

**STRATEGIC TAXATION OF THE MULTINATIONAL
ENTERPRISE: WHEN TAX CREDITS AND DEDUCTIONS
ARE EQUIVALENT**

by

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ABSTRACT

This paper analyzes the national social welfare effects of taxation on direct foreign investment (DFI) income from the operations of a multinational enterprise (MNE). This paper is unique as it both treats DFI as endogenous to tax policy and considers rival governments strategic behavior in the establishment of international tax policy. A general-equilibrium model sets forth the simple case of two countries which are identical in tastes, fixed factor endowments, and technology. MNE investment abroad is the application of corporate activities, such as research and development, across borders. It is argued that home and host countries will tax strategically so that the combined burden of their taxes is not prohibitive of DFI. If the home country offers no double taxation relief infinite sets of equilibria taxes exist. Under home taxation regimes which provide alleviation of double taxation, such as credit or deduction for foreign taxes paid, the host will fully tax locally-earned economic profits. Moreover, welfare, market structure, and profit results are identical in tax credit and deduction regimes when competition between governments is assumed.

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1. Introduction

How should governments relieve the burden of double taxation faced by multinational enterprises (MNEs)? Optimal-tax theorists, such as Slemrod (1988) and Horst (1980), suggest that governments should deduct taxes paid abroad on foreign-earned profits from domestic taxable profits and apply the same tax rates to resident profits from any source. Investors would be subject to a uniform effective tax rate on profits regardless of location. In this view, global production efficiency is achieved as firms allocate investments across countries such that marginal returns are equalized.

Yet most industrialized countries, including the United States and Japan, credit taxes paid abroad against taxes owed (Ault and Bradford 1990). How can theoretical predictions favoring tax deductions be reconciled with this observation? This paper proposes an open economy model in which tax credits and tax deductions are equivalent. Moreover, a policy which provides no double-taxation relief for foreign taxes paid may be welfare improving for an investor's home country.

The analysis differs from earlier works in two respects. The first is in the modelling of direct foreign investment (DFI). Much of our understanding of the impact of taxation credits versus deductions relies on models, such as Slemrod (1988) and Horst (1980), which treat foreign investment as portfolio investment whereby capital migrates to the region offering the highest average return in competitive markets. This ignores two important aspects of DFI: that MNEs obtain a substantial portion of financing from foreign sources thus ruling out capital availability as a determinate of DFI; and that MNEs tend to be concentrated within monopolistic or oligopolistic industries. As an exception, Hartman (1980) develops a general equilibrium model in which an MNE invests abroad because it has cost advantages over local producers. Under the assumption of constant returns to scale technology, however, this is inconsistent with monopoly production and DFI remains a portfolio decision. When monopolistic foreign investors are considered, the MNE is assumed to have a fixed

production regime which is assumed rather than explained by the model (Batra and Ramachandra 1980, Itagaki 1989, Horst 1977).

Recent theoretical models of the MNE, such as Markusen (1984) and Horstmann and Markusen (1992), which improve our understanding of the determinants of DFI have yet to be integrated into the taxation literature. As an attempt to rectify this shortcoming, this paper models an MNE which invests abroad to capture scale economies arising from a firm-specific asset. The existence of the MNE is endogenous and thus small changes in taxation policy parameters may result in a shift in market structure and discontinuous changes in welfare, as in Horstmann and Markusen (1992).

This paper offers a second refinement of earlier models by treating foreign government tax policy towards direct foreign investment as endogenous to the domestic government's decision. Income and profits of MNE operations are under the jurisdiction of two sovereign taxing agents: the home and subsidiary host governments. It is generally acknowledged that MNE decisions are endogenous to the tax policies of both home and host countries. Papers by Horstmann and Markusen (1992), Markusen, Morey and Olewiler (1993), Levinsohn and Slemrod (1993), and Brander and Spencer (1987) are a few examples of this recognition. To my knowledge, however, virtually all analyses of the tax credit versus deduction question to date assume foreign government policy is invariant to domestic tax rate and base changes. Overlooked is the strategic aspects of international taxation policy determination that arise as rival governments compete for host-source income and profits of MNEs. Within a game-theoretic framework, this paper models the nature of competition between governments.

