Chapter 28

INTERNATIONAL TAXATION*

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Abstract

The integration of world capital markets carries important implications for the design and impact of tax policies. This paper evaluates research findings on international taxation, drawing attention to connections and inconsistencies between theoretical and empirical observations.

Diamond and Mirrlees (1971a,b) note that small open economies incur very high costs in attempting to tax the returns to local capital investment, since local factors bear the burden of such taxes in the form of productive inefficiencies. Richman (1963) argues that countries may simultaneously want to tax the worldwide capital income of domestic residents, implying that any taxes paid to foreign governments should be merely deductible from domestic taxable income.

Governments do not adopt policies that are consistent with these forecasts. Corporate income is taxed at high rates by wealthy countries, and most countries either exempt foreign-source income of domestic multinationals from tax, or else provide credits rather than deductions for taxes paid abroad. Furthermore, individual investors can use various methods to avoid domestic taxes on their foreign-source incomes, in the process avoiding taxes on their domestic-source incomes.

Individual and firm behavior also differs from that forecast by simple theories. Observed portfolios are not fully diversified worldwide. Foreign direct investment is common even when it faces tax penalties relative to other investment in host countries. While economic activity is highly responsive to tax rates and tax structure, there are many aspects of behavior that are difficult to reconcile with simple microeconomic incentives.

There are promising recent efforts to reconcile observations with theory. To the extent that multinational firms possess intangible capital on which they earn returns with foreign direct investment, even small countries may have a degree of market power, leading to fiscal externalities. Tax avoidance is pervasive, generating further fiscal externalities. These concepts are useful in explaining behavior, and observed tax policies, and they also suggest that international agreements have the potential to improve the efficiency of tax systems worldwide.

Keywords

fiscal externalities, foreign direct investment, international taxation, multinational corporations, tax avoidance, transfer pricing, tax havens

JEL classification: H87, H25, F23, H21, F32

1. Introduction

The design of sensible tax policies for modern economies requires that careful attention be paid to their international ramifications. This is a potentially daunting prospect, since the analysis of tax design in open economies entails all of the complications and intricacies that appear in closed economies, with the addition of many others, since multiple, possibly interacting, tax systems are involved. These complications are no less harrowing for a researcher interested in studying the impact of taxation in open economies. Fortunately, the parallel development of theoretical and empirical research on taxation in open economies offers straightforward and general guidance for understanding the determinants and effects of tax policies, as well as their normative significance. The purpose of this chapter is to review the analysis of international taxation, drawing connections to research findings that are familiar from the analysis of taxation in closed economies.

The rapid development of open-economy tax analysis in the last fifteen or so years differs sharply from previous patterns, when the bulk of the academic research on taxation posited that the national economy was closed. In this literature the implications for tax policy of international trade and international factor movements typically consisted of a short discussion at the conclusion of a long analysis. In studies of closed economies, real and financial activity cannot cross international borders, so that prices clear each national market separately. This restriction to a closed economy characterized not only much of the theoretical work on optimal tax policy but also most of the general equilibrium models of the effects of taxes, e.g., Fullerton, Shoven and Whalley (1978) or Auerbach and Kotlikoff (1987), and even most of the econometric studies of tax policy and behavior.

To be fair, the assumption of a closed economy was widely thought to have been an adequate approximation of at least the American economy over much of the postwar period. As seen below, this assumption also succeeded in eliminating many complications that otherwise must be faced in thinking about tax policy. However, with the growing importance not only of international trade in goods and services but also of multinational corporations, together with increasing integration of world capital markets, it is becoming more and more important to rethink past work on tax policy in an open economy setting.

As described in Section 2 below, many aspects of tax policy analysis are affected by the openness of the economy. For example, while in a closed economy it does not matter whether a proportional tax is imposed on income from saving or income from investment (since aggregate saving equals aggregate investment), in an open economy this equivalence no longer holds. Furthermore, taxpayer responses to policy changes can look very different once the implications of an open economy are taken into account. In a closed economy, the analysis of the incidence of a tax on saving or investment depends on its effect on the market clearing interest rate, which in equilibrium depends on the price elasticities of both individual savings and firms' factor demand for capital. In contrast, in a small open economy, the interest rate

is determined by the world capital market, so is unaffected by a tax. Similarly, the incidence of commodity taxes becomes simpler in a small open economy, since the relative prices of at least tradable goods are again set on world markets and therefore do not respond to tax changes [1]. Results on factor price equalization even suggest that market wage rates should not be affected by tax policy, in spite of the lack of mobility of people across borders. In all of these cases, the absence of price changes means that quantity changes will be larger, generally raising the implied efficiency costs of tax distortions.

A greater complication is that the range of behavioral responses to tax policy becomes broader in an open economy setting. This paper explores in detail the types of behavioral responses that theory forecasts, and that appear in practice. Differential income tax rates on profits earned by different industries can change the pattern of trade flows, leading to increased exports from industries receiving more favorable tax treatment. The location decisions of firms earning above normal profits are likely to be particularly sensitive to tax differentials. Individual investors not only choose among domestic debt and equity securities but can also invest in equivalent securities abroad. Similarly, taxes can affect the financial as well as operational behavior of multinational firms. Not only do tax rates affect choices of where to locate foreign affiliates, but taxes also influence the optimal scale of foreign operations, the location of borrowing, research activity, exports, and a host of other decisions. A multinational firm has a certain degree of discretion in choosing the prices used to conduct transactions between members of its affiliated group, allowing it to report accounting profits in tax-favored locations.

All of these aspects of behavior depend on the tax systems of home and foreign countries. A country's tax base and even its comparative advantage therefore depend on differences between tax structures across countries. As a result, in any analysis of policy setting, the nature of interactions among tax policies in different countries becomes an important issue. To the extent that international tax competition makes tax policies in one country a function of those in other countries, the importance of such interactions is magnified.

Any analysis of tax policy in an open economy setting must reconcile the frequent inconsistency of observed behavior with the forecasts from simple models. Standard models of portfolio choice, for example, forecast that risk-averse investors will hold diversified portfolios of equities issued worldwide, yet observed portfolios tend to be heavily specialized in domestic equity. The standard assumption of costless mobility of capital across locations appears to be inconsistent with the evidence that domestic savings is highly correlated with domestic investment. As seen below, the behavior of multinational firms is also frequently inconsistent with the forecasts of standard

[1] World markets greatly dampen the price effects of tax changes from the standpoint of a small open economy, but since these price changes apply to a very large world economy, their net effect on world welfare need not be negligible.

models. Furthermore, observed tax policies often deviate sharply from those predicted by standard models. As the chapter argues in section five, some of the added considerations that have been used to explain observed individual and firm behavior may also help explain observed tax policies.

Section 2 of this chapter reviews the theory of optimal tax-setting in open economies, starting with the problems faced by governments of small countries. Section 3 generalizes these implications to a more realistic setting. Section 4 focuses on taxes and portfolio choice, in an attempt to reconcile the theory with the observed "home bias". Section 5 surveys evidence of the impact of taxation on the activities of multinational firms, while Section 6 offers a reconciliation of the evidence of behavior of taxpayers and governments in open economies.

2. Optimal income taxation in an open economy

This section considers the implications of optimal tax theory for the design of taxes in open economies. For additional detail on optimal tax structures, see Auerbach and Hines (2002) in Volume 3 of this Handbook.

The nature of optimal tax policy often depends critically on whether the economy is open or closed. The importance of this distinction is evident immediately from the difference that economic openness makes for tax incidence. In a closed economy, the incidence of a tax on the return to capital depends not only on the elasticity of saving with respect to the interest rate but also on the elasticity of factor demands and the elasticity of consumer substitution between capital-intensive and labor-intensive goods. The presumption has been that, for plausible elasticities, the burden of a corporate income tax falls primarily on capital owners.

In a small open economy, in contrast, a tax on the return to domestic capital has no effect on the rate of return available to domestic savers[2], since the domestic interest rate is determined by the world capital market. Domestic investment falls in response to higher tax rates. For firms to continue to break even, in spite of the added tax, either output prices must rise or other costs must fall by enough to offset the tax. When output prices are fixed by competition with imports, the tax simply causes the market-clearing wage rate to fall. As a result, the burden of the tax is borne entirely by labor or other fixed domestic factors. While a labor income tax would also reduce the net wage rate, it would not in contrast distort the marginal return to capital invested at home vs. abroad. Following Diamond and Mirrlees (1971a,b), a labor income tax dominates a corporate income tax, even from the perspective of labor[3]. As a result, one immediate and strong conclusion about tax policy in an open economy setting is

[2] This follows from the standard assumptions that capital is costlessly mobile internationally and there is no uncertainty.

[3] Dixit (1985) provides a detailed and elegant development of this argument.

that a "source-based tax" on capital income should not be used since it is dominated by a labor-income tax.

2.1. Choice of tax instrument

It is useful to illustrate this finding in a simple setting in which the government has access to various tax instruments, at least including a source-based tax on capital, a payroll tax, and consumption taxes on any nontraded goods. The country is small relative to both the international capital market and the international goods markets, so takes as given the interest rate, r^*, on the world capital market, and the vector of prices, p^*, for traded goods.

