha} (1-\alpha)^{1-\alpha} \left\{n^{\alpha/(\sigma-1)} L_s + \left[\tau_s^h(1 - \tau_h^h)\frac{\alpha L_h}{\sigma}\right]^{\gamma}\right\} \tag{11}$$

where use is made of the fact that $p = \sigma/(\sigma-1)$.

The objective function clearly indicates that - other things equal - the consumer is better off the larger the number n of manufactures. We will assume that $0 < \alpha/(\sigma-1) < 1$ in (11), which is a necessary (but not sufficient) condition for an interior solution where the optimal tax rate τ_s^h is positive but less than one. After differentiating (11) with respect to τ_s^h, we can write the source country's optimality condition as follows

$$n = \varphi_s [\tau_s^h(1 - \tau_h^h)]^{(1-\gamma)\theta} \tag{12}$$

where

$$\varphi_s = \left[\frac{\alpha^{2+\alpha-\gamma}}{\sigma^{1+\alpha-\gamma}} \left(\frac{1 - \alpha}{\sigma - 1}\right)^{1-\alpha} \frac{L_s}{r} L_h^{1-\gamma}\right]^{\theta}$$

$$\theta = \left(\frac{1 - \sigma}{1 - \sigma + \alpha}\right).$$

Note that $\theta > 1$ in (12) as we have assumed that $0 < \alpha/(\sigma - 1) < 1$ as a necessary condition for an interior tax rate. The implications of the first order condition (12) for the setting of the tax rate τ_s^h depend importantly

on the substitutability parameter γ. In particular, as γ goes to infinity (12) implies that τ_s^h will optimally be set so as to keep the product $\tau_s^h(1 - \tau_h^h)$ constant. Thus for γ very large, tax policy is set so as to keep total tax revenues and the provision of public goods constant regardless of the host country tax rate τ_h^h.

Further, for the special case where $\gamma = 1$ equation (12) implies that optimally τ_s^h is set so as to keep the number of varieties n constant. From (8) we see that the constancy of n requires that the expression $(1 - \tau_s^h)(1 - \tau_h^h)$ is held fixed. Thus τ_s^h is optimally adjusted in responses to changes in τ_h^h so as to keep the overall after-tax foreign source income of the multinational fixed. This is equivalent to saying that the source country grants a tax credit to host country taxes.[7] Note that the tax credit arises endogenously after we assume the source country sets its tax rate τ_s^h - applicable to the source country host country tax base - optimally in response to host country tax changes. Thus the tax credit can arise as the optimal reaction to host country tax changes rather than as a rule that is given a priori.[8]

Host country tax policy

The host government faces the task of setting the tax rate τ_h^h. Host country public revenue P_h is used to finance the provision of host country's public good. Public revenue P_h is simply related to the host country tax rate τ_h^h as follows

$$P_h = \tau_h^h n \pi_h^j \qquad (13)$$

Subsituting for π_h^j from (6) into (13), we get the following expression for P_h

$$P_h = r_h^h \frac{\alpha L_h}{\sigma} \tag{14}$$

The distinction between (10) and (14) reflects the fact that the host country can only tax the multinational's host country revenue, and that the host country has as first right to tax host country revenue.

The objective of the host country's tax policy is to maximize that country's representative consumer's welfare. Formally, the government maximizes $U(W_h, M_h^1, M_h^2, \ldots, M_h^n, P_h)$ given by (1) subject to the private sector's behavioral equations (2), (3), (8) and (14). Subsituting for W_h, M_h^j and P_h from (2), (3) and (14) into (1) we can write the government's objective function as

$$\max_{r_h^h} \left(\frac{\alpha(\sigma-1)}{\alpha}\right)^{\alpha} (1-\alpha)^{1-\alpha} \left\{n^{\alpha/(\sigma-1)} L_h + r_h^h \frac{\alpha L_h}{\sigma}\right]^{\gamma} \} \tag{15}$$

where again use is made of the fact that $p = \sigma/(\sigma-1)$.