From a technology-based theory of the MNE with an endogenous choice of market structure, this paper considers the global distribution of welfare under noncooperative taxation policies of home and host governments. The general equilibrium model sets forth the simple case of two

countries which are identical in tastes, fixed factor endowments, and technology. Two goods are produced with labor inputs: one with constant returns and another with increasing returns to scale technology due to the fixed cost of administration. Within the increasing returns industry, production is either by a monopolist in each country or a MNE monopolist.

While global and foreign production possibilities expand under MNE production, as duplication of the fixed cost is avoided, the MNE's ability to repatriate profits results in a decline in the host country's social welfare below that available under domestic monopoly production. Taxation of MNE profits provides a means for the host country to recoup these losses. The two governments, home and host of potential DFI, both have taxing jurisdiction over foreign-earned MNE profits. Countries exhibit strategic behavior as they compete for tax revenues and profits of subsidiary operations. Relief from double taxation afforded by the home country redistributes global income in favor of the host. Moreover, double taxation relief through either tax credits or tax deduction yields symmetric global welfare results. Section 2 models the nature of the game in a general-equilibrium, open-economy framework. Firm response to global tax policies are considered in section 3. Section 4 provides a social welfare analysis for each country inclusive of tax policy and resulting firm behavior. Equilibrium tax rates and the outcome of the game are discussed in section 5. Three potential home taxation treatments of a resident's foreign-earned profits are considered: full taxation with no double taxation relief; a tax deduction; and a tax credit. Finally section 6 provides some summarizing conclusions.

2. Model and Nature of the Game

A model is developed with two countries: Home, denoting the potential MNE's country of residence, and Foreign, denoting the potential host of an MNE subsidiary. In other aspects, these countries are essentially identical. The full-employment labor endowment (\bar{L}) and technology are

identical in Home and Foreign. Consumer preferences are characterized by identical and homothetic utility functions across countries. Each country produces two goods, X and Y. Good X is produced with increasing returns to scale; either by an MNE with a Home country base or by a national enterprise (NE). Good Y is produced competitively with constant returns to scale technology.

The two governments compete by strategically setting tax rates which are levied on economic profits and redistributed, lump-sum, to domestic citizens. Home taxes MNE profits on a residency basis with relief from double taxation of foreign-earned profits, through tax credits or deductions, granted at Home's discretion. Foreign also taxes locally-earned MNE subsidiary profits on a territorial principle. To avoid the issue of deferrals, MNE profits earned abroad are immediately repatriated to the home country.

In this section I describe the nature of the game played by X-producing firms and governments. All players possess common knowledge as each knows the structure of the game and knows all other players know. The extensive form is given in figure 1. In the initial stage, Home selects among three taxation rules for the treatment of foreign-earned profits at the opening node H.1. Under the first tax rule, Γ_c , Home credits foreign taxes paid against the MNE's tax bill. A second tax rule, Γ_d , allows the MNE to deduct foreign taxes paid from its Home tax base. The last option, Γ_o , provides no relief from double taxation.

Figure 1 also displays the game after the taxation rule (Γ_c , Γ_d , or Γ_o) is announced. Home and Foreign move simultaneously to set tax rates on profits at the information set of nodes H.2 and F.3. Domestically-earned profits are subject to taxation at rates t^h and t^f for Home and Foreign, respectively. Foreign-earned MNE profits (π^*) are taxed by Home at the rate t^h and by Foreign at rate t^f . Knowing the international taxation regime the Home firm decides whether to produce X in both the Home and Foreign markets, thus becoming an MNE, or whether to only produce at Home as a NE at node MNE.4. At nodes NE.5 and NE.6 the Foreign firm observes the Home firm's decision