Resident i receives indirect utility equal to $v_i(p^* + s, p_n + s_n, r^*, w(1-t)) + V_i(G)$, where p_n represents the vector of prices for nontraded goods, s and s^* respectively represent the sales tax rate on tradables and nontradables, r^* represents the rate of return to savings available on the world capital market, w equals the domestic wage rate, t is the tax rate on labor income, and G is a vector of government expenditures.

Each dollar of capital employed by domestic firms faces a tax at rate τ. Domestic firms have constant returns to scale, and operate in a competitive environment, so must just break even in equilibrium. Therefore, the unit costs for firms in each industry must equal the output price in that industry. Using c and c_n to denote the costs of producing traded and nontraded goods, respectively, equilibrium requires that, for traded goods[4], $c(r^* + \tau, w) \geq p^*$, while for nontraded goods $c_n(r^* + \tau, w) = p_n$. Since the country is assumed to be a price taker in both the traded goods market and the capital market, it follows immediately that firms in the traded sector continue to break even when τ increases only if the wage rate falls by enough to offset the added costs due to the tax. This implies that

$$\frac{dw}{d\tau} = -\frac{K}{L}, \tag{2.1}$$

in which K/L is the equilibrium capital/labor ratio in these firms[5]. Hence, the effect of taxation on domestic factor prices is determined by competition in traded goods industries.

For firms selling nontradables, the market-clearing price of their output must adjust to ensure that these firms continue to break even. The break-even condition is given by $p_n q_n = K_n(r^* + \tau) + L_n w$, in which q_n is the quantity of nontraded output, and K_n

[4] This equation is satisfied with an equality whenever the good is produced domestically.

[5] Note that this implies specialization in one particular industry, since this condition cannot simultaneously be satisfied for different industries selling tradables that have different capital/labor ratios. In equilibrium, a higher tax rate will cause the country to specialize in a less capital-intensive industry. See Lovely (1989) for further discussion.

and L_n are quantities of capital and labor used in its production. Differentiating this condition, and imposing Equation (2.1), implies that

$$\frac{\mathrm{d}p_n}{\mathrm{d}\tau} = \frac{L_n}{q_n}\left(\frac{K_n}{L_n} - \frac{K}{L}\right). \tag{2.2}$$

Prices rise in sectors of the economy that are more capital intensive than the traded goods sector, and fall in sectors that are more labor intensive.

Consider the government's choice of τ. By increasing τ, individuals are affected only indirectly, through the resulting drop in the market-clearing wage rate and through changes in the market-clearing prices of nontradables[6]. The same changes in effective prices faced by individuals could equally well have been achieved by changing appropriately the payroll tax rate t, and the sales tax rates s_n. From an individual's perspective, an increase in τ is equivalent to changes in the payroll tax rate, t, and the sales tax rates s_n, that generate the same changes in after-tax wages and prices.

Since these alternative policies are equivalent from the perspective of individual utility, holding G fixed, it is possible to compare their relative merits by observing what happens to government revenue as τ rises, while the payroll tax rate t, and the sales tax rates s_n are adjusted as needed to keep all consumer prices unaffected. Given the overall resource constraint for the economy, the value of domestic output, measured at world prices, plus net income from capital exports/imports must continue to equal the value of domestic consumption and saving plus government expenditures. Therefore[7],

$$p_g G = p^* [f(S + K_m, L_a) - (C + S)] - r^* K_m, \tag{2.3}$$

in which p_g measures the production cost of each type of government expenditure, $f(\cdot)$ is the economy's aggregate production function, S measures the net savings of domestic individuals, C is their consumption, K_m measures capital imports/exports, and L_a is aggregate labor supply.

If τ increases, but its effect on consumer prices is offset through suitable readjustments in the payroll tax and in sales tax rates, then S, C, and L will all remain unaffected. Welfare is maximized if the tax rates are chosen so that the resulting value of K_m maximizes the value of resources available for government expenditures. Given the aggregate resource constraint, this implies that $p^* f_K = r^*$. Firms would choose this allocation, however, only if $\tau = 0$. Under optimal policies, therefore, there should be no source-based tax on capital. Any capital tax prevents the country from taking full advantage of the gains from trade.

[6] Note that individual returns to saving are unaffected by τ, since this is a tax on investment in the domestic economy, while returns to saving are fixed by the world capital market.

[7] The discussion is simplified here by ignoring government purchases of nontradables. Tax changes do affect the prices of nontradables, but they imply equal changes in both government revenue and expenditures, so that these price changes have no net effect on the government budget.

The choice of tax instrument carries implications for optimal levels of government expenditure. Since the use of source-based capital taxes entails a higher welfare cost than does the alternative of raising revenue with wage and sales taxes, it follows that welfare-maximizing governments constrained to use capital taxes will generally spend less on government services than will governments with access to other taxes. Of course, one might wonder why an otherwise-optimizing government would resort to capital taxes in a setting in which welfare-superior alternatives are available. A number of studies put this consideration aside, constraining the government to use capital taxes, in order to analyze the implications of tax base mobility for government size[8].

In cases in which individual utility functions are additively separable in private and public goods, optimal government spending levels are lower with capital taxes whenever marginal deadweight losses increase with tax levels. This conclusion follows directly from the preceding analysis, since at any given individual welfare level capital taxation generates less tax revenue than does wage and sales taxation. Optimal government spending requires that the marginal cost of raising additional revenue equal the marginal benefits of government services. Consequently, if the marginal cost of raising revenue is an increasing function of tax levels, then moving from wage to capital taxation entails lower utility levels, higher marginal costs for any given spending level, and therefore reduced government spending. While there are odd circumstances in which the marginal cost of raising revenue falls at higher tax rates[9], more standard cases entail rising marginal costs, and therefore smaller government if funded by capital taxes.

This model can also be used to analyze the optimal tax rate on income from savings. Analysis of the optimal taxation of capital income in a closed economy [reviewed by Auerbach and Hines (2002)] is largely unaffected when cast in a small open economy. Since the before-tax interest rate is unaffected by the tax, the incidence of the tax now falls entirely on capital owners. As a result, the change in savings due to a tax change can be larger than in a closed economy, but wage rates will be unaffected. The same distributional considerations that might lead a government to tax savings in a closed economy may justify such a tax as well in an open economy.

The results derived by Diamond and Mirrlees (1971a,b) still imply that production will be efficient under an optimal tax system, as long as there are no relevant restrictions on the types of commodity taxes or factor taxes available. As a result, under such a "residence-based tax" on capital, residents should face the same tax rate on their return to savings regardless of the industries or countries in whose financial securities they invest[10]. These results also imply that foreign investors in the domestic

[8] See, for example, Wilson (1986), Zodrow and Mieszkowski (1986) and Hoyt (1991).

[9] See, for example, Atkinson and Stern (1974), and the discussion in Auerbach and Hines (2002) in Volume 3 of this Handbook.

[10] Naito (1999) shows, however, that these results no longer necessarily hold once one drops the assumption that different types of workers are perfect substitutes in production. Without this assumption,

economy should not be taxed – in a small open economy domestic workers would bear the burden of the tax.

Another immediate implication of the findings of Diamond and Mirrlees concerning productive efficiency under an optimal tax system is that a small open economy should not impose differential taxes on firms based on their location or the product they produce. This not only rules out tariffs but also differential corporate tax rates by industry. As shown by Razin and Sadka (1991b), this equilibrium set of tax policies implies that marginal changes in tax policy in other small countries will have no effects on domestic welfare. Behavioral changes in some other small economy can induce marginal changes in trade patterns or capital flows. Such changes in behavior have no direct effect on individual utility by the envelope condition. They therefore affect domestic welfare only to the degree to which they affect government revenue. Under the optimal tax system, however, marginal changes in trade patterns or capital imports also have no effect on tax revenue. Therefore, there are no fiscal spillovers under the optimal tax system, and the Nash equilibrium tax structure among a set of small open economies cannot be improved on through cooperation among countries.

2.2. Taxation of foreign income

The taxation of foreign income under an optimal residence-based tax system has received particular attention. When host countries impose source taxation on income earned locally by foreign investors, the use of residence-based taxation in capital exporting countries raises the possibility that foreign investment income might be double taxed. From a theoretical standpoint it is tempting to discount this possibility, since while countries may well choose to tax the income from savings that individuals receive on their worldwide investments, they should not find it attractive to impose source-based taxes on the return to capital physically located within their borders. In practice, however, all large countries impose corporate income taxes on the return to capital located therein. As a result, cross-border investments are taxed both in host and home countries. The combined effective tax rate could easily be prohibitive, given that corporate tax rates hovered near 50% in the recent past. To preserve cross-border investments, either the home or the host government must act to alleviate this double taxation. While the theory forecasts that such prohibitive tax rates would not arise because host governments would not tax this income, what instead happens is that home governments have offered tax relief of some sort on the foreign income earned by resident firms and individuals.