After differentiating (15) with respect to r_h^h, we can write the source country's optimality condition as follows

$$n = \varphi_h [(1 - r_s^h) r_h^{h\,(1-\gamma)\,\theta}] \tag{16}$$

where

$$\theta_h = \left[\frac{\alpha^{2+\alpha-\gamma}}{\sigma^{1+\alpha-\gamma}} \left(\frac{1-\alpha}{\sigma-1}\right)^{1-\alpha} \frac{L_h^{2-\gamma}}{\gamma}\right]^{\theta}$$

Again the way in which r_h^h is optimally adjusted to changes in the source country tax rate r_s^h depends critically on the parameter γ. As γ

goes to infinity the optimally condition (16) implies that τ_h^h becomes a constant which is independent of τ_s^h. Thus for large values of γ the host country will optimally make its public revenue and provision of the public good independent of source country taxation. It is further easy to check that for any positive value of γ n optimally decreases with τ_s^h from the host country's perspective, i.e. the host country will never reduce the tax rate τ_h^h enough in response to a rise in τ_h^h so as to keep the number of varieties n from going down. Thus the host country will never provide what amouts to a full host country credit towards source country taxation.

Tax interdependence

The number n implied by (12) and (16) has to be equal as a condition for a noncooperative equilibrium in the tax rates. Setting the right hand sides of (12) and (16) equal, we see that if both countries had to rely on taxing host country income (which would be the case if $\tau_s^{s*} = 0$) for any γ $\tau_s^h(1 - \tau_h^h) < \tau_h^h$ which implies that the host country always derives more tax revenues from the multinational's host country operations than the source country. This inequality is a implication of the asymmetry of the institutional set-up where the host country has a first right to tax host country income. As a result of this asymmetry it is relatively expensive for the host country in terms of foregone tax revenues to induce the multinational to produce additional varieties of the good by way of a lower host country tax rate.

As an illustration we can take the case where $\tau_h^h = 1/3$ and $\tau_s^h = 1/2$ so that $P_s = P_h$. Turning to (8), we see that for this case the number of goods n is more responsive to a change in τ_s^h than to a change in τ_h^h. In particular, $(\delta n/\delta \tau_s^h)/(\delta n/\delta \tau_h^h) = 4/3$. On the other hand, source country

tax revenues and the provision of the public good are less responsive to τ_s^h than host country tax revenue to τ_h^h. In particular, $(\delta P_s/\delta \tau_s^h)/(\delta P_h/\delta \tau_h^h) = 1/2$. From the source country's perspective additional product varieties are thus less expensive in terms of foregone public goods than for the host country. In particular, in this example $\delta n/\delta P_s = (8/3)\delta n/\delta P_h$. This demonstrates that with equal tax revenues for the 2 countries the source country has a larger incentive to provide a tax incentive for additional product innovation, and that thus the situation of equal tax revenues can thus not be an equilibrium.

In general the tax rate interaction depends in some complex way on the parameters of the model and in particular on γ. In the remainder of this section, we will examine the tax competition between the two countries for the special case of $\gamma = 1$. While there is no presumption that in fact $\gamma = 1$ and that thus private and public goods are perfect subsitutes in the utility specification (1), this special case is interesting as the resulting tax interaction appears to represent closely the tax interaction between, for instance, the United States and developing countries where U.S. multinationals operate.

For the case where $\gamma = 1$, we have shown earlier that the source country wishes to keep n constant, which from (8) implies the expression $(1 - \tau_s^h)(1 - \tau_h^h)$ is independent of τ_h^h for interior solutions of τ_s^h. Let us assume that if $\tau_s^h = 0$, then the equality (12) implies $\tau_h^h = \tau_h^{h*}$ where $0 < \tau_h^{h*} < 1$. This implies that $\tau_s^h = 0$ and $\tau_h^h = \tau_h^{h*}$ is a point on the reaction curve that indicates the optimal source country tax rate τ_s^h for any given host country tax rate τ_h^h. Algebraically, this reaction curve can be represented as follows