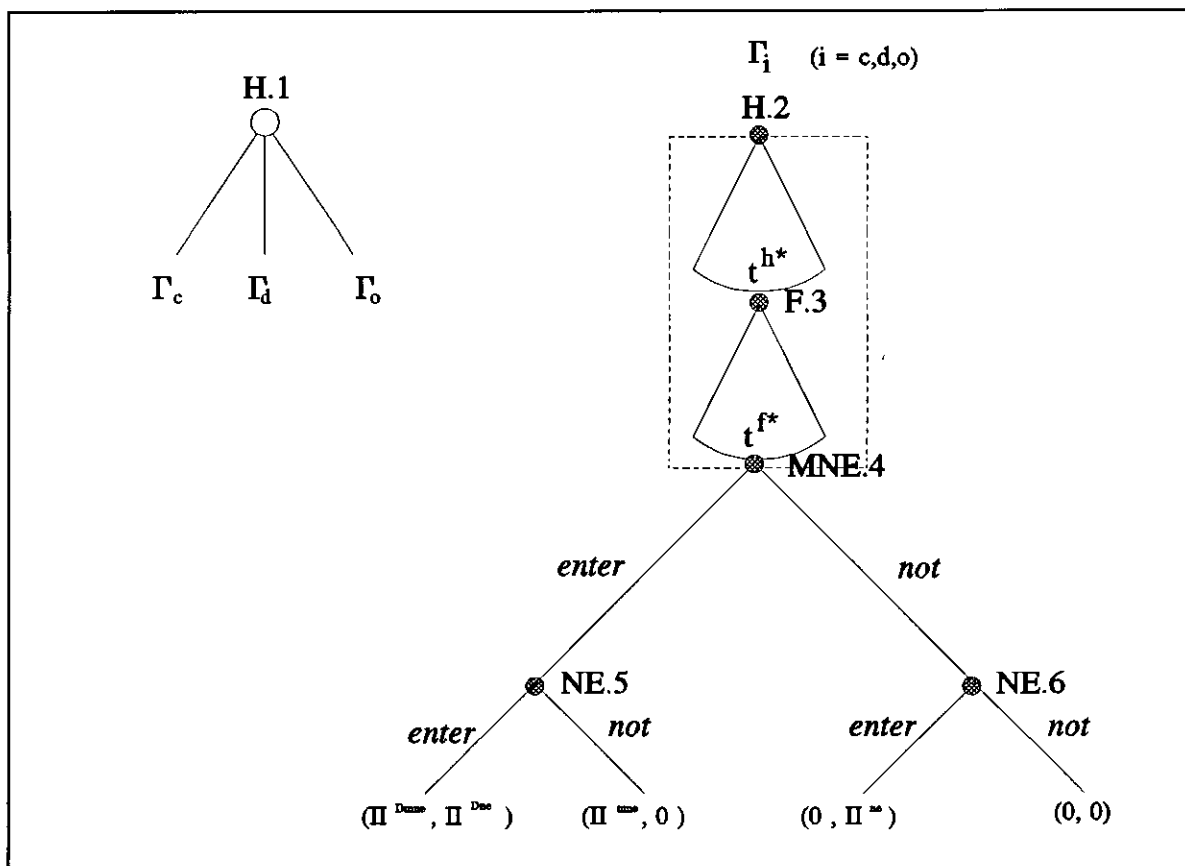


Figure 1: Strategic Form Game

and chooses whether to enter the Foreign X market as a NE.

3. Decisions of Firms in Response to Tax Policy

This game is unravelled by moving backwards in the usual fashion. I look for a subgame-perfect solution in pure strategies. Deriving potential profits of various X producers requires some restrictive assumptions about technology and the market. I follow the approach of Markusen (1984) to describe the nature of imperfect competition in the X sector in a general equilibrium framework.

Profits and costs are denominated in terms of the numeraire commodity, Y. Assume the X industry is relatively small so that wages are exogenous as determined in the Y sector, which employs only labor (L) under constant returns to scale. Labor resources \bar{L}_a^i and L_m^i are employed in X

production. With full employment in the Y sector, the production function is defined by:

$$(1) \quad Y^i = G(\bar{L} - \bar{L}_a^i - L_m^i); \quad i = h, f.$$

Define one unit of labor (L) as the quantity necessary to produce one dollar of Y. This implies that real return to labor, which is the marginal value product of labor in Y ($\partial G(L)/\partial L$), is one. With identical technology, this is a global factor payment and thus labor also functions as a numeraire.

Good X is the output of two activities: a corporate administrative activity, $A(\bar{L}_a)$; and a manufacturing activity, $M(L_m)$. Manufacturing requires inputs of labor which are employed with constant returns to scale. The M activity is not geographically constrained so that factories within a firm may exist in multiple locations, each at varying distances from the administrative (A) activity. The A activity, on the other hand, centralizes the fixed quantity of labor it employs (\bar{L}_a) in one location. In a multi-plant firm, this activity has a "public goods" aspect which is firm-specific in nature. Numerous locations of M activities are serviced by the A activity without reducing the marginal product of labor employed. The A activity represents the development of a knowledge-based asset such as R&D, management, and marketing technology.