The modern analysis of this issue started with the work of Peggy Richman (1963), who noted that countries have incentives to tax the foreign incomes of their residents while allowing tax deductions for any foreign taxes paid. This argument reflects

a marginally higher tax rate on capital in industries employing primarily skilled labor, for example, will be borne primarily by skilled workers, providing a valuable supplement to a nonlinear income tax.

incentives to allocate capital between foreign and domestic uses, and can be easily illustrated in a model in which firms produce foreign output with a production function $f^*(K^*, L^*)$ that is a function of foreign capital and labor, respectively, and produce domestic output according to $f(K, L)$, a function of domestic capital and labor. All investments are equity financed, and the foreign government taxes profits accruing to local investments at rate τ^*. From the standpoint of the home country, the total returns (the sum of private after-tax profits plus any home-country tax revenues[11]) to foreign investment are:

$$[f^*(K^*, L^*) - w^*L^*](1 - \tau^*), \tag{2.4}$$

while total returns to domestic investment are:

$$[f(K, L) - wL]. \tag{2.5}$$

For a fixed stock of total capital ($\bar{K}$), the allocation of capital between domestic and foreign uses that maximizes the sum of Equations (2.4) and (2.5) subject to the constraint that $(K^* + K) \leqslant \bar{K}$ satisfies:

$$\frac{f_k}{f_k^*} = (1 - \tau^*). \tag{2.6}$$

If the home country imposes a tax on domestic profits at rate τ, then to preserve the desired allocation of capital expressed by Equation (2.6), it must also tax foreign profits *net of foreign taxes* at the same rate τ. Denoting the residual home country tax on foreign profits by τ_r, a firm receives $[f^*(K^*, L^*) - w^*L^*](1 - \tau^* - \tau_r)$ from its investment in the foreign market, and $[f(K, L) - wL](1 - \tau)$ from its investment in the domestic market; profit-maximizing capital allocation therefore implies:

$$\frac{f_k}{f_k^*} = \frac{1 - \tau^* - \tau_r}{1 - \tau}. \tag{2.7}$$

Equation (2.7) is consistent with Equation (2.6) only if $\tau_r = \tau(1 - \tau^*)$, which means that the home government subjects after-tax foreign income to taxation at the same rate as domestic income. The logic of this outcome is that, from the standpoint of the home country government, foreign tax obligations represent costs like any other (such as wages paid to foreign workers), and should therefore receive analogous tax treatment.

[11] This formulation treats private income and government tax revenue as equivalent from a welfare standpoint, which is sensible only in a first-best setting without other distortions. Horst (1980), Slemrod, Hansen and Procter (1997), Keen and Piekkola (1997) and Hines (1999b) evaluate the impact of various tax and nontax distortions on the optimal tax treatment of foreign income.

In practice, most tax systems do not in fact tax foreign income in this way. Richman offers the interpretation that governments may adopt policies designed to enhance world rather than national welfare. She notes that, from the standpoint of home and foreign governments acting in concert, the appropriate maximand is the sum of pre-tax incomes:

$$\left[f^*(K^*, L^*) - w^*L^*\right] + \left[f(K, L) - wL\right]. \tag{2.8}$$

Maximizing the sum in Equation (2.8) subject to the capital constraint yields the familiar condition that $f_k^* = f_k$, which, from Equation (2.7), is satisfied by decentralized decision makers if $\tau_r = (\tau - \tau^*)$. As will be described shortly, this condition is characteristic of the taxation of foreign income with full provision for foreign tax credits, a policy that broadly describes the practices of a number of large capital exporting countries, including the United States.

3. Tax complications in open economies

This section considers extensions of the simple model of optimal taxation in open economies. These extensions incorporate the difficulty of enforcing residence-based taxation, the optimal policies of countries that are large enough to affect world prices or the behavior of other governments, the time inconsistency of certain optimal policies, and the effects of fiscal externalities.

3.1. Increased enforcement problems in open economies

The analysis in Section 2 assumes that tax rules can be costlessly enforced. While this assumption can of course be questioned even in a closed economy, the potential enforcement problems in an open economy are much more severe. Consider, for example, the enforcement of a tax on an individual's return to savings. This return takes the form primarily of dividends, interest, and accruing capital gains. Enforcement of taxes on capital gains is particularly difficult, but even taxes on dividends and interest face severe enforcement problems in an open economy.

In a closed economy, taxes on dividend and interest income can be effectively enforced by having firms and financial intermediaries report directly to the government amounts paid in dividends and interest to each domestic resident[12]. Without this alternative source of information to the government, individuals face little incentive to report their financial earnings accurately and enforcement would be very difficult.

[12] With a flat tax rate on the return to savings, the government can simply withhold taxes on interest and dividend payments at the firm or financial intermediary level, with rates perhaps varying with the nationality of the recipient.

In an open economy, however, individuals can potentially receive dividends and interest income from any firm or financial intermediary worldwide. Yet governments can impose reporting requirements only on domestic firms and intermediaries. As a result, individuals may be able to avoid domestic taxes on dividends and interest they receive from foreign firms and intermediaries. This is true even if the dividends or interest originate from domestic firms, if the recipient appears to be foreign according to available records [13]. Furthermore, states competing for foreign investment accounts have incentives to help individual investors maintain secrecy and therefore hide their foreign investment income from the domestic tax authorities. Of course, individuals would still have incentives to report all interest payments and tax losses, so on net the attempt to tax capital income should result in a loss of tax revenue [14].

Based on the presumed ease of evasion through this use of foreign financial intermediaries, Razin and Sadka (1991a) forecast that no taxes on the return to savings can survive in an open economy. Any taxes would simply induce investors to divert their funds through a foreign financial intermediary, even if they continue to invest in domestic assets. Of course, use of foreign financial intermediaries may not be costless. The main costs, though, are likely to be the relatively fixed costs of judging how vulnerable the investment might be due to differing regulatory oversight (in practice as well as in law) in the foreign country. Individuals with large savings would still likely find it worth the fixed cost to find a reliable foreign intermediary, so that the tax would fall primarily on small savers. Enforcement problems therefore give the tax unintended distributional features and higher efficiency costs (by inducing individuals to shift their savings abroad as well as to reduce their savings). As the costs of using foreign intermediaries drop over time due to the growing integration of financial markets, these pressures to reduce tax rates become larger. There is considerable controversy in interpreting recent European tax developments, but some argue that tax rates within Europe are falling in response to such international pressures [15].

A uniform tax on the return to savings, consistent with the results in Diamond and Mirrlees (1971a,b), should tax accruing capital gains at the same rate as dividends and interest. The taxation of capital gains, however, is an administrative problem even in a closed economy. In a closed economy, financial intermediaries may have information on the sales revenue from most assets sales for each domestic resident, but they would rarely have information about the original purchase price. Therefore, a tax on *realized* capital gains is difficult to enforce. Even if it were enforceable, it is not equivalent to a tax on capital gains at accrual, since investors can defer tax liabilities until they

[13] Note that the optimal tax policies analyzed in Section 2 would exempt foreigners from domestic taxation.

[14] See, for example, Gordon and Slemrod (1988), Kalambokidis (1992), or Shoven (1991) for evidence that the U.S. tax system lost revenue from attempting to tax capital income, at least in the years analyzed (1975–1986).

[15] See, for example, the papers collected in Cnossen (2000).

choose to sell their assets[16]. The practice has instead been to tax accruing capital gains primarily at the firm level by imposing corporate taxes on retained earnings that generate these capital gains[17]. The lower is the effective tax rate on realized capital gains at the individual level, the higher would be the appropriate tax rate on accruing gains at the firm level.

Under the equivalent tax system in a small open economy, the government would need to tax corporate retained earnings to the extent that shares are owned by domestic residents. Such taxes are inconsistent with current international tax practice. Imposing instead a higher tax rate at realization on foreign-source capital gains would be difficult, since the government cannot learn directly about the sale of an asset if the investor uses a foreign financial intermediary, and again the high rate generates a costly "lock-in" effect.

One method of addressing these enforcement problems is for countries to establish bilateral information-sharing agreements that provide for exchange of information to aid in the enforcement of domestic residence-based taxes. However, these agreements have been undermined by various tax havens that enable domestic investors to acquire anonymity when they invest, facilitating avoidance of residence-based taxes on capital income. As Yang (1996) notes, as long as there is one country that remains completely outside this network of information-sharing agreements, then evasion activity would in theory be left unaffected – all savings would simply flow through the sole remaining tax haven. Recent sharp efforts by the OECD (2000) to encourage all countries to share information on foreign bank accounts and investment earnings of foreign investors are intended to prevent their use to avoid home-country taxes.

Gordon (1992) and Slemrod (1988) argue that an international agreement to impose withholding taxes on any financial income paid to tax haven intermediaries, at a rate equal to the maximum residence-based income tax rate, would be sufficient to eliminate the use of tax havens to avoid taxes on income earned elsewhere. Again, however, any one country on its own would not have an incentive to impose such a withholding tax on payments made to tax haven financial intermediaries, so an international agreement among all countries would be necessary to implement such a policy.