$$\tau_s^h = 1 - \frac{1 - \tau_h^{h*}}{1 - \tau_h^h} \qquad (17)$$

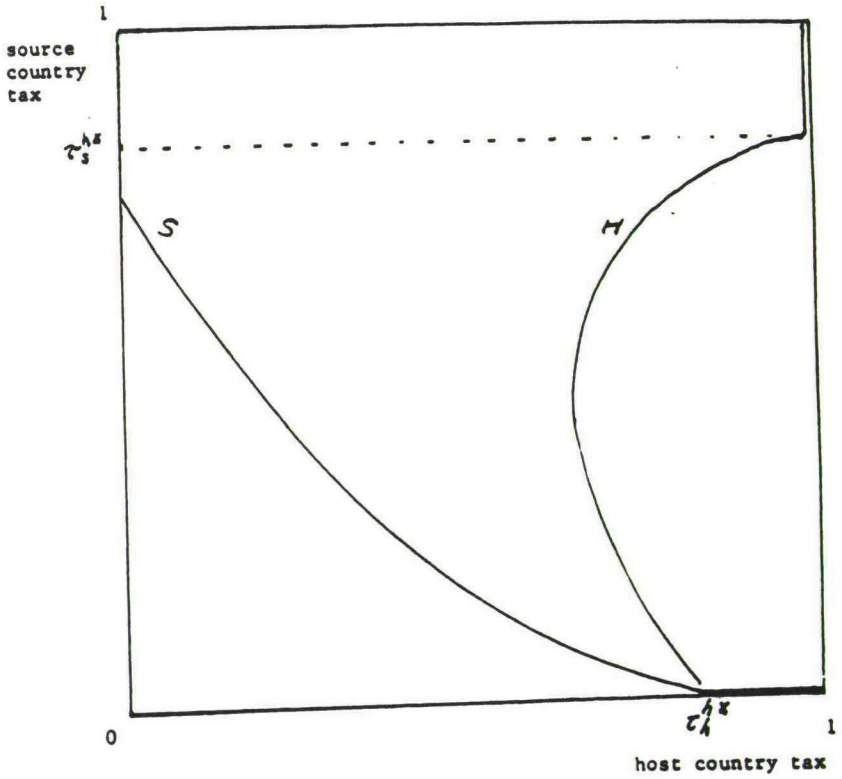
This relationship is represented by the curve labeled S in Figure 1.

Turning to the host country, it is immediately clear from (12) and (16) that for the special case of $\gamma = 1$ the optimal number of goods from the host country's perspective is less than from the source country's perspective for any positive source country tax rate τ_s^h. Noting (8), this shows that for $0 < \tau_s^h \leq 1$ the host country reaction curve, labeled H in Figure 1, lies to the right of the source country reaction curve, S.[9] Equation (16) also implies that for some τ_s^{h*} where $0 < \tau_s^{h*} < 1$, if $\tau_s^{h*} \leq \tau_s^h \leq 1$, then optimally $\tau_h^h = 1$.[10] Finally, note that for $\tau_s^h = 0$ equations (12) and (16) are identical.

Using these facts, we can draw a host country reaction curve, H, as in Figure 1. Note that the unique Nash equilibrium in the tax rates τ_s^h and τ_h^h is characterized by the intersection of the S and H curves, where we have $\tau_s^h = 0$ and $0 < \tau_h^h < 1$.[11] This establishes that in equilibrium the host country gets positive tax revenue from host country income, while the source country gets none.

The foregoing results accord well with the reality of the taxation of U.S. multinationals. The United States indeed provides a tax credit to U.S. multinationals' host country taxes on foreign source income rather than a mere deduction which was found optimal in Feldstein and Hartman [1979]. Under this system host countries frequently find it in their interest to raise the host country tax rate at least to the level of the U.S. domestic tax rate such that the U.S. treasury receives no tax revenues at all from

Figure 1. Tax reaction curves



the foreign operations of U.S. multinationals. The multinationals' ability to spread overseas, however, is still in the source country's interest as equation (8) indicates that as long as $(1 - r_s^h)(1 - r_h^h)L_h > 0$, then the number of varieties produced will be larger in the case where the multinational can spread abroad than otherwise. Thus the source country as a whole benefits from the multinationals foreign operations as they yield positive externalities to source country consumers, if not to the source country treasury.