$$(2) \quad X^i = A(\bar{L}_a^i)M(L_m^i); \quad i = h, f.$$

Consider the NE's optimization problem. As shown in figure 1, the national enterprise moves last after observing the global tax policy and the MNE response. To limit our scope, assume that the X market is sufficiently small so that two X producers in any one country will incur negative profits ($\Pi^{Dmne} < 0$, $\Pi^{Dne} < 0$) in the post-entry Cournot-Nash equilibrium. Thus the strategy Π^{Dne} is strictly dominated by no Foreign NE entry which has zero payoff. If an MNE is not present both Home and Foreign NEs are domestic monopolists.¹ Symmetry assures that the profit functions of firms in both

countries are identical, where $p(X)$ is the inverse demand function of X . Domestic profits are taxed at rate t^i , $i=h,f$.

$$(3) \quad \Pi_i^{ne} = (1-t^i)[p(X)A(\bar{L}_a^i)M(L_m^i) - \bar{L}_a^i - L_m^i]; \quad i=h,f$$

The first-order condition for profit maximization is:

$$(4) \quad p \left(1 - \frac{1}{e_x} \right) = [A(\bar{L}_a^i) M'(L_m^i)]^{-1} \equiv m; \quad \text{where } e_x = -\frac{\partial X}{\partial p} \frac{p}{X}$$

The price of X in terms of Y , p , is a markup over marginal cost. The A activity is fixed by assumption ($A(L)$ is a constant) and manufacturing activity exhibits constant returns to scale ($M'(L_m)$ is a constant). Thus marginal cost (m) is constant. Note that the price elasticity of demand, e_x is the same across countries under the assumption of identical and homothetic preferences. Symmetry implies that p is the same for both countries.

Consider the payoff of MNE production.² Home-earned MNE profits (π), defined as Home revenues less Home accrued costs, are taxed at rate t^h . Foreign-earned revenues net of Foreign expenditures equals Foreign-source MNE profits (π^*). These profits are taxed by both Home and Foreign (at rates t^{h*} and t^{f*} respectively) under one of three Home tax regimes for treatment of Foreign-earned profits (Γ_i , where $i = c, d, \text{ or } o$). Determination of the overall tax rate on Foreign-earned profits (t^*), which depends on the tax regime (Γ) as well as Home and Foreign tax rates, is predetermined in the game and will be discussed later. The MNE maximizes net of tax global profits, Π^{mne} , by choosing X quantities (and therefore labor quantities) according to the following programming problem.

$$\begin{aligned}
(5) \quad \Pi^{mne} &= (1 - t^h) \pi + (1 - t^*) \pi^* \\
&= (1 - t^h)[p(X)A(\bar{L}_a^h)M(L_m^h) - \bar{L}_a^h - L_m^h] \\
&\quad + (1 - t^*)[p(X)A(\bar{L}_a^f)M(L_m^f) - L_m^f]
\end{aligned}$$

Note that Foreign NE profits, equation 3, equals gross MNE Foreign-earned profits minus Foreign administrative costs ($\Pi^{ne} = \pi^* - \bar{L}_a$) while NE profits equal Home MNE profits ($\Pi^{ne} = \pi$). MNE production is a technological improvement over duopoly-NE production as the A activity is concentrated at Home and Foreign administration cost (\bar{L}_a^f) is avoided. One first-order condition for MNE profit maximization reduces to equation (4).³ Since a profit tax is employed, optimal marginal decisions are not affected. The world price, p , is therefore independent of profit tax policy as shown in the Appendix. From the assumption of constant marginal costs and identical and homothetic demand, price outcomes are equivalent for either MNE or NE production. The level and distribution of income between countries, however, do depend on the market structure for X production.

The Home firm decides whether to invest abroad or not at node MNE.4. Knowing that the Foreign firm will not jointly enter the duopoly outcome, with a Home-firm payoff of Π^{Dmne} , is off the path of play. The Home firm's MNE payoff exceeds NE payoff by net Foreign-earned profits $(1 - t^*)\pi^*$. By assumption gross Foreign-earned profit (π^*) is positive. Thus the Home firm invests abroad if and only if the total tax rate on foreign profits is not prohibitive ($t^* \leq 1$).