Some countries attempt to enforce their tax systems by preventing individuals from purchasing foreign securities while still allowing domestic multinationals to establish foreign operations[18]. The benefit of imposing such controls is that enforcement

[16] In principle, the tax rate paid at realization can be adjusted to make the tax equivalent to a tax at accrual. See Auerbach (1991) or Bradford (1996) for further discussion. No country has attempted such a compensating adjustment in tax rate, however. Many countries, though, have imposed a reduced rate on realized capital gains, to lessen the incentive to postpone realizations, thereby further lowering the effective tax rate on capital gains compared to that on dividends and interest.

[17] In some countries, most notably the United States, profits rather than retained earnings have been taxed, subjecting dividend income to double taxation. Many countries, though, have adopted dividend imputation schemes that rebate corporate taxes collected on profits paid out as dividends.

[18] During the 1980's, controls of roughly this form existed in such countries as Australia, France, Italy, Japan, and Sweden. See Razin and Sadka (1991a) for a theoretical defense of this approach.

problems are much less severe when taxing domestic firms than when taxing domestic individuals on their foreign-source incomes. Under existing tax conventions domestic governments have the right to tax retained earnings accruing abroad to domestic multinationals, even if they cannot tax these retained earnings when individuals invest abroad. In addition, multinationals need to submit independently audited accounting statements in each country in which they operate, providing tax authorities an independent source of information about the firms' earnings that is not available for portfolio investors. If multinational firms can be monitored fully and portfolio investment abroad successfully banned[19], then this approach solves the enforcement problem. Since multinationals can take advantage of the same investment opportunities abroad that individual investors can, the models do not immediately point out any efficiency loss from such a channeling of investments abroad through multinationals. Capital controls can therefore provide an effective means of making avoidance of domestic taxes much more difficult, facilitating much higher tax rates on income from savings. Gordon and Jun (1993) show that countries with temporary capital controls also had dramatically higher tax rates on income from savings during the years in which they maintained the capital controls. For example, Australia had capital controls until 1984. Until then, the top personal tax rate on dividend income was 60%. By 1988, taking into account both the drop in the top tax rate and the introduction of a dividend tax credit, Australia's net marginal tax rate had fallen to eight percent. Similarly, Sweden had capital controls until 1988. At that date, the top marginal tax rate was 74%, but two years later it had fallen to 30%. Capital controls are difficult and costly to enforce, however, and can prevent individuals from taking advantage of sound economic reasons for investing in foreign assets. As a result, many countries have abandoned capital controls in recent years, reopening the problem of enforcing a tax on the return to savings.

3.2. Countries that affect market prices

The models described above made strong use of the assumption that a country is a price taker in world markets. There are several reasons, however, for questioning this assumption.

The first possibility, discussed at length by Dixit (1985), is that a country may have a sufficiently dominant position in certain markets that its exports or imports can have noticeable effects on world prices. Yet unless the domestic industry is monopolized, the country will not take advantage of this market power without government intervention. Therefore, tariffs can be used to gain at the expense of foreign producers and

[19] Enforcement of taxes discouraging or banning portfolio investment in foreign assets remains difficult, however. Gros (1990) and Gordon and Jun (1993) both report evidence of substantial ownership of foreign financial assets by investors in countries with capital controls, held through foreign financial intermediaries.

consumers[20]. As a simple example, assume that the domestic production cost of some exportable good, X, is $p(X)$, while the revenue received in world markets from the export of X equals $q(X)X$. Then the exporting country's desired value of X satisfies $p' = q + Xq'$. It follows that $q > p'$, so price exceeds marginal cost. This allocation can be achieved by use of an export tariff at rate t satisfying $t = -Xq'$.

Similarly, if a country is large relative to world capital markets, so that the size of its capital exports and imports affects world interest rates, then the country has an incentive to intervene to take advantage of its market power. If it is a net capital importer, then it would want to restrict imports in order to lower the rate of return required on the world market. One approach to restricting imports is to impose a withholding tax on payments of dividends or interest to foreign investors in the domestic economy. Conversely, a capital exporter would want to restrict exports, e.g., by imposing a surtax on financial income received from abroad. These implications are apparent from differentiating the country's budget constraint (2.3) with respect to K_m, permitting the world interest rate r^* to be a function of K_m. The first-order condition for budget (and thus welfare) maximization becomes:

$$p^* f_K = r^* + K_m \frac{\mathrm{d}r^*}{\mathrm{d}K_m}. \tag{3.1}$$

This condition characterizes private sector economic activity if the government imposes a tax on interest payments (or a subsidy on interest receipts) at a rate equal to the elasticity of the world interest rate with respect to capital imports $\left(\frac{\mathrm{d}r^*}{\mathrm{d}K_m}\frac{K_m}{r^*}\right)$.

While net capital flows from the largest countries have the potential to affect world interest rates[21], tax policy in these countries has not changed in the ways forecast when net capital flows changed. For example, the United States did not increase withholding taxes on financial payments to foreign investors when it became a large capital importer in the 1980's – in fact, it eliminated its withholding tax on portfolio interest income in 1984. Withholding tax rates are also quite similar in capital exporting and capital importing countries. Apparently, a country's effects on world interest rates are too small to generate any noticeable response.

When the return to capital invested in different countries is uncertain, with outcomes not fully correlated across countries[22], then even small countries may have some

[20] In an intertemporal context, Gordon (1988) argues that countries will also have incentives to reduce their current account deficits or surpluses in efforts to maintain the optimal quantity of exports period by period. Summers (1988) provides evidence that countries do in fact attempt to limit their current account deficits and surpluses.

[21] For example, the extra capital demand in the United States following its tax cuts in the early 1980's, and in Germany following reunification, are contemporaneous with higher world interest rates. See, e.g., Sinn (1988).

[22] Random differences in weather patterns, in demand patterns by domestic residents, or in technology (assuming incomplete information flows across borders), would all generate such idiosyncratic risk patterns. Adler and Dumas (1983) in fact document a very low correlation in equity returns across countries.

market power in world capital markets. Each country's securities provide investors a source of diversification not available elsewhere, and as a result, exhibit downward sloping demand curves. For example, if returns across countries are independent, then a CAPM-type model would imply that the expected rate of return, r^e, that investors require in order to be willing to invest an extra unit of capital in country n equals:

$$r^e = r^* + \rho K_{ni} \sigma_n^2, \tag{3.2}$$

in which σ_n is the standard deviation of the return to a unit of capital invested in country n, K_{ni} is the amount of capital in country n owned by investor i, r^* is a risk-free opportunity cost of funds, and ρ measures the investor's risk aversion.

Rather than facing a fixed cost, r^*, per unit of capital acquired from abroad, Equation (3.2) instead implies that the marginal cost of acquiring funds on the world market is an upward sloping function of the total volume of funds acquired. Each domestic firm, however, would take the cost of funds, r^e, as given in making its investment decisions, and therefore ignore the effects of its extra investment on the cost of funds faced by other domestic firms. Based on standard optimal tariff considerations, it follows that a country has an incentive to intervene to reduce the amount of domestic equity acquired by foreign investors[23].

This intervention might take the form of corporate taxes on the return to domestic capital supplemented by an additional withholding tax on dividends and capital gains paid to foreign owners[24]. Hines and Willard (1992) document that, while many countries impose significant withholding taxes on dividend payments to foreign owners, it is much less common to impose large withholding taxes on interest payments. This is as would be expected if countries have little ability to affect the net-of-tax interest rate paid on "risk-free" assets[25]. With this explanation for withholding taxes, it is no longer surprising that countries change them very little in response to changes in net capital flows.

As with other uses of tariffs, the gains to country n from imposing withholding taxes come at the expense of investors from other countries, who earn lower rates of return on their investments in country n's securities. These losses to nonresidents would not be considered by the government of country n in setting its policies, implying that the policies chosen in equilibrium by each government will not be Pareto optimal from the perspective of the governments jointly. As a result, there would potentially be a mutual gain from agreements to reduce tariffs[26]. In fact, bilateral treaties to reduce

[23] See Gordon and Varian (1989), Werner (1994), Huizinga and Nielsen (1997) and Gordon and Gaspar (2001) for alternative derivations of the optimal tax policies in this setting.

[24] See Gordon and Gaspar (2001) for a formal derivation.

[25] Huizinga (1996) offers evidence that higher withholding taxes raise pretax interest rates, but that the availability of foreign tax credits offered by creditor countries mitigates this effect.

[26] As always, if countries are sufficiently asymmetric, then side payments may be needed to assure that each government gains from these mutual tariff reductions.

withholding taxes on cross-border financial payments are common, as documented by Hines and Willard (1992).

3.3. Time inconsistency of the optimal tax system

Another important aspect of simple models of optimal tax policy is that individuals own no assets initially, thereby removing the possibility of implementing a nondistorting (lump-sum) tax on initial asset holdings. If individuals do own assets at the time tax policy is being determined, then the model implies that one component of the optimal tax policy will be to seize any initial assets, since such actions raise revenue without distorting future decisions. Not only does this seizure have no efficiency cost, but it may also be attractive on distributional grounds to the extent that the owners are rich or foreign[27]. While such lump-sum taxes are seldom observed, unexpected taxes on capital investments also raise revenue from the initial owners of assets, so can serve much the same purpose[28].

