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Credit and Deferral as International Investment Incentives

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ABSTRACT

The US government taxes the foreign income of American firms, using a system that grants credits for foreign taxes paid and permits tax deferral for unrepatriated income. This paper shows that the tax system encourages firms to restrict their equity stakes in new foreign investments, and to finance their new investments with considerable debt. These incentives are strongest for US investments in low-tax foreign countries, and exist even when transfer price regulation effectively limits the profit rates foreign subsidiaries can earn. The behavior of US multinationals in 1984 appears to reflect these tax incentives.

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1. Introduction.

Foreign direct investment plays an important part in the lives of modern economies. Tax policy has the ability to exert considerable influence over the level of new foreign investment, and the behavior of established foreign-owned firms. As a consequence, modern governments devote considerable effort to tailor their tax systems in order to the meet their own revenue needs while not excessively discouraging foreign investors. Naturally, in order to design effective tax systems, it is necessary to understand the incentives that foreign investors face.

The purpose of this paper is to analyze the effect of international tax systems on foreign direct investment, and in particular, to analyze the incentives built into worldwide tax systems that grant foreign tax credits and permit tax deferral for outbound investments. The United States uses such a system to tax the foreign earnings of subsidiaries of US corporations, and a number of other capital-exporting countries use similar systems.

The second section of this paper outlines the US system of taxing international income, and reviews earlier work on the impact of tax law on foreign investment decisions. Section three considers the impact of credit and deferral systems on the dynamic investment strategies US multinationals use in making foreign investments. It appears that investments in low-tax foreign countries - those investments that can get the most from exploiting tax credits and tax deferral - are likely to be restricted to rather low levels in their early stages. The reason is that, by keeping initial investment levels down, firms provide themselves profitable opportunities to reinvest their earnings as they accumulate, thereby creating greater opportunities for tax deferral than otherwise would be available.

One implication of this dynamic path, described in section three, is that investors who so restrict their initial foreign investment levels may find it profitable to make short-term loans to their foreign subsidiaries in the early years of the investments. Since the underinvestment phenomenon is likely to be most pronounced in low-tax foreign countries, the paradoxical result is that multinational parent firms located in high-tax countries may find themselves making loans to their subsidiaries in low-tax countries.

One difficulty that arises in analyzing the dynamic path of a subsidiary's growth is that production functions often imply that subsidiaries earn pure profits. The source of these profits is, presumably, either serendipity or the presence of intangible assets that the parent firm contributes to its subsidiary. The tax systems of most capital-exporting countries like the US do not permit their own firms to exploit their (home-country) patents, trademarks, and other intangibles to earn pure profits in foreign jurisdictions without somehow attributing the pure profit components to the home-country's taxing jurisdiction. One way in which this restriction applies in practice is that governments look critically at the profit rates of foreign affiliates, particularly those in low-tax foreign countries.

Section four reconsiders the incentives facing firms making foreign investments, taking as its premise that tax rules cap the allowable profit rates that foreign subsidiaries can earn. Under this assumption, the home-country parent corporation, and not the foreign subsidiary, becomes the residual claimant on the excess profits of a subsidiary's marginal investments. The section shows that some of the standard views (Hartman, 1985) of the investments incentives facing mature subsidiaries no longer hold if tax laws are enforced in this way, since the marginal investment decision turns, in part, on its effect on the allocation of profits between parent and subsidiary. This interpretation of the tax rules also carries important implications for the dynamic path of a subsidiary's capital accumulation, and indeed, appears to simplify the analysis relative to the more standard treatment of section three.

There remains the question of whether firms behave in a manner that is consistent with the incentives described. Section five examines financial flows from the foreign subsidiaries of US multinaionals to their parent corporations in 1984. The results suggest that interest payments (and, by implication, the debt levels of US subsidiaries) are sensitive to local tax conditions, which is an implication of models described in this paper (as well as many other models). The results in section five also contain a nonlinearity in the tax effect that is of unknown origin. Section six is the conclusion.

2. The Tax System, Its Interpretation and Application.

This section outlines the US system of taxing international corporate income, and reviews some earlier theoretical work on its implications. The focus in this section, as in the work that is reviewed, is on the US system of tax credits and tax deferral for foreign subsidiaries.

The US System of Taxing International Income

The United States taxes income on a residence basis, meaning that American corporations and individuals owe taxes to the US government on all of their worldwide income, whether earned in the United States or not. In order to avoid subjecting American multinationals to double taxation, US law provides a foreign tax credit for income taxes (and related taxes) paid to foreign governments. The US corporate tax rate is currently 34 percent. With the foreign tax credit, a US corporation that earns $100 in a foreign country with a 15 percent tax rate pays a tax of $15 to the foreign government and $19 to the US government, since its US corporate tax liability of $34 (34 percent of $100) is reduced to $19 by the foreign tax credit of $15.

The foreign tax credit is limited to US tax liability on foreign income. In the example, if the foreign tax rate were 50 percent, then the firm would pay $50 to the foreign government, and no taxes to the US government. The US firm would not receive a tax rebate from the US government, because its US foreign tax credit would be limited to $34. American corporations calculate their foreign tax credits on a worldwide basis, so that all foreign income and foreign taxes paid (possibly including income from many subsidiaries) are added together in the computation of the foreign tax credit limit. Hence a US firm receives full tax credits for its foreign taxes paid only when it is in a "deficit credit" position, i.e., when its average foreign tax rate is less than its domestic tax rate. A firm has "excess credits" if its available foreign tax credits exceed US tax liability on its foreign income.[1]

Deferral of US taxation of certain foreign earnings is another important feature of the US international tax system. A US parent firm is taxed on its subsidiaries' foreign income only when returned ("repatriated") to the parent corporation. This type of deferral is available only to foreign operations that are separately incorporated in foreign countries ("subsidiaries" of the parent) and not to consolidated ("branch") operations.[2] Multinationals choose the legal form of their foreign operations, and this choice affects their tax obligations. The US government taxes the profits of foreign branches of US companies as they are earned.[3]

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[1]Furthermore, income is broken into different functional "baskets" in the calculation of applicable credits and limits. In order to qualify for the foreign tax credit, firms must own at least 10 percent of a foreign affiliate and only those taxes that qualify as income taxes are creditable. In addition, there are some complications in the calculation of tax credits that are discussed further in the Appendix.

[2]The nomenclature is rather involved. All foreign operations take place through affiliates; those that are separately incorporated are subsidiaries.

[3]The deferral of US taxation may create incentives for US firms to delay repatriating dividends from their foreign subsidiaries. In 1962, Congress enacted the Subpart F provisions in part to prevent indefinite deferral of US tax liability on income earned abroad that is continually reinvested merely in order to escape US taxes. Subpart F rules apply to controlled foreign corporations (CFCs), which are foreign corporations owned at least 50 percent by US persons holding stakes of at least 10 percent each. The Subpart F rules include provisions that treat a CFC's passive income (and income invested in US property) as if that income were distributed to its American owners, so it is subject to immediate US taxation. CFCs that reinvest their earnings in active foreign businesses avoid the Subpart F restrictions and can continue to defer US tax liability on those earnings. The Tax Reform Act of 1986 further expands the coverage of Subpart F, and also makes currently taxable the income of American investors in passive foreign investment companies that do not qualify as CFCs because they do not meet the 50 percent ownership rule.

Steady State Implications

A number of studies analyze the incentives generated by the tax rules governing international investments, and in particular, the features of tax crediting and deferral. Horst (1977) assumes that multinationals maximize the sum of the after-tax earnings of the parent corporation and the after-foreign-tax eanrings of its foreign subsidiaries. He concludes that under credit and deferral the effective tax rate on a subsidiary's investment is a weighted average of foreign and US tax rates, with the weights determined by the subsidiary's dividend payout rate.

In an important paper, Hartman (1985) takes the position that the US system of taxing international income has no effect on the investment decisions of foreign subsidiaries of US multinationals, as long as those investments are financed out of the subsidiaries' retained earnings. The idea is that domestic taxes on repatriated dividends represent unavoidable costs: US taxes reduce the after-tax value of foreign profits, but multinational firms maximize the present value of profits nonetheless.