4. Problem of Governments: A Social Welfare Analysis

The goal of governments is to optimize the social welfare of domestic citizens. One implication of MNE production is that Foreign-earned profits (π^*) otherwise earned by the Foreign NE, are repatriated to Home. This redistributes π^* to Home MNE shareholders and erodes Foreign

income. An incentive arises for Home and Foreign to use tax policy in the competition over π^* . Moreover, under some conditions Foreign may want to prohibit MNE production in favor of its domestic NE.

In order to examine optimal tax policy, I incorporate tax implications into a welfare analysis under both the MNE and NE market structures. With international trade, the balance of payments constraint requires the value of national consumption to be equivalent to national income. Moreover, there is no aggregation problem under the assumption of identical and homothetic preferences. Thus welfare in each country is optimal when national income is maximized.⁴

In the presence of two domestic NEs, national income is derived from returns to production in both the Y and X industry. In the competitive Y sector, zero profits assure that revenues (Y) equal factor payments (L_y). X-sector revenues are comprised of NE profits (Π^{ne}) and payments to labor employed in both manufacturing and administration (L_a and L_m). With identical endowments and preferences, NE production implies Home and Foreign incomes are also identical. Under NE production, the national income of either country (NI^{ne}) equals the following.

$$(6) \quad NI^{ne} = Y^{ne} + pX^{ne} = \bar{L} + \Pi^{ne}$$

Under an MNE market structure, national incomes differ between countries. Administration activity is concentrated at Home and net Foreign X-sector profits repatriated to Home. Foreign benefits as labor resources, otherwise devoted to administration, are freed for other uses and MNE tax revenues are gained. This is offset, however, by the repatriation of net Foreign-earned MNE profits $(1-t^f)\pi^*$. Foreign national income under the MNE market structure is defined as follows.

$$(7) \quad NI^{f,mne} = Y^{f,mne} + pX^{f,mne} - (1-t^f)\pi^* = \bar{L} + t^f\pi^*$$

Home income under an MNE market structure includes factor payments, Home-earned

profits, and net repatriated profits from subsidiary operations.

$$(8) \quad NI^{h,mne} = Y^{h,mne} + pX^{h,mne} + (1-t^{f*})\pi^* = \bar{L} + \Pi^{ne} + (1-t^{f*})\pi^*$$

Consider Foreign income over the range of market structure options. The Home firm becomes an MNE if the effective Foreign profit tax is not prohibitive ($t^* \leq 1$). Should t^* exceed one, the Home firm does not invest abroad and a Foreign NE arises. NE profits equals reported MNE Foreign-earned profits less Foreign administration costs ($\Pi^{ne} = \pi^* - \bar{L}_d$). Substitute for Foreign NE profits in equation 6. Equations 6 and 7 can be rewritten integrating the tax conditions for market structure outcomes.

$$(9) \quad NI^f = \bar{L} + \Pi^{ne} |_{t^* > 1} + t^{f*}\pi^* |_{t^* \leq 1}$$

Home national income can be written as a function of taxes. Combine equations 6 and 8 with the taxation conditions for MNE production.

$$(10) \quad NI^h = \bar{L} + \Pi^{ne} + (1-t^{f*})\pi^* |_{t^* \leq 1}$$

5. Equilibrium Tax Rates

Each Home tax regime (Γ_c , Γ_d , or Γ_o) is associated with a subgame perfect equilibrium t^* which is a function of both Home and Foreign tax rates (t^h and t^f). As shown in figure 1, Home selects the tax regime promising the highest levels of welfare at node H.1 with the belief that other agents (Foreign, MNE and NEs) will respond rationally. Next Home and Foreign governments simultaneously set profit tax rates (t^h and t^f) at nodes H.2 and F.3 respectively. Each exhibits Nash behavior by treating the taxation policy of the rival government as given.

Consider government response to taxation regime Γ_o , which allows both countries to tax Foreign-earned MNE profits (π^*) with no double taxation relief. Under this regime, the effective tax rate on MNE Foreign-earned profits is $t^* = t^{h*} + t^{f*}$.

Home is indifferent between income in the form of MNE repatriated profits and tax revenues as both are redistributed to citizens in an identical, lump-sum fashion. Assume home will not intentionally set a tax that will rule out MNE production (t^{h*} such that $t^* > 1$). Given the conjectured Foreign tax rate (t^{f*}), the set of optimal Home tax rates is $t^{h*} \in [0, 1-t^{f*}]$.