These policies would not be time-consistent, however. The optimal policy involves no such seizure of assets in later periods, yet the government will have an incentive according to the model to impose such a "lump-sum" tax in the future whenever it reconsiders its tax policy. Investors might then rationally anticipate these seizures in the future, thereby discouraging investment and introducing distortions that optimal tax policies would otherwise avoid.

As a result, governments have incentives *ex ante* to constrain themselves not to use such time-inconsistent policies in the future. Laws can be enacted, for example, providing full compensation in the event of an explicit expropriation. Existing assets can also be seized indirectly, however, by unexpected tax increases, assuming investments already in place have become irreversible. Given the inevitable uncertainties about future revenue needs, a commitment never to raise taxes in the future would not be credible. At best, governments can attempt to develop reputations for not imposing windfall losses on existing owners of assets by grandfathering existing assets from unexpected tax increases.

This problem of time inconsistency is present even in a closed economy. The incentive to renege on any implicit commitment is much stronger, however, when foreigners own domestic assets. If foreign investors can impose a large enough penalty *ex post* on any government that seizes foreign-owned assets (directly or indirectly), then a government would not find it attractive to seize these assets and the time consistency

[27] As emphasized by Huizinga and Nielsen (1997), the government will be more inclined to seize assets owned by foreigners, since their welfare is of no consequence to the government. Faced with this threat, however, firms have incentives to reduce the share of their assets held by foreigners, a point emphasized in Olsen and Osmundsen (2001).

[28] In fact, a commitment to using distorting rather than lump-sum taxes may provide a means for the government to promise credibly not to impose too high a tax rate *ex post*, due to the resulting efficiency costs.

problem disappears[29]. Governments would therefore find it in their interests to make it easier for foreign investors to impose such penalties. By maintaining financial deposits abroad that can be seized in retaliation for any domestic expropriations, for example, governments can implicitly precommit not to expropriate foreign-owned assets, though at the cost of making these financial deposits vulnerable to seizure by the foreign government. These approaches are unlikely to be effective against unexpected increases in tax rates, however.

How can a government induce foreign investment in the country, given this difficulty of making a credible commitment not to raise taxes on these investments in the future? If foreign investors expect the government to impose an extra amount T in taxes in the future due to these time consistency problems, then one approach the government might take initially is to offer investors a subsidy of T if they agree to invest in the country[30]. Alternatively, governments might offer new foreign investors a tax holiday for a given number of years, yet still provide them government services during this period. Since firms commonly run tax losses during their first few years of business, however, given the large deductions they receive initially for their start-up investments, Mintz (1990) shows that such tax holidays may not in fact be very effective at overcoming the time consistency problem.

3.4. Fiscal externalities

As tax systems deviate from the pure residence-based structure predicted by the simple theory, the result that the Nash equilibrium in tax policies generates no fiscal externalities is lost. In general, changes in tax policy in any one country can affect welfare in other countries, effects that would be ignored in setting tax policies independently. In particular, when a single country raises its tax rate, individuals have incentives to reallocate taxable income into other jurisdictions, providing positive externalities to these other jurisdictions. Conversely, when countries use taxes to exploit their power in international markets, or to seize foreign assets irreversibly invested in the local economy, then they impose negative externalities on investors in other countries. Given these externalities, there is potential for mutual gains from coordinating tax policies.

In order to illustrate these effects, assume that the economies in other countries have the same general structure as the domestic economy analyzed in Section 2. In particular, the utility of each foreign individual equals $v_i^*(p^* + s^*, p_n^* + s_n^*, r^*, w^*(1 - t^*)) + V_i(G^*)$, where the superscript "*" denotes "foreign". The foreign government's budget constraint implies that $p_g^* G^* = \tau^* K^* + s^* Q^* + s_n^* Q_n^* + t^* w^* L^*$, in which Q^* and Q_n^*, respectively, denote consumption of tradables and nontradables by consumers in the

[29] See Eaton and Gersovitz (1981) for an exploration of the form such penalties can take.

[30] Doyle and van Wijnbergen (1994), for example, note that the government can contribute T towards the initial costs of the investment.

foreign country. If the domestic country raises its tax rate τ, then capital leaves and is invested elsewhere[31]. This can affect welfare abroad for a variety of reasons. To begin with, if the remaining capital invested in the domestic economy is "sunk", then existing capital owners now earn lower after-tax returns, at least until the capital stock depreciates to the new equilibrium level. To the extent this capital was owned by foreign investors, they suffer windfall losses on their savings.

In addition, the increase in τ causes K to fall. Since total savings should remain unaffected, assuming no nonnegligible changes in r^*, capital simply shifts abroad, raising K^*. The extra capital raises welfare abroad first due to the extra resulting tax revenue, $\tau^* \Delta K^*$. In addition, this extra investment will tend to raise the wage rates in these foreign countries, and slightly lower the world interest rate. These price changes will be attractive to many governments on distributional grounds, and would normally induce people to work more, generating an efficiency gain due to the tax revenue on the extra earnings[32].

Changes in rates of capital income taxation therefore create a variety of externalities on foreigners, some negative but most positive. If on net these externalities are positive, then the Nash equilibrium choices for τ will be too low from an international perspective, and conversely. In spite of the potential gains from tax coordination it does not then follow that tax harmonization measures, even if wisely implemented, necessarily will be welfare-enhancing for all participating countries. Differences between country sizes [as analyzed by Bucovetsky (1991) and Wilson (1991)], to say nothing of differences in consumer preferences or other endowments, create heterogeneous welfare effects of tax harmonization when individual countries can affect world prices. This is evident by comparing the implications of Equation (3.1) for countries of differing sizes, in a setting in which the world capital market guarantees that dr^*/dK_m is the same for all countries. The direction in which a country prefers the world interest rate, and therefore capital tax rates, to move then depends critically on its level of K_m, which must differ between countries unless none are capital importers.

Of course, taxes other than those on capital income are capable of generating fiscal externalities. Bucovetsky and Wilson (1991) note that international capital mobility implies that similar fiscal externalities appear with wage taxation. In their model of tax competition between symmetric countries with wage and capital tax instruments, governments set inefficiently low wage tax rates because they ignore their impact on other countries. Higher wage tax rates generally reduce labor supply (if aggregate labor supply is an increasing function of after-tax wages), increasing the pretax cost of labor and causing capital outflow. This process stimulates greater labor demand in capital-importing countries, thereby enhancing efficiency to the extent that foreign countries also tax labor income.

[31] Note that total savings would remain unchanged, as long as the interest rate is unaffected.

[32] See Gordon (1983) for a more complete tabulation of the many forms that these cross-border externalities can take, and Wilson (1999) for a useful survey of tax competition models.

A second type of fiscal externality appears with indirect taxation. For example, when value-added tax (VAT) rates vary by country, and are imposed on an origin basis, then consumers have incentives to travel in order to buy goods in countries with low VAT rates. While transportation costs have limited the volume of cross-border shopping in the past, cross-border shopping is likely to become far more important in the future with the growth of mail-order houses and more recently of internet sales. When goods physically cross borders, governments have at least the potential to impose a VAT at the border, preventing evasion. Monitoring at the border is costly, however, which is why it has been abandoned within the European Union. When goods do not physically cross borders, e.g., when information is transferred electronically over the internet or when financial services create no detectable cross-border transfer of funds, then consumers can easily take advantage of differences in VAT rates across countries. A reduced VAT rate in one country then imposes fiscal externalities on other countries. As a consequence, there is the potential for welfare-improving agreements between countries to coordinate VAT rates[33].

Differences in the timing of income taxes and value-added taxes can also generate fiscal externalities through migration. Individuals have incentives to work in countries with low tax rates on labor income, but to retire to countries with low VAT rates. Differences in capital gains tax rates also create incentives for individuals to move before selling assets with large accumulated capital gains. The quality of publicly-provided schools, hospitals, and safety-net programs can differ substantially across countries, inviting migration in anticipation of heavy use of these government services. Use of debt finance invites inmigration when debt issues substitute for taxes, but outmigration when the debt is repaid.

While multilateral agreements to coordinate tariff policies are common, there have been few such attempts to coordinate tax policies across countries. Giovannini and Hines (1991) point out the gains from coordinating income tax policies within the European Union. They observe that one way to enforce residence-based tax rates on capital income within Europe is to impose equal source-based taxes on capital income at the highest European rate, permitting capital owners to claim rebates for any differences between the European tax rate and those imposed by their home governments. Enforcement costs fall as a result, since it is far easier to monitor the return to capital physically located in the country than to monitor the income accruing internationally to each domestic resident. However, such source-based taxes can be maintained in equilibrium, according to the models, only if the governments explicitly coordinate among themselves, since each government in isolation has an incentive to eliminate its source-based tax[34]. In spite of much discussion, there have been no such agreements within the European Union.

[33] See, for example, Mintz and Tulkens (1986), Trandel (1992) and Kanbur and Keen (1993).

[34] The mechanism described by Giovannini and Hines might require intercountry resource transfers if there are uneven capital flows within Europe. See Gammie (1992) for a more recent detailed examination of the options for coordination of corporate tax structures within the European Union.