Consider the tax cost of dividends (D) paid from a foreign subsidiary to its American parent. Assume that the foreign country uses a classical corporate income tax system and imposes no withholding tax on dividends. Then the dividend payment does not change the foreign tax liability of the firm, but it does produce a US tax liability of:

$$Tax_{US} = \tau[D + FTC] - FTC \qquad (1)$$

in which τ is the US tax rate and FTC the foreign tax credit generated by the dividend payment.[4] For parent corporations that do not have excess foreign tax credits, and their subsidiaries that pay dividends out of current earnings, the foreign tax credit available on a dividend payment of D is:

$$FTC = (\tau^*\pi)\{D/[(1-\tau^*)\pi]\} = D\tau^*/(1-\tau^*) \quad (2)$$

in which τ^* is the foreign tax rate and π represents the (before-foreign-tax) earnings and profits of the subsidiary.[5]

Combining (1) and (2), US tax liability upon receipt of the dividend is:

$$Tax_{US} = D(\tau-\tau^*)/(1-\tau^*) \quad (3)$$

After-tax dividends then equal $D(1-\tau)/(1-\tau^*)$, and assuming the value of the firm (V) to be the discounted present value of after-tax dividends, (3) implies:

$$V = \sum_{j=0}^{\infty} \frac{D_j[(1-\tau)/(1-\tau^*)]}{(1+\Delta)^j} = [(1-\tau)/(1-\tau^*)] \sum_{j=0}^{\infty} \frac{D_j}{(1+\Delta)^j} \quad (4)$$

in which Δ is the discount rate that applies to after-tax receipts by the American parent corporation.

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[4]Note that, in equation (1), the dividend is "grossed up" by the amount of the foreign tax credit, which accords with US law. Tax liability is calculated this way to yield the US tax burden presented in (3).

[5]Note that the foreign tax credit is calculated, in (2), by multiplying total foreign taxes paid ($\tau^*\pi$) by the fraction of after-foreign-tax foreign profits represented by dividends $\{D/[(1-\tau^*)\pi]\}$. This follows US law (as clarified by the 1962 tax act), which uses this formula to assign foreign taxes paid by subsidiaries to dividends they remit. Complicated inventory rules apply when subsidiaries pay dividends that exceed their current-year after-foreign-tax profits.

A profit-maximizing firm maximizes the value of (4), selecting dividend payout policy to maximize the present value of the stream of D_j, discounted at Δ. Hartman (1985) observes that, if a firm pays dividends in two consecutive years, then maximizing the present value of D_j implies that $Q'(K^*_j)(1-\tau^*) = \Delta$, in which $Q'(K^*_j)$ is the marginal product of the subsidiary's reinvested capital in period j. This is the same condition that governs the reinvestment decisions of a multinational that is untaxed by its home country, and not surprisingly, since the dividend-cum-investment policy that maximizes the value of (4) also maximizes value if the home country imposes no taxes. As a consequence, the value of τ has no effect on the choice of D_j, except possibly if τ affects Δ.

Hartman's finding applies quite generally. In his 1985 article, he observes that the same condition - equality of the after-foreign-tax marginal product of capital with the discount rate, Δ - is also a characteristic of deduction and deferral systems, in which home countries require capital exporters to pay taxes on their after-foreign-tax foreign incomes without any tax credits to offset this tax liability. More generally still, consider a system in which home countries permit capital exporters to claim a tax credit equal to $\delta(\pi\tau^*)D/[\pi(1-\tau^*)]$. If $\delta = 1$ then this system is identical to the credit and deferral system Hartman analyzes; if $\delta = 0$ then this system is a deduction and deferral system. If, instead, $0 < \delta < 1$, then this system offers partial foreign tax credits.[6]

Applying (1), the US tax liability from this system is:

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[6]It is also straightforward to show that $\delta = [\tau(1-\tau^*)]/[\tau^*(1-\tau)]$ corresponds to an exemption tax system. The shadow value of foreign tax credits in practice is often well represented by a value of δ that lies between zero and one. The simplest case is one in which a firm has excess foreign tax credits, and carries forward the credits to future years. Under US law, foreign tax credits may be carried forward five years (with no adjustment for inflation), and the ex ante uncertainty of their ultimate use drives the value of δ (this year) below one. Even firms that use all of their foreign tax credits contemporaneously may not attach $\delta = 1$ value to foreign tax credits produced by subsidiaries located in high-tax foreign countries, since the repatriation of income from low-tax countries is, in part, endogenous to the availability of the credits. See Scholes and Wolfson (1992) for a discussion of the shadow value of foreign tax credits.

$$\text{Tax}_{US} = D[\tau-(1-\delta)\tau\tau^*-\delta\tau^*]/(1-\tau^*) \qquad (5)$$

and the value of the dividend stream becomes:

$$V = \sum_{j=0}^{\infty} \frac{D_j(1-\tau)[1-(1-\delta)\tau^*]/(1-\tau^*)}{(1+\Delta)^j} = (1-\tau)[1-(1-\delta)\tau^*]/(1-\tau^*) \sum_{j=0}^{\infty} \frac{D_j}{(1+\Delta)^j} \qquad (6)$$

in which, once again, maximizing the value of the firm is consistent with the same behavior that maximizes the value of (pre-US-tax) dividends, for a wide range of tax systems described by different values of δ.

Tax Base Differences

Hartman's analysis of the investment behavior of dividend-paying subsidiaries relies, in part, on the assumption that foreign governments define taxable income in the same way that home governments define taxable income. In practice, this is often not the case. For example, under US law the profits of foreign subsidiaries (used in the denominator of (2) to determine the FTC) are calculated using accounting rules that permit firms to depreciate new investments only with slow methods over long depreciable lifetimes, making the present value of those depreciation allowances small relative to their domestic counterparts.[7]

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[7]By way of contrast, American law prior to the passage of the Tax Reform Act of 1986 offered domestic investors generous treatment through accelerated depreciation, investment tax credits for certain assets, and other features. See Auerbach and Hines (1988) for an analysis of those investment incentives over the period 1953-1986.

Domestic and foreign income definitions often differ on other taxable income items, such as allowable interest deductions, appropriate transfer prices, head office charges, and the like. This paper focuses specifically on investment incentives, but these other definitions may be important as

If there is a difference between the foreign definition of taxable income and the home-country definition, the Hartman conclusion that the investment behavior of a dividend-paying subsidiary is unaffected by home-country taxation is no longer valid. The reason is that the subsidiary's dividend decision no longer turns just on the comparison between the after-tax value of a dividend this year and the dividend that could be paid (by reinvesting the money) the following year. If tax base definitions differ, any marginal investment that a subsidiary makes influences the foreign tax credits its parent company can claim for the inframarginal dividends the subsidiary was already paying.[8] This effect arises because marginal investements change the average foreign tax rate paid by the subsidiary, as calculated using the home-country tax base definintion.

The Appendix offers an analytic formulation of this effect. In addition to undermining the Hartman result, differences in tax base definitions carry two other implications. The first is that popular investment incentives, such as accelerated depreciation allowances for new investments, are likely to influence foreign investors less than they would local investors, even though foreign investors finance their new capital purchases out of retained earnings. The second is that there may be no steady state for dividend-paying subsidiaries. If, by paying a dividend, a subsidiary lowers the average rate of home-country taxation on all of its dividends, then the firm will find a steady subsidiary capital stock and dividend flow to be inferior to a cyclical pattern of high dividend payouts one year followed by small dividend payouts the following year.

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well.

[8]See Hines (1988), in which this argument is elaborated and its significance assessed by estimating the impact of tax base differences on effective tax rates facing mature US subsidiaries located in various foreign countries. Leechor and Mintz (1990) also make this point, and extend it to include differences in tax law definitions of interest deductions.