In contrast, Foreign prefers the MNE outcome only if MNE tax revenues exceed potential NE profits. Figure 2 below graphs Foreign national income from equation 8. Consider Foreign's decision when the Home tax rate is zero ($t^{h*}=0$). When $t^{f*}=0$ the MNE enters and national income is \bar{L} as profits are repatriated. A higher level of income ($\bar{L} + \Pi^{nc} = \bar{L} + \pi^* - L_a$) is attainable in the NE equilibrium, which dominates at $t^{f*} > 1$. If Foreign could retain MNE profits through full taxation ($t^{f*}=1$), national income is maximized at ($\bar{L} + \pi^*$). Foreign resources once employed in administration (the A activity) are freed for other production while consumer prices remain constant. Taxation provides a means for the host to retain MNE profits. There exists a critical tax rate (t_c^{f*}) where Foreign is indifferent between MNE and domestic NE production. For $t^{h*}=0$, the critical tax is derived when national income under the alternative market structures, equations 6 and 7, are equal. Thus the critical foreign tax rate is a function of the ratio of foreign administration costs (which are avoided under MNE production) to gross MNE profits.

$$(11) \quad t_c^{f*} = 1 - \frac{L_a}{\pi^*}$$

Foreign's national income maximizing tax strategy prohibits MNE production (sets $t^* > 1-t^{h*}$) unless it can feasibly tax at or above the critical rate (t_c^{f*}). Given a conjectured t^{h*}

under tax regime Γ_o , Foreign's equilibrium tax rate is as follows.

$$(12) \quad \begin{aligned} t^{f*} &= (1 - t^{h*}) \Big|_{(0 \leq t^{h*} < 1 - t_c^{f*})} \\ t^{f*} &> (1 - t^{h*}) \Big|_{(t^{h*} > 1 - t_c^{f*})} \end{aligned}$$

This regime, Γ_o , does not yield a unique predicted outcome but rather a set of Nash-equilibria tax rates.