4. Concluding remarks

This paper explicitly recognizes that intangible assets and in particular research and development into new product varieties is influenced by tax policies in any of the countries where they operate. Specific parameterizations of the model can explain why it is in the source country's interest to provide its multinationals' with a tax credit towards foreign source income tax. Another reason for tax credits is of course that they help to promote an efficient international allocation of resources, if reciprocated, will benefits all countries involved. The efficiency argument, however, does not explain why the U.S. applies the tax credit universally instead of reciprocally. An additional reason why foreign tax credits remain is of course the political influence of the large corporations that stand to lose most from its abolition.

One implication of the model, which was not stressed in the text, is that the noncooperative tax equilibrium will be inefficient. In particular, countries will set their tax rates such that there will be an underprovision of product varieties by the multinational enterprises. When countries set

their tax rates for the product innovating multinational they do not take into account the externality of domestic tax policy to foreign consumers and thus they will generally set taxes too high and the multinationals will engage in too little innovation from a worldwide perspecitve.

A final issue concerns how the analysis would be altered if tax havens were included in the model. Tax havens in principle can make a difference as they enable a multinational to incorporate outside both the host and the source countries, thereby avoiding any source country taxation of host country income. However, for the case where the model yields the result that in equilibrium $r_s^h = 0$, it will do the multinational no good to incorporate off-shore. The inability of the U.S. to derive substantial tax revenues from the multinationals' foreign operations under the present regime may well explain why so many U.S. multinationals in fact remain incorporated within the United States.

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Endnotes

1. For a general discussion of the role of intangible assets in multinational enterprise, see Caves [1982]. Models of the multinational enterprise based on this view and their implications for international trade, are examined in Markusen [1984] and Helpman [1984].

2. For 1984 the tax liability before tax credits for U.S. corporations was $107.9 billion on $257.0 billion of worldwide income. $22.9 billion of foreign tax credits and $21.2 billion of other tax credits reduced the actual tax liability to $63.9 billion. (See Statistics on Income 1984, Corporation Income Tax Returns, Table 16, p. 66).

3. The multinational could equally well produce only in the source country and subsequently export to the foreign country. However, in this case there is some ambiguity as to where the multinational will locate its profits for tax purposes as the multinational could transfer price its exports at either production cost or final exort sales price. See Ethier [1986] and Horstmann and Markusen [1987] for a discussion of licensing and the multinational enterprise.

4. One can think of having n multinational enterprises that each produce one variety of the manufactured good. If n is large, this will give rise to a monopolistically competitive market structure.

5. More acurately, the elasticity σ approaches $1/(1 - \beta)$ when the number of varieties goes to infinity. For a discussion, see Krugman and Helpman [1985].

6. Alternatively, one could assume that the two domestic tax rates are set equal so that $t_s^s = t_s^h$. The results shown below for the special case of $\gamma = 1$ goes through under this assumption.

7. For the value of t_s^{s*} such that $t_s^{s*} = (1 - t_s^h)(1 - t_h^h)$ is consistent with the quantity n that is optimal from the source country's perspective, there is a tax credit where the domestic tax rate and composite tax on foreign source income are equal.

8. Note that the tax credit arises endogenously after we assume the source country sets its tax rate t_s^h - applicable to the source country host country tax base - optimally in response to host country tax changes. Thus the tax credit arises as the optimal reaction to host country tax changes rather than as a rule that is given a priori. Of course, the model does not allow us to distinguish whether source country tax rates are set optimally given that the tax system will exhibit a foreign source income tax credit, or whether tax rates are set optimally in some general fashion and then yield a tax credit endogenously.

9. If $t_s^{s*} = 0$, then the host country reaction curve H lies to the right of the source country reaction curve S for any point except the point $t_s^h = 0$ and $t_h^h = t_h^{h*}$. If instead $t_s^{h*} > 0$, then the curve H meets the t_h^{h*}-axis to the right of the point where the t_h^{h*}-axis..

10. The reason is that for $r_s^h = 1$ we see from (8) that n is positive, while the right hand side of (16) is equal to zero.

11. Note that in Figure 1, the S curve is shown for the case where r_s^{s*} equals zero.

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