Dynamic Implications

The Hartman analysis describes mature subsidiaries that pay dividends. Studies by Stewart (1986), Newlon (1987), Altshuler and Fulghieri (1990), and Sinn (1990) analyze the dynamic path that subsidiary capital stocks and financial variables follow under a variety of tax regimes, including credit and deferral. Their findings are all consistent with Hartman's analysis of dividend-paying subsidiaries.[9]

3. Investment Incentives over the Life of a Subsidiary.

This section examines the effect of tax credits and deferral on the time pattern of investments by a multinational firm's foreign subisidiary. As in section two, I assume that the investment is undertaken by a parent corporation located in a country with tax laws similar to those of the US, and that the parent corporation does not have excess foreign tax credits.[10] In addition, I take there to be economies that require the parent firm and its subsidiary to be owned jointly; otherwise, tax arbitrage would give parent firms that are located in countries like the US incentives to sell off their subsidiaries to foreign investors who are not subject to US taxation.[11]

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[9]Newlon analyzes the dynamic path of the subsidiary's financing, arguing that debt will be employed by multinational firms along with equity at different times in the evolution of the subsidiary. Sinn (1990), which follows an earlier paper [Sinn (1991)] written independently of Newlon (1987) and the earlier version of this paper, offers the most complete analysis of the dynamic path of a subsidiary, but resticts the analysis to subsidiaries that cannot borrow or lend funds. Altshuler and Fulghieri (1990) devote considerable attention to the incentives faced by subsidiaries of parent firms with transiting state conditions such as excess foreign tax credit status.

[10]If the parent corporation has chronic excess foreign tax credits, then home-country tax rules become unimportant to the investment behavior of the subsidiary, except insofar as excess foreign tax credits may encourage the parent firm to finance its subsidiary with as much debt as possible.

[11]This incentive exists even though the proceeds of such a sale would be treated as a dividend for tax purposes. The reason that such a sale would be tax favored is that part of the sale proceeds would be classified as return of paid-in equity, and would be untaxed by the US. An alternative way to get around home-country taxation is for the parent corporation to move its site of legal residence, but this is not easily done; see Hines (forthcoming) for a discussion of the issues involved.

The Time Profile of a Profitable Subsidiary

Consider the incentives facing a firm that produces output with the production function $Q(K^*_t)$, in which K^*_t is the capital stock employed by the subsidiary in year t, and the $Q(\cdot)$ function subsumes profit-maximizing choices of labor and other inputs. For the moment, take Q to be output net of capital depreciation, and assume that both countries' tax systems apply true economic depreciation for tax purposes. Assume that the output is sold locally at an unchanging price, taken to be unity and parametric to the firm; units are defined so that the exchange rate between domestic and foreign currencies is one, and is constant over time. Assume further that the production function exhibits decreasing returns to scale, implying that the multinational may earn pure profits from its foreign operations.[12]

I assume that the parent firm chooses the real and financial policies of its subsidiary to maximize the present value of the parent's after-tax cash flow. As before, let Δ represent the factor used to discount after-tax cash flows (in the hands of the parent corporation). Denote by D_t the dividend payment from the subsidiary to the parent in period t; by assumption, $D_t \geq 0$. Denote by E_t the flow of equity funds from the parent to the subsidiary in period t. Note that it is possible that $E_t < 0$, but only in the case in which the subsidiary has already paid out all of its after-tax foreign

[12]As Hartman's analysis demonstrates, subsidiaries pay dividends only once capital accumulation drives down the marginal product of their capital sufficiently. Subsidiaries might never reach that point if they can invest their retained earnings in new firms or in asset markets. Passive investments in capital markets are subject to Subpart F treatment under US law, but, as Hines and Rice (1990) show, may dominate dividend repatriations if the rate of return is high enough. Historically, US firms have not reported very much income subject to Subpart F (see the data reported in Hines and Hubbard, 1990), and, for the remainder of the paper, I assume that low rates of return make investment in passive assets an unattractive alternative to dividend repatriations.

profits, since tax laws do not permit equity repatriation until profit repatriation is complete. Home countries do not treat the repatriation of initial equity as taxable income.[13]

Let S_t denote the stock of accumulated parent equity in the subsidiary. Introduce a new state variable, K, defined as the net worth of the subsidiary; K_t equals S_t plus accumulated reinvested profits. Let B_t denote the level of borrowing by the subsidiary, and r* the interest rate the subsidiary faces on this borrowing.

The parent maximizes the present value of the stream:

$$[D_t(1-\tau)/(1-\tau^*) - E_t]\, e^{-\Delta t} \tag{7}$$

subject to the constraints that:

$$D_t,\ B_t,\ S_t,\ K_t \geq 0 \tag{8}$$

Either (i) $E_t \geq 0$, or (ii) $(S_t - K^*_t) \geq 0$, or (iii) both $E_t \geq 0$ and $(S_t - K^*_t) \geq 0$ (9)

$$dK_t/dt = \{[Q(K^*_t) - r^*B_t](1-\tau^*) - D_t + E_t\} \tag{10}$$

$$dS_t/dt = E_t \tag{11}$$

$$K^* = K_t + B_t \tag{12}$$

The current-value Hamiltonian corresponding to the maximization of (7) subject to (8)-(12) is:

$$H = [D_t(1-\tau)/(1-\tau^*) - E_t] + \lambda_1\{[Q(K_t+B_t) - r^*B_t](1-\tau^*) - D_t + E_t\}$$
$$+ \lambda_2E_t + \lambda_3D_t + \lambda_4B_t + \lambda_5S_t + \lambda_6K_t + \lambda_7E_t[1 - \lambda_8(S_t-K_t)] \tag{13}$$

[13]This is the basis of Jun's (1989) explanation of some curious features of the financial flows between US parent companies and their foreign affiliates. For an alternative explanation, see Hines and Hubbard (1990).

in which the multipliers λ_1 and λ_2 correspond to the laws of motion of the state variables K_t and S_t, respectively, and the multipliers λ_3 - λ_8 reflect the inequality constraints in (8) and (9).

The first-order conditions that characterize the maximum of (13), assuming the appropriate continuity conditions to hold, are:

$$\partial H/\partial D_t = [(1-\tau)/(1-\tau^*)] - \lambda_1 + \lambda_3 = 0 \quad (14)$$

$$\partial H/\partial E_t = -1 + \lambda_1 + \lambda_2 + \lambda_7[1 - \lambda_8(S_t-K_t)] = 0 \quad (15)$$

$$\partial H/\partial B_t = \lambda_1(1-\tau^*)[Q'(K^*_t) - r^*] + \lambda_4 = 0 \quad (16)$$

while the costate equations are:

$$\partial H/\partial K_t = \lambda_1 Q'(K^*_t)(1-\tau^*) - \Delta\lambda_1 + \lambda_6 + \lambda_7\lambda_8 E_t = -d\lambda_1/dt \quad (17)$$

$$\partial H/\partial S_t = \lambda_5 - \Delta\lambda_2 - \lambda_7\lambda_8 E_t = -d\lambda_2/dt \quad (18)$$

There are several aspects of subsidiary behavior implied by conditions (14)-(18). The first is standard in the analysis of foreign tax credits and deferral: that subsidiaries in low-tax locations do not simultaneously receive equity transfers and pay dividends. For mature firms with positive net equity, $\lambda_2 = 0$, $\lambda_5 = 0$, and $\lambda_8 = 0$. Then (14) and (15) imply:

$$[(1-\tau)/(1-\tau^*)] + \lambda_3 = 1 - \lambda_7 \quad (19)$$

or:

$$\lambda_3 + \lambda_7 = [(\tau-\tau^*)/(1-\tau^*)] > 0 \quad (20)$$

The multiplier λ_3 corresponds to the constraint that dividends are nonnegative, while λ_7 corresponds to the constraint that equity infusions are nonnegative. Since the two multipliers sum to a positive number, at least one of the constraints must bind, and the subsidiary does not simultaneously pay dividends and receive equity transfers.

A second lesson of (14)-(18) is that, from (16), subsidiaries borrow funds from their parent firms (or from third parties) as long as $Q'(K^*_t) \geq r^*$.

A third implication of (14)-(18) is that the financing arrangements of the subsidiary are discontinuous in time. Consider first the steady state; the steady state of the subsidiary is, as Hartman showed, achieved when $Q'(K^*_t)(1-\tau^*) = \Delta$. Equation (17) illustrates this condition: for a mature subsidiary paying dividends (and with positive net worth), the value of K^*_t is unchanging, and so, therefore, is $Q'(K^*_t)$. Since $E_t = 0$ for such a subsidiary, and $\lambda_6 = 0$, it must be the case that $d\lambda_1/dt = -\lambda_1[\Delta - Q'(K^*_t)(1-\tau^*)]$. Since the subsidiary pays dividends in the steady state, $\lambda_3 = 0$, and from (14), $\lambda_1 = [(1-\tau)/(1-\tau^*)] \neq 0$; consequently, the steady state value of $Q'(K^*_t)(1-\tau^*) = \Delta$.