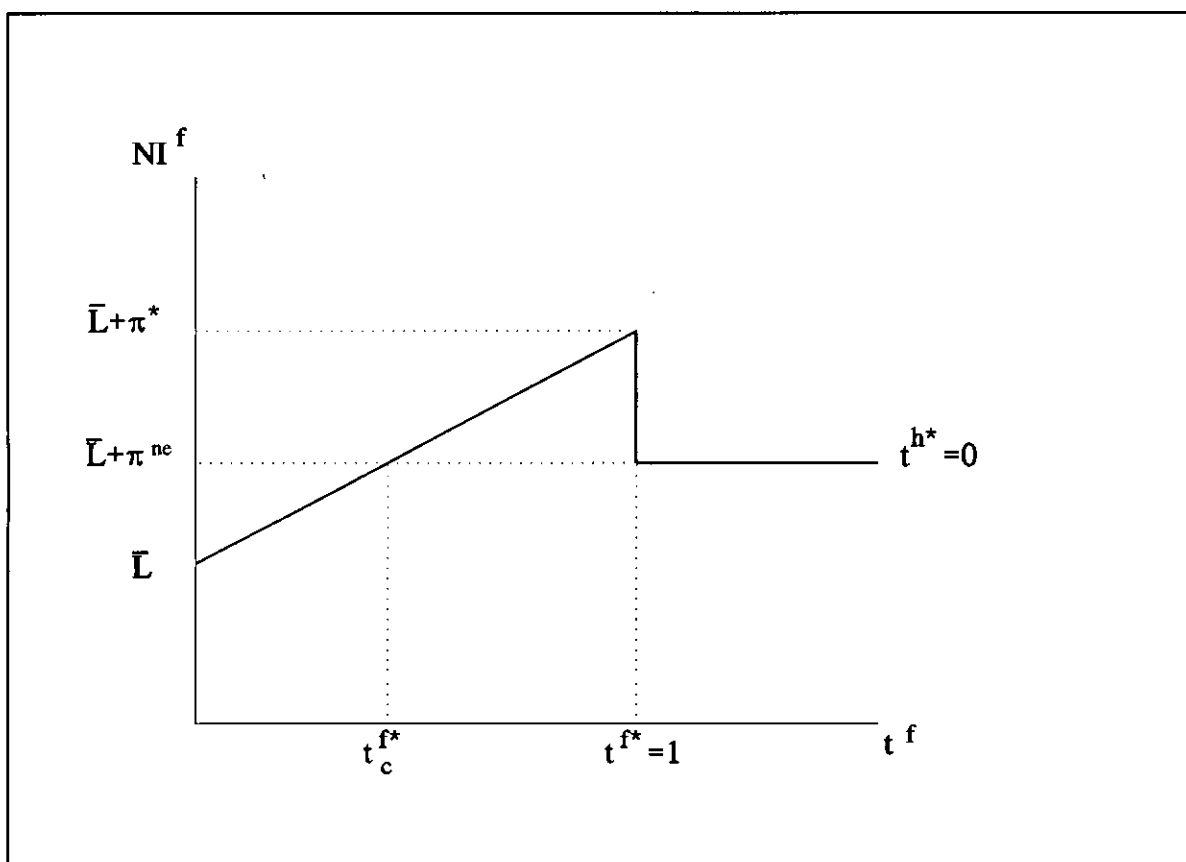


Figure 2: Foreign National Income

Within the second tax regime, Γ_c , Home allows taxpayers to credit foreign income taxes paid at rate t^* , not exceeding t^h . The MNE's overall tax rate on profits earned abroad is $t^* = t^h - \min(t^h, t^f) + t^f$, or by rearranging $t^* = \max(t^h, t^f)$. Given a conjecture about t^* the home country sets t^h . As Home is indifferent between income in the form of repatriated profits and tax revenues,

the Nash-equilibrium t^{h*} is an element of the closed set $[0, 1]$.⁵

Foreign realizes that the MNE is able to avoid double taxation through Home's tax credit policy. It will thus set $t^{f*} = 1$, regardless of Home's tax rate, and retain all Foreign-earned profits (π^*) in the form of tax revenues. Foreign's equilibrium national income under Γ_c is $\bar{L} + \pi^*$. Under Γ_c , Home cedes the primary right to tax profits earned abroad to Foreign and is rewarded with $\bar{L} + \Pi^{nc}$, a national income level achievable with a national enterprise equilibrium.

Alternatively, Home may relieve double taxation by allowing the MNE to deduct taxes paid abroad from Home-taxable income. This is represented by Home's choice of Γ_d at the first stage of the game. The effective tax rate on Foreign-earned profits is $t^* = t^{h*}(1 - t^{f*}) + t^{f*}$. Regardless of the conjecture of t^{f*} , Home sets t^{h*} within the closed set $[0, 1]$. With a Foreign tax deduction, the Home firm will become an MNE as long as either tax rate, t^{f*} or t^{h*} , does not exceed 1. Once again, Foreign's equilibrium solution is $t^{f*} = 1$ regardless of t^{h*} . In equilibrium, the effective tax rate on MNE profit is $t^* = 1$. Even with this seemingly more restrictive relief of double taxation, Foreign gains the subsidiary's profit as tax revenue. In welfare terms the tax deduction is equivalent to a tax credit. Both yield national incomes for Home and Foreign of $\bar{L} + \Pi^{nc}$ and $\bar{L} + \pi^*$ respectively.

Finally, a subgame-perfect solution to the game may be derived by considering home's choice of taxation regime at node H.1. Knowing the subsequent moves of the other players, Home can do no worse than choosing either a tax credit or a tax deduction and is indifferent between the two regimes. Moreover, either regime results in equivalent firm-level profit rates and welfare levels for Foreign. The effect of double taxation relief, in the presence of pure economic profits, is to allow the foreign authorities to fully tax profits earned within their borders. The commonly held belief that Home should prefer the tax deduction regime over a tax credit allowance appears not to hold when Foreign responds strategically.

Home may potentially do better, however, by permitting double taxation. This limits

Foreign's ability to tax MNE profits without imposing a change in market structure. Although the optimal solution to this problem is indeterminate, the worse Home can do is to either tax at a rate above $1-t_c^*$ so that Foreign blocks MNE entry or not tax at all. Either of these equilibrium outcomes will yield Home welfare results identical to those under a double taxation relief regime.⁶ For any Home tax rate other than $t^h=0$, Foreign is better off with double taxation relief which allows the full absorption of Foreign-earned MNE profits.