Countries do commonly have bilateral tax treaties that set withholding tax rates on payments of dividends, interest, and capital gains between signatories. The agreements on withholding tax rates almost always involve *reductions* in these rates, however, suggesting that negative externalities, e.g., through exercise of market power, outweigh any positive externalities generated by tax competition[35]. In addition, these treaties deal only with withholding tax rates, whereas domestic personal and corporate income taxes can also generate tax spillovers to other countries.

Another source of coordination is the OECD convention that member countries adopt some mechanism to avoid the double-taxation of foreign-source income, either through a crediting arrangement or through exempting foreign-source income. Either arrangement is contrary to the forecast from the initial theory that countries would seek to impose residence-based taxes, so the OECD requirement does help to explain the existence of crediting and exemption arrangements for foreign-source income. Under an exemption system, however, corporate taxes are precisely source-based so that the Nash equilibrium set of tax rates is zero in small open economies. Therefore, this convention does not serve to internalize tax spillovers.

Under the crediting system, there is not even a Nash equilibrium set of tax policies with trade in capital[36]. Gordon (1992) points out, however, that the crediting system might make sense if the capital exporters coordinate and act as a Stackelberg leader. Given this crediting system, capital-importing countries will have incentives to match the tax rate chosen by the capital exporters. In particular, under such a tax credit system, the net-of-tax income accruing to a foreign subsidiary in some country c equals[37] $\pi_c[1-\tau_c-\max(\tau_h-\tau_c,0)]=\pi_c[1-\max(\tau_c,\tau_h)]$, where π_c equals the pretax taxable income of the subsidiary, τ_c is the tax rate in the host country, and τ_h is the tax rate in the home country offering a tax credit. As long as $\tau_c \leqslant \tau_h$, any increase in τ_c leaves firms unaffected yet collects additional revenue for the host country; therefore, the host country has an incentive to raise τ_c up to τ_h[38].

Knowing this response of any host government, capital-exporters can induce tax rates to rise point for point in host countries when they increase their own domestic tax rates. As a result, domestic residents would face the same tax increase abroad that they face at home when the home country raises its tax rate, so can no longer avoid the tax by shifting operations abroad. From the perspective of the firm, the tax

[35] The link between reductions in withholding tax rates and information-sharing agreements also suggests that countries may reduce their withholding tax rate simply because they no longer need such a high tax rate to prevent domestic investors from shifting their assets offshore.

[36] See, e.g., Bond and Samuelson (1989) or Gordon (1992) for further discussion.

[37] Under existing crediting schemes, firms can receive credits for any foreign taxes paid up to the amount of domestic taxes due on foreign income. When foreign tax payments exceed domestic tax liabilities on this income, the firm has "excess foreign tax credits", since it has potential credits it cannot use. If instead the firm owes residual domestic taxes on foreign income, then it has what is known as "deficit foreign tax credits".

[38] By prior arguments, it would not want to raise τ_c further, since doing so is simply a source-based tax on capital.

has become a residence-based tax[39]. Gordon (1992) shows that use of this tax credit may be attractive to the capital-exporting country, even without OECD requirements, if investors can otherwise avoid a residence-based tax at some cost. Without such a tax-crediting scheme, equilibrium capital income tax rates instead equal zero.

Under this argument, however, capital exporters are attempting to induce capital-importing countries to raise their tax rates on capital imports so as to discourage capital flight. This is contrary to the observation in tax treaties that governments attempt to *reduce* the taxes host governments impose on capital imports. In addition, all countries except New Zealand that offer a credit against their domestic taxes for foreign tax payments allow multinationals to defer their domestic tax liabilities until profits are repatriated. With deferral, host countries still have incentives to impose withholding taxes on dividend repatriations to parent firms. Corporate taxes, however, are now dominated by withholding taxes[40]. Furthermore, many countries allow firms to pool their repatriations from abroad, so that excess foreign tax credits from one country can offset domestic taxes otherwise owed on repatriations from other countries. Firms can then arrange their investments and repatriations so that no taxes are due in the home country on foreign operations. If no domestic taxes are due, then any taxes paid abroad become source-based taxes, which remain unattractive.

Given the availability of both worldwide averaging and deferral of tax until repatriation, it is difficult to argue that tax-crediting arrangements have much effect on equilibrium corporate tax rates in host countries. Therefore, there is no plausible theoretical expectation as well as no direct evidence of coordination of tax policies.

4. Taxes and portfolio capital flows

This section considers the effect of taxation on the demand and supply of international portfolio capital flows. Such capital flows are characterized by the absence of mutual controlling interest between transacting parties, so that they might take the form of bank loans to unrelated firms, or individual purchases of shares of stock in foreign companies. Most international capital movements take the form of portfolio capital flows, and while there are features of portfolio capital flows that carry standard implications for international tax policies, there are also some observed aspects that are difficult to reconcile with standard theories.

4.1. Uniform income taxation

The most analytically straightforward type of international capital flow is that involving debt contracts between unrelated parties, since simple capital market arbitrage

[39] From the perspective of the governments, however, the outcome is not equivalent to a residence-based tax, since the tax payments made by domestic residents on their investments abroad go to the foreign rather than the domestic government.

[40] A corporate tax now discourages investment because the credit is delayed in time, and therefore of less value.

implies that investors must face identical risk-adjusted after-tax real interest rates for all transactions. International borrowing and lending entail at least two important complications that distinguish them from purely domestic transactions. The first is that borrowers and lenders experience gains or losses resulting from movements in the relative values of foreign and domestic currencies. The tax treatment of these gains and losses then affects the desirability of borrowing and lending in currencies in which exchange gains and losses are possible. The second complication is that governments may impose withholding taxes on cross-border payments of interest. These issues are considered in turn.

Interest rates in international capital markets adjust in reaction to anticipated nominal price changes, though the extent of this adjustment is affected by the tax regime. This point is illustrated most clearly in the case of a small open economy. The expected after-tax net return to foreign lenders ($r_{n,w}$) loaning money to a borrower in the small open economy is:

$$r_{n,w} = (1-\theta^*)r + (1-g^*)\dot{e}^*, \tag{4.1}$$

in which θ^* is the foreign tax rate on interest receipts from abroad (inclusive of any withholding taxes), r is the home (small) country nominal interest rate, g^* is the foreign tax rate on exchange rate-related gains and losses, and $\dot{e}^*$ is the anticipated appreciation (in foreign currency) of domestic assets held by foreign lenders. We assume exchange rates to be determined by purchasing power parity (PPP) in the goods market, which implies $\dot{e}^* = \pi^* - \pi$ (in which π^* is the foreign inflation rate, and π is the domestic inflation rate)[41]. A small open economy must offer foreign lenders an after-tax rate of return equal to returns available elsewhere[42]. Consequently, capital market equilibrium implies that $\frac{dr_{n,w}}{d\pi} = 0$, and differentiating Equation (4.1) with respect to π implies:

$$\frac{dr}{d\pi} = \frac{(1-g^*)}{(1-\theta^*)}, \tag{4.2}$$

in which it is implicit that $\frac{d\pi^*}{d\pi} = 0$. If foreign tax systems treat exchange rate-related gains and losses in the same way as ordinary income, so that $g^* = \theta^*$[43], then $\frac{dr}{d\pi} = 1$,

[41] While this assumption is fairly standard, it is important to note that the literature suggests that PPP is best understood as a long-run phenomenon. See, for example, Parsley and Wei (1996) and Froot, Kim and Rogoff (1995).

[42] Strictly speaking, capital market equilibrium requires that risk-adjusted after-tax returns must be equalized. In the certainty framework used here, risk considerations are absent and capital market equilibrium requires only that after-tax returns be equalized. For an explicit consideration of the implications of risk for the analysis, see for example Gordon and Varian (1989).

[43] In practice, the capital exporting countries whose tax systems are described by the Commission of the European Communities (1992, pp. 235–303) generally set $g^* = \theta^*$. For the issues that arise when these tax rates differ, see Levi (1977) and Wahl (1989).

consistent with much of the empirical work on the relationship between interest rates and inflation[44].

While this change in r in response to an increase in inflation leaves foreign investors unaffected, the rate of return available to domestic investors falls. In particular, domestic investors receive real returns of $r(1 - \theta) + (1 - g)(\pi - \pi^*) - \pi$ on their investments in bonds from any given country (including their own). An increase in the domestic inflation rate, π, then reduces the after-tax return on all bonds, both domestic and foreign, as viewed from the standpoint of domestic lenders. The reason is that lenders must pay taxes on the purely nominal component of their investment returns. If, instead, domestic nominal interest rates were to respond to inflation so that $\frac{dr}{d\theta} = \frac{1}{(1-\theta)}$, then (taking $g = \theta$), lenders would experience no change in their after-tax real returns; this is the basis of Feldstein's (1976) argument that nominal interest rates should rise more than one-for-one with inflation in closed economies.

What distinguishes foreign and domestic investors is that foreign lenders are able to deduct against their taxable incomes any foreign exchange losses (or reduced foreign exchange gains) created by domestic inflation, while domestic savers are unable to deduct the real losses they incur as a result of domestic inflation. Perfect indexation of domestic tax systems would of course eliminate this difference, but in practice, most countries do not provide such indexation. Foreign exchange gains are taxable, and foreign exchange losses are deductible, simply by virtue of the convention of measuring taxable income in units of home currencies.