Prior to the steady state, the value of λ_1 steadily declines over time, since $-d\lambda_1/dt = \lambda_1[Q'(K^*_t)-\Delta](1-\tau^*) > 0$. Differentiating (15), and imposing that $\lambda_2 = \lambda_8 = 0$ yields that $d\lambda_7/dt = -d\lambda_1/dt > 0$. The implication is that the parent transfers equity to its subsidiary (so that $E_t > 0$ and $\lambda_7 = 0$) either in the initial period or never. The parent cannot transfer equity to its subsidiary in more than one instance, since a continuously declining λ_7 cannot take the value zero more than once. Similarly, differentiating (14) yields that $d\lambda_3/dt = d\lambda_1/dt < 0$ prior to the steady state. Hence λ_3 takes the value zero, and dividends are positive, only in the steady state.

Finally, it should be noted that the (mathematical) complications that surround the repatriation of initial equity, and the associated values of λ_2, λ_6, and λ_8, are not important, since the subsidiary stays in the steady state (with $Q'(K^*_t)(1-\tau^*) = \Delta$ and $d\lambda_1/dt = 0$) once capital accumulation proceeds far enough to drive down the marginal product of capital sufficiently.

Explanation and Some Difficulties

Figure one illustrates the pattern just described. The idea is that a subsidiary is financed in the beginning with (possibly) some equity and some debt. There are several possible regimes; figure one pictures the standard case. In this case, the subsidiary is funded initially with E_0 in equity. Let $\Gamma(\cdot)$ be the inverse function of the marginal product of capital, so that $\Gamma(Q'(K^*)) = K^*$. A subsidiary borrows to finance its investments as long as $Q'(K^*_t) \geq r^*$. In a frictionless capital market, subsidiary borrowing guarantees that this condition is met with equality, and that the physical capital employed by the subsidiary never falls below $\Gamma(r^*)$. If $E_0 < \Gamma(r^*)$, then the subsidiary borrows funds, initially, to make up the difference: $B_0 = \Gamma(r^*) - E_0$.

The net worth of the subsidiary then increases over time, as the subsidiary reinvests all of its after-foreign-tax profits, thereby retiring debt at an increasing rate (since profits increase and interest charges fall over time). During this phase, the physical capital employed by the subsidiary does not change. At a certain point (t_1 in figure one), the subsidiary accumulates enough net worth that $S_t \geq \Gamma(r^*)$, and there is no need (or profitable capacity) to borrow any more. From that point on, the subsidiary grows through reinvesting its earnings, until the marginal product of capital is driven down to the value identified by Hartman: $Q'(K^*_t) = \Delta/(1-\tau^*)$. At this point ($t_2$ in figure one), the subsidiary's capital stock equals $\Gamma[\Delta/(1-\tau^*)]$, and the subsidiary stops accumulating; henceforward, it pays annual dividends equal to its net output, and keeps at the same capital stock indefinitely.

It is instructive to consider the financing of the subsidiary in its early stages. In choosing E_0, the firm balances the advantage of starting the dividend stream sooner with the cost of sinking more equity investment (which is never returned) in its subsidiary. It is unclear what effect τ^* has on the level of E_0. Low foreign tax rates imply that the subsidiary grows quickly through reinvesting its after-tax profits, since lower tax rates correspond to higher after-tax rates of return. Low tax rates also make deferral more attractive. Both of these considerations suggest that lower tax rates would be associated with low values of E_0. On the other hand, low foreign tax rates also raise the value of the subsidiary. By raising the value of the subsidiary, low foreign tax rates make future dividend streams more valuable, and encourage parent firms to invest higher levels of E_0 in order to trigger dividend streams earlier. Furthermore, low foreign tax rates raise the level of the steady-state capital stock of the subsidiary ($\Gamma[\Delta/(1-\tau^*)]$), encouraging additional initial investment.

The implication of the dynamic model is that tax rates have an ambiguous effect on E_0. Sinn (1990) finds the same ambiguity in his analysis of credit and deferral systems in which subsidiaries cannot borrow investment funds. There are other, related, ambiguities. For example, it is not clear whether the initial level of E_0, or for that matter K^*_t, exceeds the level that firms would rationally invest in the presence of accrual taxation (rather than deferral). There are sporadic proposals to eliminate deferral in order to reduce the volume of US capital exported.[14] But the comparison between capital invested abroad under accrual and deferral systems turns on complicated considerations. Under accrual taxation, the subsidiary invests up to the point at which $Q'(K^*_t)(1-\tau) = \Delta$, unless $r^* < [\Delta/(1-\tau)]$, in which case the subsidiary is financed with debt, and initial investment levels are identical under deferral and accrual taxation systems. If, instead, $r^* \geq [\Delta/(1-\tau)]$, the subsidiary would be financed with equity, and it is not clear which system generates greater initial investment.

There is another source of ambiguity as well. There is nothing in the first-order conditions that guarantees that $E_0 > 0$, or that $E_0 < \Gamma(r^*)$. Consequently, it is possible that the subsidiary is financed with no parent equity, or alternatively, with no borrowing.[15]

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[14]See, for example, McIntyre (1989).

[15]This assumes, of course, that local tax authorities would permit (in the first case) such thin financing of a subsidiary. Newlon (1987) offers a proof that debt is used before the period of internal growth of the subsidiary, but the proof misses the possibility that $E_0 > \Gamma(r^*)$. No doubt responsibility for this oversight must be borne in part by the members of his Ph.D. committee.

It is unfortunate that it is not possible to isolate clearly the effect of taxes on financial behavior. But one of the most serious limitations of this analysis is that the subsidiary earns pure profits. The existence of pure profits immediately raises a problems concerning the intercompany pricing rules.

Subsidiaries in low-tax foreign countries are tax-disadvantaged relative to local firms; hence, if they earn pure profits, these must arise either by luck or through association with their parent companies. The home-country sources of these rents - such as the parent company's research and development, home office services, trademarks, and the like - must, according to section 482 of the US Internal Revenue Code, receive fair compensation from the foreign subsidiary in the form of rent and royalty payments. But the available models contain no provision for such payments.

4. Investment Incentives with Regulated Returns.

The difficulty with the formulations just considered is that subsidiaries earn pure economic profits. These pure profits are problematic, since their sources are not identified in the model. In what follows, I assume that the parent company undertakes some activity that makes the subsidiary profitable. This activity might be one of many things, including advertising in the home country, spending money to develop patents or enhance market share, driving out competitors, and other daily business activities.

Under US law, and the laws of most other developed, capital-exporting countries, it is incumbent on the foreign subsidiary to remit rents or royalties to its parent company in return for the intangible that is responsible for the pure profits it earns. These rents and royalties are taxable in the receiving country, and can be deducted from taxable income in (most) paying countries. Royalties should, in principle, reflect the true economic value provided by the parent to the subsidiary.

For the purpose of the following analysis, I will assume that the royalty is chosen to afford the subsidiary a normal (before-tax) return on capital invested. This assumption represents a reasonable interpretation of the impact of Section 482 and related legislation designed to prevent firms from transferring profits to tax-favored foreign locations. Indeed, rates of return typically are used by the courts in determining the appropriateness of royalties and transfer prices.[16]

Static Implications

One consequence of tax legislation that effectively regulates profit rates is that the decision to pay a dividend this year influences not only the dividends that can be paid in future years, but also the royalty that the subsidiary is required to pays to the parent.

Consider the generalized foreign tax credit system described in section two, in which the home country imposes the tax indicated in (5) upon payment of a dividend equal to D. Denote by ρ the rate of return on subsidiary capital imposed by tax authorities. The value of $1 paid as a dividend this year is, from (5), $[1-\tau^*(1-\delta)](1-\tau)/(1-\tau^*)$. By deferring the dividend payment one year, the subsidiary could instead pay a dividend of $[1+\rho(1-\tau^*)]$, with value $[1+\rho(1-\tau^*)][1-\tau^*(1-\delta)](1-\tau)/(1-\tau^*)$. In addition, the parent firm's royalty receipt from its subsidiary would drop by an amount equal to the difference between ρ and the marginal product of the dollar reinvested; the after-tax value of this difference is $(1-\tau)[Q'(K^*_t)-\rho]$. A subsidiary that pays dividends in two consecutive years must be indifferent between these two alternatives. Equality of the two present values (taking $[1+\Delta]$ to be discount factor) implies:

$$Q'(K^*_t)(1-\tau^*) = \Delta - (1-\delta)\tau^*[\Delta-\rho(1-\tau^*)] \tag{21}$$

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[16]See Berry et al. (1992) for a critical discussion of recent decisions. The reason that rates of return are used has to do with the vast complexity that surrounds the analysis of separate profitability.