6. Concluding Remarks

This paper differs from earlier analyses in two respects. First, international taxation policy is endogenous as governments consider both firm and rival government reaction in establishing taxation regimes and rates. A second refinement is in the modelling of global market structure as endogenous. Firm number, plant number and location, and ownership are functions of the global tax structure. In this context, MNE investment abroad is treated as the application of corporate activities, such as research and development or administration, across borders. It is argued that home and host countries will tax strategically so that the combined burden of their taxes is not prohibitive of DFI. If the home country offers no double taxation relief infinite sets of equilibria taxes exist. Under home taxation regimes which provide alleviation of double taxation, such as credit or deduction for foreign taxes paid, the host will fully tax locally-earned economic profits.

Two key results emerge from this exercise. First, the traditional result that a deduction of foreign taxes paid on DFI is preferred to a credit is overturned. To the extent that taxation of DFI falls on pure economic profits these two taxation regimes result in identical effects on firm-level production and pricing as well as the international distribution of profits and tax revenues. This is because either form of double taxation relief afford primary taxing authority to the host government.

Previous analysis ignore the response of the host government and focus on portfolio effects of each regime in the global distribution of financial capital.

Second, it is shown that for the DFI's source country, no relief of double taxation weakly dominates both the tax credit and deduction regimes. The parent country's ability to tax MNE profits in effect limits the host country's taxing ability. This result is, in part, due to the MNE's ability to exit foreign markets when taxation becomes prohibitive.

This second result also poses an agenda for future analysis. One implication for net exporters of DFI is that by eliminating all relief of double taxation, welfare can be transferred from the host country with no global deadweight loss. Moreover, such a move might provide a better negotiating environment for an international taxation policy agreement whereby the gains of MNE production are more evenly distributed between home and host governments as well as the MNE's shareholders. Such an agreement would permit Foreign to tax at a rate above that critical rate (t_c^*) to prefer MNE over NE production but below unity. Home could gain by either the earning of tax revenue or through net repatriated profits from subsidiary operations.

Endnotes

1. Implicitly this assumes producers service only local markets. As in Horstmann and Markusen (1992), this case may arise when, for example, transport costs are relatively high so as to preempt exports.
2. It is acknowledged that a wide array of production options which characterize DFI may exist. For expository reasons, this simple example is considered.
3. See Appendix.
4. Note that prices are identical for each market structure.
5. Since Home credits Foreign taxes paid t^h is not a function of t^f .
6. Note that Foreign is not indifferent between these two tax rates but will prefer $t^h=0$.

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APPENDIX

The following proof shows that price is independent of profit taxes. The first-order conditions for profit maximization are:

$$(i) \quad \frac{\partial \pi^{mne}}{\partial X^h} = (1-t^h) \left[\frac{\partial p(X)}{\partial X} X^h + p(X) - \frac{w}{A(L_a^h)m} \right] + (1-t^*) \frac{\partial p(X)}{\partial X} X^f = 0$$

$$(ii) \quad \frac{\partial \pi^{mne}}{\partial X^f} = (1-t^h) \frac{\partial p(X)}{\partial X} X^h + (1-t^*) \left[\frac{\partial p(X)}{\partial X} X^f + p(X) - \frac{w}{A(L_a^h)m} \right] = 0$$

Divide (i) by (ii):

$$(iii) \quad \frac{(1-t^h) \left[\frac{\partial p(X)}{\partial X} X^h + p(X) - \frac{w}{A(L_a^h)m} \right]}{(1-t^h) \left[\frac{\partial p(X)}{\partial X} X^h \right]} = \frac{-(1-t^*) \left[\frac{\partial p(X)}{\partial X} X^f \right]}{-(1-t^*) \left[\frac{\partial p(X)}{\partial X} X^f + p(X) - \frac{w}{A(L_a^h)m} \right]}$$

Equation (iii) reduces to:

$$(iv) \quad \frac{\partial p(X)}{\partial X} (X^h + X^f) \left[p(X) - \frac{w}{A(L_a^h)m} \right] + \left[p(X) - \frac{w}{A(L_a^h)m} \right]^2 = 0$$

Divide both sides of equation (iv) by $\left[p(X) - \frac{w}{A(L_a^h)m} \right]$ and rearrange:

$$(v) \quad p \left(1 - \frac{1}{e_x} \right) = \frac{w}{A(L_a^h)m}; \quad \text{where } e_x = -\frac{\partial X}{\partial p} \frac{p}{X}$$

Equation (v), or equation (4) in the text, implies price is determined as a markup which is independent of tax policy.