This tax treatment of exchange rate gains and losses then also influences the effect of inflation on the demand for capital investment in domestic economies. Tax systems that are not perfectly indexed permit inflation to affect investment incentives through the use of historic cost depreciation and inventory valuation, the taxation of nominal capital gains, and the ability to deduct nominal interest payments[45]. While all of these considerations appear in closed economies, what makes the open economy different is the attenuated reaction of nominal interest rates to changes in inflation. Since nominal interest rates react only one-for-one to changes in inflation, the real after-tax interest rate falls as inflation rises. Then to the extent that debt finance is used at the margin, and more generally that investment is affected by the cost of capital, domestic investment should rise in reaction to a reduced cost of borrowing[46]. The net

[44] Unless $g = \theta$ in all countries, however, then r cannot respond to changes in π in a way that leaves all investors indifferent, a point emphasized by Slemrod (1988). In this case, without some addition to the model, e.g., short-sales constraints as in Gordon (1986) or risk considerations as in Gordon and Varian (1989), there will no longer be an equilibrium.

[45] See Feldstein (1980). Auerbach and Hines (1988) note, however, that over the postwar period, U.S. depreciation schedules appear to have been informally indexed by regular legislative adjustments to compensate for inflation.

[46] See Hartman (1979) for a development of this argument. For evidence of the responsiveness of saving and investment to the after-tax cost of capital, see Bernheim (2002) and Hassett and Hubbard (2002) in Volume 3 of this Handbook.

effect of inflation on capital demand then depends on the relative importance of this consideration and others including the nonindexation of depreciation deductions[47].

The preceding analysis ignores the impact of withholding taxes on cross-border interest payments. In practice, many governments impose such taxes, which might take the form of requiring domestic borrowers to withhold a tax equal to 5% of any interest paid to foreign lenders. These withholding taxes are formally the obligation of those receiving interest payments, so lenders can claim foreign tax credits for withholding taxes. But since some lenders are ineligible to claim foreign tax credits (because their home governments do not permit them), and others are unable to take full advantage of additional foreign tax credits (due to tax losses, excess foreign tax limits, or a decision not to report the income), it follows that at least some fraction of withholding tax liabilities are borne by lenders and should therefore be reflected in higher nominal interest rates. Huizinga (1996) offers evidence that pre-tax borrowing rates are increasing functions of local withholding tax rates, though there is some indication that the potential creditability of withholding taxes mitigates this effect. Papke (2000) reports volumes of loans from foreigners to American borrowers are negatively affected by withholding tax rates on interest payments from the United States.

It is possible to broaden this analysis to consider the effect of taxation on individual portfolios containing differentiated assets. The starting point in thinking about taxes and portfolio choice is the observation that taxes have no effect on equilibrium portfolios if all countries impose residence-based taxes on income from savings at the same rate for all forms of savings, even though these rates are not identical across countries. To see this, assume there are I possible assets, where any asset i yields a before-tax real returns of r_i. Assume that each country k imposes a uniform residence-based income tax at rate m_k. Then in equilibrium investors are indifferent among all the different assets if and only if they yield the same risk-adjusted after-tax return:

$$r_i(1-m_k) = r_j(1-m_k) \; \forall \, i,j,k. \tag{4.3}$$

In equilibrium, it must be that $r_i = r_j \; \forall \, i,j$, and there are no tax distortions to portfolio choice.

4.2. Nonuniform income taxation

In practice, tax rates on investment income commonly differ by type of asset, with rules differing by country. For example, relative tax rates on interest, dividends, and

[47] Gordon (1982) attempts to measure the sizes of these terms, finding that the reduced value of depreciation allowances is likely to be more than offset by the induced decline in the real cost of debt and equity finance. Desai and Hines (1999b) analyze the magnitude of the welfare costs of inflation-associated saving and investment distortions, finding that the welfare costs of inflation in open economies have the potential greatly to exceed the costs of inflation in closed economies.

capital gains differ by country; and the returns to certain assets are tax-exempt in some countries but not in others. Denote the tax rate on the return to asset i in country k by m_{ik}. Then investors from that country are indifferent between holding any two assets i and j if and only if $r_i(1 - m_{ik}) = r_j(1 - m_{jk})$. As emphasized by Slemrod (1988), this equality can hold simultaneously for investors from different countries for only a very restrictive set of relative tax rates, yet actual tax structures are much more variable. Equilibrium portfolios are therefore distorted, given existing tax structures. In fact, without some additional factors limiting portfolio choice (such as restrictions on short sales) there is no equilibrium. It is therefore important to consider the implications of nonuniform taxation of asset income, and the factors that might reconcile them with observed portfolios.

The preceding analysis of the effect of inflation takes foreign exchange gains and losses to be taxed at the same rates as ordinary income. As emphasized by Gordon (1986), additional portfolio distortions are introduced if capital gains and losses resulting from changes in exchange rates are not taxed at accrual – as is, for example, characteristic of equity investments that generate unrealized capital gains, or when tax systems fail to implement appropriate discount rules for long-term bonds. In particular, bonds issued in countries with a high inflation rate might need to pay a high nominal interest rate to compensate for the capital loss that investors experience due to the inflation. When the required addition to the nominal interest rate is taxed at a higher rate than applies to the associated capital loss due to inflation, the size of the increase in the interest rate needed to compensate for inflation will be higher the higher the tax rate of the investor. As a result, these bonds will be purchased primarily by investors facing low tax rates. If exchange rates were riskless, then a costless form of tax arbitrage becomes feasible, with investors in high tax brackets borrowing in countries with a high inflation rate and investing in bonds from countries with a low inflation rate, and conversely for investors in low tax brackets.

When different types of assets face different tax rates, their pretax rates of return will adjust in equilibrium to compensate for the differences in tax treatment, so that heavily taxed assets offer the highest pretax rates of return. This observation has interesting implications for tax policy. For a country raising capital from abroad, the pretax rate of return it has to pay to foreign investors will be higher if the financial asset used will face higher domestic tax rates in the investors' home countries. By this argument, bond finance should be more expensive than equity finance, at least after controlling for risk. However, when interest but not dividend payments are deductible under the corporate tax, firms may prefer debt to equity finance – due to the deductibility of interest payments, debt finance can be cheaper to the firm even when it is more expensive for the country as a whole. The government absorbs the extra costs through the fall in tax revenue, and so has a strong incentive to reduce or eliminate the tax advantage to debt finance[48]. Similarly, when domestic investors have a tax incentive to buy equity

[48] For further discussion, see Gordon (1986).

or other more lightly taxed assets, the pretax return they earn is reduced, which again would be reflected in a fall in government tax revenue. This pressure towards equal tax treatment of different type of assets is an example of the gains from productive efficiency described in Diamond and Mirrlees (1971a,b).

4.3. Home bias

The standard approach in the finance literature to explain portfolio choice is to assume that investors are risk averse and that the returns to different assets are risky, with the return on each asset having at least some idiosyncratic elements. Without taxes, standard portfolio models forecast full diversification of portfolios worldwide. The difficulty is that this forecast is clearly counterfactual, since the data show that a large fraction of the equity and debt issued in any country is held directly by residents of that country. This phenomenon is known as "home bias"[49], and its source is not entirely understood. One possibility is that tax systems may be responsible for at least part of observed "home bias".

Introducing taxes into a standard portfolio model generates the prediction that investors will tend to specialize in those securities where they face relatively favorable tax treatment compared with other investors. For example, if investors in country k face a tax rate m_k on income from bonds and a rate αm_k on income from equity, with $\alpha < 1$, where for simplicity α does not vary across countries, then the fraction of portfolios held in equity should be an increasing function of m_k. This model implies that the portfolios of American investors should contain smaller fractions of equity following the U.S. personal tax rate reduction in 1986[50]. As documented by Scholes, Wolfson, Erickson, Maydew and Shevlin (2002), foreign investors (primarily foreign multinational firms) increased their equity investments in American firms after 1986, which is consistent with the forecast of this model.

Taxes have the potential to affect portfolio choices, and some of the forecasted effects appear in the data. However, the above forecasts with taxes still do not explain the observed specialization in portfolios, suggesting important omissions from this model. One important omission is the possibility of tax evasion on income from foreign securities through use of foreign financial intermediaries. This potential ease of evading personal income taxes on portfolio income through use of foreign financial intermediaries has strongly influenced some of the discussion of equilibrium tax policy in the theoretical literature. If "capital flight" were an important empirical phenomenon, then a large fraction of the funds invested in the United States should appear to be coming from "nonresidents", as residents try to disguise themselves as nonresidents in order to avoid domestic taxes. Consistent with this forecast, an

[49] See Adler and Dumas (1983) and French and Poterba (1991) for evidence.

[50] The tax change in fact raised α by increasing the relative tax rate on capital gains, reinforcing this forecast.

unusually large volume of funds enters the United States from Switzerland, the Netherlands Antilles, and other tax havens. The same process, however, implies that domestic investors will appear to be foreign in the data, so that observed portfolios should have a "foreign-bias" rather than a "home-bias", which is inconsistent with reported patterns.