Equation (21) indicates that the Hartman result holds either if $\delta = 1$ (the home country grants full foreign tax credits for foreign taxes paid), or if it happens that $\rho(1-\tau^*) = \Delta$. It is striking that the Hartman result for foreign tax credit systems is resilient to such a change in the interpretation of the tax rules. If, however, the multinational receives only partial foreign tax credits, or is subject to full taxation after foreign taxes are deducted, then home country taxation influences the size of the subsidiary's capital stock in the steady state. Higher values of ρ, the regulated rate of return, correspond to higher values of $Q'(K^*_t)$, and (generally) lower steady-state values of K^*_t. It is noteworthy, however, that home-country taxation influences capital accumulation by a subsidiary through δ and ρ, and not through the domestic tax rate τ.

Dynamic Implications

The regulation of subsidiary profit rates simplifies the analysis of growing subsidiaries, since their growth rates depend on regulations rather than the precise form of their production functions. Unfortunately, the investment behavior of regulated subsidiaries still generally depends on the shape of their production functions, since the level of royalties paid to parents depends on the inframarginal returns subsidiaries earn. In this section, I consider full foreign tax credit systems ($\delta = 1$) and one case in which it is possible to obtain a closed-form solution for the growth path of the subsidiary: the case in which the after-local-tax rate of interest in the foreign country $[r^*(1-\tau^*)]$ is equal to the after-tax rate of interest in the home country [i.e., $r(1-\tau) = r^*(1-\tau^*)$]. In addition, I assume firms discount cash flows at the after-tax domestic interest rate $[\Delta = r(1-\tau)]$, and that subsidiaries are regulated to earn before-tax rates of return equal to the before-tax domestic interest rate ($\rho = r$).

It is clear that the subsidiary's dynamics must, again, involve underinvestment up front, followed by subsequent accumulation of equity. The interest rate assumption implies that the stock of *physical* capital employed by the subsidiary does not change over the lifetime of the subsidiary, since the subsidiary will borrow enough capital initially to drive its marginal product down to the point identified by Hartman.[17] After the initial period, the subsidiary reinvests all of its profits to drive out debt in the early stages of its development, followed by immediately arriving in the steady state once debt is gone.

Consider a subsididary that starts with an initial equity infusion of E_0, and earns a (regulated) after-foreign-tax return of $E_0r(1-\tau^*)$. After t periods, the stock of equity is: $E_0\exp\{r(1-\tau^*)t\}$. Accumulation so described will continue until the stock of initial plus reinvested equity equals the stock of (physical) capital, at which time the subsidiary will start to pay dividends to its parent.

How long will it take for equity to build up within the subsidiary sufficiently that it drives out all of the debt? Let K_T denote the steady-state stock of physical capital in the subsidiary. Then, if the time required for equity to reach this level is denoted by T, it will be the case that:

$$K_T = E_0\exp\{r(1-\tau^*)T\} \tag{22}$$

and T is given by:

$$T = [\ln(K_T) - \ln(E_0)]/[r(1-\tau^*)] \tag{23}$$

Once the steady-state capital stock is reached, the value of the subsidiary (net of royalty payments) is given by $K_T[(1-\tau)/(1-\tau^*)]$. Then the present value of the subsidiary, as of the moment initial equity (E_0) is injected, equals:

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[17]This can be verified by noting that the Hartman condition implies that $Q'(K_T)(1-\tau^*) = \Delta = r(1-\tau)$, or that $Q'(K_T) = r(1-\tau)/(1-\tau^*)$. The interest rate assumption implies that $r^* = r(1-\tau)/(1-\tau^*)$, so the subsidiary always borrows enough capital in the first period to ensure that its capital stock equals the steady state level identified by Hartman.

$$V(E_0) = K_T[(1-\tau)/(1-\tau^*)]\exp\{-r(1-\tau)T\} \tag{24}$$

Transforming (22), it is straightforward to show that:

$$\exp\{-r(1-\tau)T\} = [E_0/K_T]^{(1-\tau)/(1-\tau^*)} \tag{25}$$

Consequently, (24) and (25) imply:

$$V(E_0) = K_T[(1-\tau)/(1-\tau^*)]\ [E_0/K_T]^{(1-\tau)/(1-\tau^*)} \tag{26}$$

The firm then chooses E_0 to maximize the total value of the project, inclusive of the cost of startup equity. The optimal level of E_0 can be obtained by differentiating (26) with respect to E_0,

$$V'(E_0) = K_T^{(\tau-\tau^*)/(1-\tau^*)}\ [(1-\tau)/(1-\tau^*)]^2\ E_0^{(\tau^*-\tau)/(1-\tau^*)} \tag{27}$$

and setting the value of $V'(E_0)$ equal to unity. With some manipulation, this yields:

$$E_0 = K_T\ [(1-\tau)/(1-\tau^*)]^{2(1-\tau^*)/(\tau-\tau^*)} \tag{28}$$

Equation (28) indicates that the initial equity injection is a linear function of the steady-state level of capital stock, and a nonlinear function of the difference in the tax rates τ and τ^*. The striking feature of (28) is that the shape of the production function does not affect E_0 at all. The difference between E_0 and K_T is driven only by the difference in the tax rates.

One question that naturally arises is the effect of τ^* on E_0. Glancing at (28) offers some intuition that E_0 may be larger at higher values of τ^*. It is, after all, only via the relationship $\tau^* < \tau$ that $E_0 < K_T$ in the first place.

From (28), the derivative of E_0 with respect to τ^* (holding K_T constant) is:

$$dE_0/d\tau^* \quad = \quad [2E_0/(\tau-\tau^*)]\ \{1 + [(1-\tau)/(\tau-\tau^*)]\ln[(1-\tau)/(1-\tau^*)]\} \tag{29}$$

While (29) has the look of taking either positive or negative values, it is straightforward to show that $\tau > \tau^*$ implies that $dE_0/d\tau^* > 0$. Perhaps surprisingly, high-tax areas attract more initial equity investment than do low-tax areas, as a fraction of total capital invested.[18] While it is difficult to generalize from analysis based on a single set of assumptions, it is important to bear in mind that low tax rates need not always be associated with higher investment levels.

Investment Riskiness and its Implications

Up to this point, the subsidiary and parent firm have been assumed to operate in a world of perfect certainty. The role of uncertainty is, as a practical and theoretical matter, likely to be very important. Some insight into its importance can be obtained by glancing at (27), which indicates that the value of the subsidiary is a uniformly concave function of invested equity. Once money is invested in the subsidiary and the growth process started, a subsidiary would not (or, more likely, should not) take a fair bet with an unrelated party. Note that this does not apply to risks that involve overall valuation of the subsidiary, such as exchange rate risks: a risk-neutral firm should be indifferent to such risks.

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[18]Of course, the assumption that after-tax rates of return are equalized means that high-tax foreign areas also have the highest before-tax interest rates, a feature that may well have a chilling effect on firms' desires to borrow.

5. Evidence from US Multinationals in 1984.

Short of estimating international investment equations, there are few straightforward tests of the implications of the models described in this paper. Nevertheless, some interesting patterns appear in the data concerning the behavior of US multinationals.

Empirical Applications

A number of recent studies apply the Hartman model to estimate the impact of taxes on international investment. Since the Hartman framework implies that τ should have no effect on investments out of retained earnings, several authors run regressions of foreign direct investment by US multinationals, including the US tax rate as a right-hand-side variable. Balance of payments data on foreign direct investment conveniently distinguish between investments out of retained earnings and investments financed by new equity transfers. The Hartman model is taken to imply that investments should be unaffected by home-country taxation. By contrast, the standard assumption is that investments financed by new equity transfers are affected by home-country taxes.

A typical specification of the foreign direct investment process regresses the level of foreign investment, scaled by national income in the host country, on variables reflecting gross rates of return, taxes, and time trends.[19] US data is used to explain the level of direct investment abroad by US companies as well as the level of foreign direct investment by foreign firms in the United States. To summarize these aggregate investigations, it appears that the after-foreign-tax rate of return in host countries affects foreign investment out of retained earnings, but that tax variables usually perform poorly in explaining investment out of initial fund transfers.

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[19]This literature is summarized recently in Slemrod (1990). The more important studies in it include Hartman (1981, 1984), Boskin and Gale (1987), Newlon (1987), Slemrod, and Jun (1989). While specifications and data differ, the conclusions are roughly similar.

Interpreting these regressions within the framework of the Hartman model encounters several difficulties, including problems common to the analysis of empirical investment equations: investment decisions are sensitive to marginal returns, while the analyst can observe only average returns; the use of a stock-flow framework requires a prior specification of adjustment processes; the treatment of expectations is usually unsatisfactory; and coefficients may be biased by the presence of significant measurement error.

Furthermore, these investment function specifications face three problems that are specific to their international contexts. First, the Hartman model implies that, for any given mature subsidiary, investment out of retained earnings is unaffected by its home-country tax rate. This is not the same thing as implying that aggregate investments out of retained earnings will be unaffected. Since host country tax rates affect the level of initial equity transfers, and hence the scale and number of ongoing operations by multinational subsidiaries,[20] they also should affect the aggregate level of reinvested earnings, even if the last are simply constant functions of subsidiary size. Second, the model applies only to subsidiaries that actually make dividend repatriations. As the data reported in Hines and Hubbard (1990) show, fewer than 20% of the foreign subsidiaries of US multinationals paid dividends to their American parents in 1984. Third, tax rates are not sufficiently exogenous for the investment equation to be validly estimated by least squares. A country's unobservable (to the econometrician) characteristics that influence its desirability as a location for new investment are very likely to be correlated with its tax rate: Ireland offers tax holidays for new investment in order to attract capital that otherwise would be located in a country with more infrastructure and closer proximity to large markets.

[20]And furthermore the choice between organizing operations as a branch or a subsidiary. This paper does not dwell on that aspect of firm choice, but it is worth keeping in mind that focusing attention on the aggregate behavior of subsidiaries may overlook the endogeneity of organizational form.

There is already considerable support for the view that subsidiaries experience a period of internally-funded growth during their development. Hines and Hubbard (1990) report that 84% of US controlled foreign corporations (representing 67% of the total assets of all US controlled foreign corporations) made zero dividend payments to their American parent firms in 1984. Altshuler and Newlon (1991) report similar findings for US controlled foreign corporations in 1986.

Interest Payments in 1984

The goal of this section is to evaluate the degree to which the behavior of the foreign subsidiaries of US corporations is consistent with the dynamic models described in sections 3 and 4, and to do so in a way that is not quite as sensitive to local unobservables as standard investment equations are. If the models are taken seriously, then interest payments by subsidiaries to their parent corporations are the product of interest rates, foreign capital stocks, and their indebtedness ratios; while before-tax subsidiary profit is a function of capital employed. Consequently, the ratio [Interest payment/(Profits + Interest payment)] reflects simply the interest rate used and the degree to which a subsidiary is financed with debt from the parent.

Table 1 reports some summary statistics for financial flows from subsidiaries to their US parents in 1984. Table 2 reports regressions of the ratio [Interest payment/(Profits + Interest payment)] on tax rates faced by US controlled foreign corporations located in various foreign countries in 1984.[21] One can think of these regressions as representing reduced-form second-order approximations to the effect of tax rates on financing. Data on the behavior of US firms were drawn from Bradford (1990); they suffer from all the usual problems of aggregation, mixing excess foreign tax credit firms with deficit foreign tax credit firms, the difficulty of measuring the appropriate

[21]Countries were excluded from the sample if, on aggregate, US firms had negative earnings and profits in 1984.

foreign tax rate, and so on. The striking feature of the regressions reported in the first two columns of Table 2 is that the tax effect, which, taken singly, is zero, exhibits considerable curvature: higher tax rates at the low end encourage borrowing, while higher tax rates at the high end discourage it. Some of this effect may have to do with the use of interest plus rents and royalties as a dependent variable, but the effect is striking nevertheless.

Another implication of the model is that dividend-paying firms are, if located in low-tax jurisdictions, not the same firms that borrow. Consequently, the propensity to borrow to finance initial investments can be estimated by removing dividends from before-tax profits, as a way of removing (some of) the effect of mature firms on the sample. The results are similar to those obtained without removing dividends. Similarly, Table 3 offers an analysis of the maturity structure of firms in different countries, represented by interest payments relative to dividends, as a function of local tax rates. The results are quite similar to those reported in Table 2.

6. Conclusion.

Domestic and foreign tax policies affect the investment behavior of multinational firms, and do so in important ways. The tax law encourages firms to defer dividend payments from foreign subdidiaries to their parent companies; knowing that, firms have incentives to limit the initial capitalization of their subsidiaries in order to permit profits to accumulate for lengthy periods of time within subsidiaries. This effect is present even when tax authorities effectively regulate the profits that subsidiaries can earn. Hence one may not observe significant transfers of investment funds from parent companies even to those subsidiaries located in attractive investment locations. Further, one expects (and sees) that many subsidiaries pay no dividends at all to their parent companies, and that interest flows from subsidiaries to parents are sensitive to local tax conditions. It appears, therefore, that tax policy influences foreign investment behavior with more subtlety than just by pushing capital from high-tax to low-tax locations, and that these subtle influences carry important implications for the multinational firms that undertake foreign investment.

Appendix:

Investment Tax Incentives and Mature Subsidiaries

This appendix reconsiders Hartman's steady-state analysis of the investment incentives faced by mature foreign subsidiaries of US multinationals in the context of actual US taxation of foreign income. The point of the appendix is that, in fact, home country tax systems generally do affect marginal investment decisions of mature foreign subsidiaries, and that, in particular, home country tax laws may ameliorate the impact of widely used tax incentives such as investment tax credits and accelerated depreciation. Furthermore, the effect of home-country taxation is often to create a situation in which there exists no steady state for the foreign subsidiary.

US tax law defines foreign investment income somewhat differently than it does domestic investment income, and this distinction can very important to investors. New foreign investments in plant and equipment receive very unfavorable tax treatment relative to investments in the United States, and relative to the tax treatment they receive in most foreign countries.

Consider a firm facing the standard credit and deferral system described by equations (1)-(3). In order to analyze the effect of this differential treatment of foreign and domestic investment incentives, it is necessary to reformulate (2) in order to take explicit account of the definition of taxable income. Let π_f represent the subsidiary's foreign taxable income as defined by the foreign host country, and π_{US} its taxable income as defined by the United States. For example, if a foreign subsidiary earns 100 of gross profit abroad and the foreign government allows 20 of interest deductions against that income, then π_f equals 80. It is entirely possible that the same activity might be allocated an interest deduction of 40 by the U.S. government, so π_{US} would be 60. Let β represent the ratio of U.S.-defined income to foreign-defined income:

$$\beta \equiv \pi_{US}/\pi_f \qquad \text{(A1)}$$

The US government grants indirect foreign tax credits based on the fraction of *US-definition* after-tax foreign income repatriated by subsidiaries as dividends. Hence the foreign tax credit is:

$$\text{FTC} \;=\; D[\pi_f\tau^*/(\pi_{US} - \tau^*\pi_f)] \qquad \text{(A2)}$$

Foreign tax credit calculations as represented in (A2) do not fundamentally change the rest of the foreign tax story; net US tax liability is still calculated as in (1), with the result that:

$$\text{Tax}_{US} \;=\; \tau D\{1 + [\tau^*\pi_f/(\pi_{US} - \tau^*\pi_f)]\} - D[\pi_f\tau^*/(\pi_{US} - \tau^*\pi_f)] \;=\; D(\beta\tau-\tau^*)/(\beta-\tau^*) \qquad \text{(A3)}$$

Then dividends after US taxes equal:

$$\text{Net dividends} \;=\; D\beta(1 - \tau)/(\beta - \tau^*) \qquad \text{(A4)}$$

And it is the present discounted value of (A4) that firms maximize, not the present value described in (4). Naturally, the two problems yield the same solution if β is always constant. But, in fact, β may vary, and furthermore the firm's investment decisions affect β through a variety of channels. One of the most important of these channels is the provision of investment incentives through accelerated depreciation schedules and related measures.

As a general matter, β is likely to be a function both of the dividends paid by the foreign subsidiary, and of the capital stock (and earnings) of the subsidiary, and can be written $\beta(D_t, K_t)$. Other variables, such as previous years' investments and dividends, may also be important. One example of a system in which β is a function of current dividends and current capital is the case in which foreign and American governments use first-year capital recovery allowances in place of depreciation schedules.[22] With this scheme, a foreign subsidiary of an American firm investing I_t in year t gets an immediate tax deduction of $I_t z$ against its US-definition foreign income and $I_t z^*$ against its taxable income in the foreign country, in which z and z* represent the expected present values of depreciation allowances actually provided in the law. The effective tax rate on foreign investments, ignoring the tax due to the US upon repatriation, is then a function of z* as well as the foreign statutory tax rate. Take this effective foreign tax rate to be τ^*.

Until 1986, the US tax system used the average (US-definition) foreign tax rate in the most recent applicable year to calculate deemed-paid foreign tax credits that accompany dividend repatriations.[23] These depreciation allowances were considerably less generous than those permitted by governments, such as Canada and the UK, that offered investors accelerated depreciation in order to attract new investment.

Replacing $D_t(1-\tau)/(1-\tau^*)$ in (7) with the expression for net dividends in (A4), the firm's current-value Hamiltonian becomes:

$$\begin{aligned} H \;=\; & [D_t(1-\tau)\beta/(\beta-\tau^*) - E_t] + \lambda_1\{[Q(K_t+B_t) - r^*B_t](1-\tau^*) - D_t + E_t\} \\ & + \lambda_2 E_t + \lambda_3 D_t + \lambda_4 B_t + \lambda_5 S_t + \lambda_6 K_t + \lambda_7 E_t[1 - \lambda_8(S_t-K_t)] \end{aligned} \tag{A5}$$

the first-order conditions of which are identical to those obtained in section 3, with two exceptions: equation (14) is now replaced by:

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[22]As proposed by Auerbach and Jorgenson (1980) in the domestic context. Their idea was to minimize investor risk arising from inflation-rate uncertainty. It is intended here to simplify some of the analysis by restricting the number of state variables.

[23]U.S. tax law changed in 1986 to introduce multi-year "pooling" of foreign earnings and dividends to prevent perceived manipulation of the foreign tax credit system by multinational firms. The "pooling" method still produces foreign tax credits that are sensitive to the issues described in this section, albeit in a more complicated way than was true before passage of the 1986 act.

$$\partial H/\partial D_t = [(1-\tau)\beta/(\beta-\tau^*)] - \tau^* D_t(1-\tau)(\partial\beta/\partial D_t)/(\beta-\tau^*)^2 - \lambda_1 + \lambda_3 = 0$$

$$= [(1-\tau)\beta/(\beta-\tau^*)]\{1 - \tau^*\eta/(\beta-\tau^*)\} - \lambda_1 + \lambda_3 = 0 \qquad \text{(A6)}$$

in which $\eta \equiv D(\partial\beta/\partial D)/\beta$, the elasticity of β with respect to D. In addition, (17) is replaced by:

$$\partial H/\partial K_t = \lambda_1 Q'(K^*_t)(1-\tau^*) - \tau^* D_t(1-\tau)(\partial\beta/\partial K_t)/(\beta-\tau^*)^2 - \Delta\lambda_1 + \lambda_6 + \lambda_7\lambda_8 E_t = -d\lambda_1/dt \qquad \text{(A7)}$$

It is abundantly clear, from (A7), that $Q'(K^*_t)(1-\tau^*) = \Delta$ is no longer the condition for the steady state of the subsidiary, since now there is an additional term, $\tau^* D_t(1-\tau)(\partial\beta/\partial K_t)/(\beta-\tau^*)^2$, in the equation of motion for λ_1. If $(\partial\beta/\partial K_t)$ is nonzero, then $\lambda_6 = \lambda_8 = 0$ no longer is sufficient for the Hartman condition to hold.

It is worth considering the likely signs of $(\partial\beta/\partial K_t)$ and $(\partial\beta/\partial D_t)$. Consider the case of a foreign country that offers attractive investment incentives, so that $z^* > z$. For a subsidiary with a net worth close to the steady state identified by Hartman, marginal investments are likely to raise the value of β, since marginal effective tax rates for countries with investment incentives are typically well below average effective tax rates.[24] Consequently, one can expect that $(\partial\beta/\partial K_t) > 0$ and $(\partial\beta/\partial D_t) < 0$. From (A7), then, the steady-state condition requires that $Q'(K^*_t)(1-\tau^*) > \Delta$.

There is, however, another complication that arises in this analysis, one that is difficult to resolve in a satisfactory manner. The complication is that the steady-state condition [that $d\lambda_1/dt = 0$ in (A7)] may not be consistent with the second-order condition corresponding to the maximum

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[24]Note that this is as much a statement about the longevity of attractive investment incentives as it is a statement about accounting definitions of profits. In some steady states, average and marginal tax rates are equal. For the purposes of the current analysis, it is not necessary to consider whether such a steady state would exist; instead, assume that foreign investment incentives have recently been introduced (z^* was increased), so marginal and average foreign tax rates differ.

described by (A6). To see this, recall that the second-order condition for maximizing firm value is that $\partial^2 H/\partial D^2 \leq 0$. Differentiating (A6) with respect to D yields:

$$\partial^2 H/\partial D^2 = [\beta(1-\tau)\tau^*/(\beta-\tau^*)^2]\{\partial\eta/\partial D - (\partial\beta/\partial D)[1 - 2\tau^*\eta/(\beta-\tau^*)]\} \quad \text{(A8)}$$

which, if $(\partial\beta/\partial D) < 0$ and is sufficiently large in absolute value, may imply that $\partial^2 H/\partial D^2 > 0$ when the steady-state condition of (A7) is satisfied. Consequently, it may often be inappropriate to consider the steady-state behavior of subsidiaries facing investment tax incentives.[25] The reason is that a subsidiary, by paying out more today and less tomorrow, may raise the creditable foreign tax rate on many of the repatriated dividends.

Implications

The analysis suggests that local investment incentives are of only limited attractiveness to subsidiaries that repatriate some of their current-year earnings. For firms that do so, their profits are taxed at the home-country rate anyway. The tax incentives described by (A7) become important as the distinction between z and z* gets larger. Since the practice of the US government has been to deny US multinationals generous treatment of depreciation allowances on their foreign investments, it is likely that US tax policy has discouraged investment by US multinationals in countries that offer tax incentives for new invesments.

Hines (1988) offers estimates of effective tax rates for US multinationals located in various foreign countries in 1982, comparing the effective tax rates for strictly domestic firms located in those

[25]Leechor and Mintz (1990) examine whether a subsidiary will settle in a steady state configuration over its debt/equity choices, but go on to consider the steady-state behavior of firms with investment incentives, assuming that such a steady state exists and represents the optimal choice on the part of the firm. Altshuler and Fulghieri (1990), and, in truth, Hines (1988) also consider steady states without confirming that they exist.

countries, firms that face only the local tax code, with those for mature US multinationals. The effective tax rates for U.S. multinationals are calculated using the steady-state equivalent of (A7). It is clear from the results that the US tax law can substantially reduce the incentives for US multinationals to reinvest their profits in some countries. Of the five countries analyzed, Canada, [what was then] West Germany, the United Kingdom, Japan, and Brazil, two of them, Canada and the United Kingdom, offered firms significant investment tax incentives in the form of generous depreciation rules in 1982. For Canadian firms operating in Canada the effective tax rate on new investments that year was 19%; for United Kingdom firms investing in the UK the effective tax rate was 21%. But for internally-financed US multinationals, the effective tax rates were much higher: 37% in Canada and 53% in the United Kingdom. In the other countries, with similar income definitions to that in the United States, the effective tax rates were little different for US multinationals.

References

Altshuler, R. and P. Fulghieri (1990), "Incentive Effects of Foreign Tax Credits on Multinationals", Columbia University Department of Economics Discussion Paper No. 478.

Altshuler, R. and T.S. Newlon (1991), "The Effects of U.S. Tax Policy on the Income Repatriation Patterns of U.S. Multinational Corporations", NBER Working Paper No. 3925.

Auerbach, A.J. and J.R. Hines (1988), "Investment tax incentives and frequent tax reforms," ***American Economic Review***, Papers and Proceedings 78: 211-216.

Auerbach, A.J. and D. Jorgenson (1980), "Inflation-proof depreciation of assets," ***Harvard Business Review*** 58: 113-118.

Berry, C.H., D.F. Bradford, and J.R. Hines (1992), "Arm's-Length Pricing: Some Economic Perspectives", ***Tax Notes*** 54: 731-740.

Boskin, M.J. and W.G. Gale (1987), "New results on the effects of tax policy on the international location of investment," in M. Feldstein ed., ***The Effects of Taxation on Capital Accumulation*** (Chicago: University of Chicago Press).

Bradford, J.J. (1990), "Controlled Foreign Corporations, 1984: A Geographic Focus", ***SOI Bulletin*** 9:115-134.

Goodspeed, T.J. and D.J. Frisch (1989), "U.S. Tax Policy and the Overseas Activities of U.S. Multinational Corporations: A Quantitative Assessment", mimeograph, U.S. Treasury Department.

Hartman, D.G. (1981), "Domestic Tax Policy and Foreign Investment: Some Evidence," NBER Working Paper No. 784.

Hartman, D.G. (1984), "Tax policy and foreign direct investment in the United States," ***National Tax Journal*** 37: 475-488.

Hartman, D.G. (1985), "Tax policy and foreign direct investment," ***Journal of Public Economics*** 26: 107-121.

Hines, J.R. (1988), "Taxation and U.S. multinational investment," in L.H. Summers ed., ***Tax Policy and the Economy*** (Cambridge: MIT Press).

Hines, J.R. (forthcoming), "The Flight Paths of Migratory Corporations", ***Journal of Accounting, Auditing, and Finance***.

Hines, J.R. and R.G. Hubbard (1990), "Coming home to America: Dividend repatriations by U.S. multinationals," in A. Razin and J. Slemrod eds. ***Taxation in the Global Economy*** (Chicago: University of Chicago Press).

Hines, J.R. and E.M. Rice (1990), "Fiscal Paradise: Foreign Tax Havens and American Business", NBER Working Paper No. 3477.

Horst, T. (1977), "American taxation of multinational firms," ***American Economic Review*** 67: 376-389.

Jun, J. (1989), "What is the Marginal Source of Funds for Foreign Investment?", NBER Working Paper No. 3064.

Leechor, C. and J. Mintz (1990), "On the Taxation of Multinational Corporate Investment when the Deferral Method is Used by the Capital Exporting Country", mimeograph, University of Toronto.

McIntyre, R.S. (1989), "Tax Americana," ***The New Republic***, March 27, 18-20.

Newlon, T.S. (1987), "Tax policy and the multinational firm's financial policy and investment decisions," unpublished Ph.D. dissertation, Princeton University.

Scholes, M.S. and M.A. Wolfson (1992), ***Taxes and Business Strategy: A Planning Approach*** (Englewood Cliffs, NJ: Prentice Hall).

Sinn, H.-W. (1990), "Taxation and the Birth of Foreign Subsidiaries", NBER Working Paper No. 3519.

Sinn, H.-W. (1991), "The Vanishing Harberger Triangle", ***Journal of Public Economics*** 45:271-300.

Slemrod, J. (1990), "Tax effects on foreign direct investment in the United States: Evidence from a cross-country comparison," in A. Razin and J. Slemrod eds. ***Taxation in the Global Economy*** (Chicago: University of Chicago Press).

Stewart, M.B. (1986), "U.S. tax policy, intrafirm transfers, and the allocative efficiency of transnational corporations," ***Public Finance*** 41: 350-371.

FIGURE 1

THE OPTIMALLY-FINANCED SUBSIDIARY

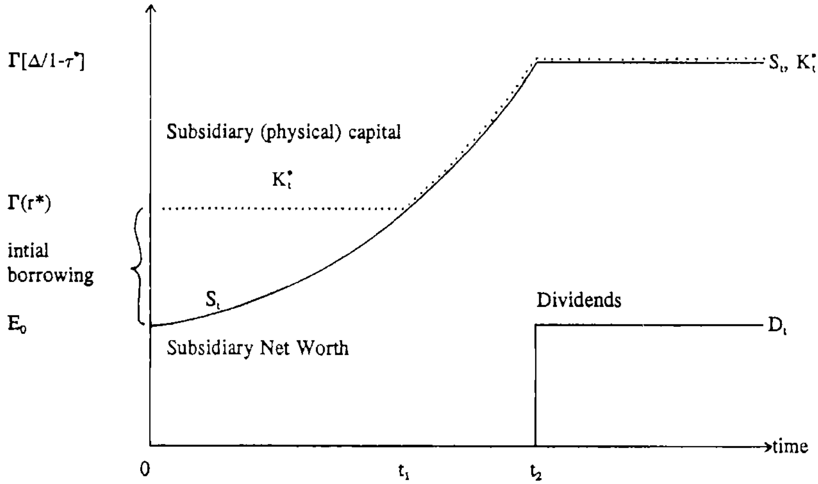

TABLE 1

SAMPLE CHARACTERISTICS

VARIABLE	MEAN	STANDARD DEVIATION
Int/[Prof+Int]	0.1440	0.1282
Int/[Prof+Int-Div/(1-τ^*)]	0.2244	0.1937
ln[Int/Div]	-0.6616	1.4282
ln[Int(1-τ^*)/Div]	-1.1821	1.4979
τ^*	0.3794	0.1769
τ^{*2}	0.1747	0.1349

NOTE: These variables are constructed from country-by-country aggregate data on the activities of US controlled foreign corporations (CFCs) in 1984. The variable "Int" is interest, rent, and royalty payments from CFCs to their US parents; "Prof" is the before-tax earnings and profits (net of interest payments) of US CFCs; and "Div" is dividend payments from CFCs to their US parents. The variable τ^* is the average (local) foreign tax rate paid by US CFCs in 1984.

TABLE 2

SUBSIDIARY BORROWINGS AND FOREIGN TAX RATES

	DEPENDENT VARIABLE:			
	Int/[Prof+Int]		Int/[prof+Int-Div/(1-τ^*)]	
constant	0.1387 (0.0330)	0.0329 (0.0414)	0.1908 (0.0517)	0.0315 (0.0628)
τ^*	0.1388 (0.7877)	0.7584 (0.2796)	0.0886 (0.1342)	1.2094 (0.3831)
τ^{*2}		-1.0112 (0.3654)		-1.5223 (0.4840)
R^2	0.0004	0.078	0.007	0.083
$\hat{\sigma}$	0.1294	0.1254	0.1948	0.1888
n	57	57	57	57

NOTE: These regression results are based on the country-by-country aggregate behavior of US controlled foreign corporations (CFCs) in 1984. The variable "Int" is interest, rent, and royalty payments from CFCs to their US parents; "Prof" is the before-tax earnings and profits (net of interest payments) of US CFCs; and "Div" is dividend payments from CFCs to their US parents. The variable τ^* is the average (local) foreign tax rate paid by US CFCs in 1984. Values in parentheses are heteroskedasticity-corrected standard errors.

TABLE 3

INTEREST PAYMENTS, DIVIDENDS, AND FOREIGN TAX RATES

	DEPENDENT VARIABLE:			
	ln[Int/Div]		ln[Int(1-τ^*)/Div]	
constant	-0.4719 (0.4377)	-1.6714 (0.5884)	-0.3472 (0.4517)	-1.7196 (0.5928)
τ^*	-0.4999 (1.1711)	7.9392 (3.9732)	-2.2006 (1.2223)	7.4556 (4.0186)
τ^{*2}		-11.4626 (5.7326)		-13.1158 (5.8138)
R^2	0.004	0.084	0.068	0.163
$\hat{\sigma}$	1.4384	1.3921	1.4595	1.3957
n	57	57	57	57

NOTE: These regression results are based on the country-by-country aggregate behavior of US controlled foreign corporations (CFCs) in 1984. The variable "Int" is interest, rent, and royalty payments from CFCs to their US parents; "Prof" is the before-tax earnings and profits (net of interest payments) of US CFCs; and "Div" is dividend payments from CFCs to their US parents. The variable τ^* is the average (local) foreign tax rate paid by US CFCs in 1984. Values in parentheses are heteroskedasticity-corrected standard errors.