There are at least some elements of the tax law that result in higher effective tax rates on holdings of *foreign* equity. For example, countries commonly impose withholding taxes on dividends and capital gains received by foreign investors. While many investors receive credits for these withholding taxes against their domestic income tax liabilities, this is not true for all investors[51]. Those investors whose tax liabilities are increased by withholding taxes would in response reduce their equity investments[52].

In addition, many countries have dividend imputation schemes. Under a dividend imputation scheme, when a domestic shareholder in country j receives a dividend d from a domestic firm, he owes personal taxes of $d(m_j - \tau_c)/(1 - \tau_c)$ on this income, where τ_c is the domestic corporate income tax rate[53]. In contrast, when the investor receives a dividend d from a foreign firm, he owes personal taxes of dm_j[54]. Therefore, the scheme gives domestic investors a powerful incentive to favor domestic equity[55]. Foreign investors, in contrast, normally do not qualify for the rebate of corporate taxes under the dividend imputation scheme[56].

Under these dividend imputation schemes, however, individual investors could simply shift to investing abroad through domestic multinational companies. The investor would then potentially qualify for the dividend imputation scheme on the dividends paid by the domestic parent firm regardless of whether the underlying income was earned at home or abroad[57]. As a result, domestic taxes would no longer distort

[51] Since the foreign tax credit is limited to domestic tax liabilities, investors in low tax brackets are unable to take full advantage of them. Foreign tax credits are of least value to tax-exempt investors such as pension funds, though some tax treaties do exempt foreign pension funds from withholding tax liabilities.

[52] When countries have market power in world equity markets, then the intent of these withholding taxes may well have been to reduce foreign holdings of domestic equity.

[53] The intent of these schemes is to tax the pre-corporate-tax income at the personal tax rate m_j. In particular, a local firm needs to earn $d/(1 - \tau_c)$ before corporate taxes on its local investments to finance this dividend. While it pays $\tau_c d/(1 - \tau_c)$ in corporate taxes on this income, the shareholder receives this amount as a rebate, so on net he faces an effective tax rate of m_j on the underlying corporate income.

[54] This assumes that investors do not evade domestic taxes on the dividends they receive from foreign firms. If taxes on foreign but not domestic dividends are evaded, then the dividend imputation scheme provides an incentive to specialize in domestic equity only if $m_j < \tau_c$.

[55] See Boadway and Bruce (1992) for further discussion.

[56] The U.K. is one exception, allowing foreign investors to receive the same rebate of U.K. corporate taxes.

[57] In an attempt to restrict the rebate to domestic-source income, dividends are commonly eligible for the dividend imputation scheme only to the extent that they are less than reported domestic-source income,

the international composition of portfolios, though in many countries they strongly favor multinational investments over portfolio investments.

While these tax distortions may explain some part of the observed portfolio specialization, they are far too small to rationalize the substantial specialization in portfolios observed in the data[58]. As a result, a large literature has developed exploring a variety of possible explanations for the observed "home bias" in portfolios[59]. The question from a tax perspective is the implications of the resulting home bias for both positive and normative models of taxes on income from capital.

A natural inference from observed home bias is that aggregate demand for domestic equity is much less elastic than would be implied by standard models of portfolio choice. As a result, the incidence of a tax on the return to domestic equity falls more heavily on the owners of this equity (both foreign and domestic) than would be true in standard portfolio choice models that forecast more balanced portfolios. This less elastic behavior then may help explain the substantial tax rates that apply to income from domestic capital, in spite of the forecasts from simpler models that there should be no "source-based" taxes on capital.

Surprisingly, perhaps, the attempts to date to confirm this intuition by reexamining optimal tax rates in an explicit model potentially capable of rationalizing specialized portfolios do not support this intuition. Gordon and Bovenberg (1996), for example, analyze tax policy in a model in which specialized portfolios result from asymmetric information across investors from different countries – investors are assumed to be much better informed about domestic securities than about foreign securities, so may overpay for foreign securities. In this model, the resulting "lemons" problem leads to too little trade in equity. Domestic owners of equity gain at the margin from greater foreign demand, since it consists of more poorly informed customers that potentially can be overcharged. In a small open economy, however, it is still true that the incidence of any subsidies or taxes on income from domestic capital falls entirely on domestic residents. As a result, the government in a small open economy has an incentive to subsidize foreign purchases of domestic equity until the resulting gains to domestic owners are just offset by the costs of the marginal subsidy. Rather than leading to

requiring that $d(\pi_d + \pi_f) \leqslant \pi_d$, where d is the dividend payout rate and where π_d (π_f) equals domestic-source (foreign-source) income. This constraint therefore requires that $d < \pi_d/(\pi_d + \pi_f)$. Given typical dividend payout rates, this constraint is likely to bind for only a few highly international companies. [Hines (1996b) notes, though, that payout rates seem to be higher on foreign-source income.]

[58] See French and Poterba (1991), for example, for an attempt to calculate the size of the relative advantage to domestic equity needed to rationalize observed behavior.

[59] For example, French and Poterba (1991) and Tesar and Werner (1994) both conclude that higher transactions costs on investments abroad cannot be the explanation. Eldor, Pines and Schwartz (1988) hypothesize that domestic equity helps hedge against risks in labor income; Hartley (1986) suggests that it may hedge against risks from nontraded assets; while Gordon and Gaspar (2001) focus on a hedging role against random consumer prices. Bottazzi, Pesenti and van Wincoop (1996) provide some empirical support for the first such hedging role, while Pesenti and van Wincoop (2002) provide evidence against the second such hedging role.

positive tax rates on domestic capital, this model forecasts subsidies at least to foreign purchasers of domestic capital.

Gordon and Gaspar (2001) analyze optimal tax policy under the alternative assumption that investors specialize in domestic equity because it offers a hedge against uncertainty in the price of domestic consumer goods. Their results suggest that introducing this hedging role for domestic equity lowers rather than raises the optimal tax rates on domestic capital. An important reason is that hedging lowers the fraction of domestic shares owned by foreigners, thereby reducing the extent to which any tax burden is shifted abroad.

Other possible explanations for observed "home bias" could well have yet different implications for optimal tax policy. In the absence of a compelling explanation for observed "home bias", it is difficult to characterize optimal tax policy even in a small open economy.

5. Taxes and the behavior of multinational firms

Multinational corporations play a dominant role in international capital flows and international trade, so it is essential in analyzing the effects of taxation in an international context to focus on their implications for the behavior of multinationals. In particular, it is useful to consider empirical evidence of the effect of taxation on the activities of multinational firms, and the extent to which these responses are consistent with theoretical forecasts. Important differences between actual and predicted behavior have the potential to suggest useful modifications to the theory of multinational firms, which in turn may carry implications for optimal tax design. This section takes these issues in turn, first reviewing the evidence, then assessing its theoretical implications[60].

5.1. Behavioral evidence

International tax rules and the tax laws of other countries have the potential to influence a wide range of corporate and individual behavior, including, most directly, the location and scope of international business activity, but also including domestic operations that are connected to foreign operations through various international tax provisions[61]. A sizable and growing literature is devoted to measuring behavioral responses to international tax rules. In so doing, this literature identifies behavioral patterns that are important to understanding the responses to domestic taxation as well. These patterns

[60] The following section relies heavily on Hines (1997, 1999a).

[61] There are numerous indirect ways in which international taxation affects domestic economies, such as by influencing the nature and extent of competition from imports and from foreign multinational firms. This section follows virtually all of the literature in focusing on the direct effects of international tax rules, since indirect effects are extremely difficult to identify with available data.

include investment behavior as well as various financial and organizational practices used to avoid taxes.

5.1.1. Foreign direct investment

Cross-border investment by controlling entities has acquired a special name, foreign direct investment, and an associated acronym, FDI. What defines such investment is not only that owners reside in a different country than the site of investment, but also that ownership is of a controlling form, typically defined as 10% or more of total ownership in the local investing entity[62].

Tax policies are obviously capable of affecting the volume and location of FDI, since, all other considerations equal, and in the absence of countervailing effects, higher tax rates reduce after-tax returns, thereby reducing incentives to commit investment funds. In practice, FDI is affected by commercial and regulatory policies, characteristics of labor markets, the nature of competition in product markets, the cost and local availability of intermediate supplies, proximity to final markets, and a host of other attributes that influence the desirability of an investment location. The importance of these other considerations suggests to observers such as Markusen (1995) that any effect of taxes on FDI will be unnoticeable in practice. The most reliable FDI studies indicate, however, the existence of statistically significant and quantitatively important tax effects. These findings are important not only because they demonstrate the ability of the data to identify tax effects against a background of many other variables affecting FDI, but also because there are at least two additional reasons why one might anticipate not finding an important empirical relationship between taxes and FDI. The first is that firms may be able to use creative financing and other methods so effectively that they costlessly avoid all taxes on their international income. The second is that governments imposing high tax rates may indirectly compensate firms with difficult-to-measure investment incentives such as worker training and infrastructure.

The empirical literature on the effect of taxes on FDI considers almost exclusively U.S. data, either the distribution of U.S. direct investment abroad, or the FDI patterns of foreigners who invest in the United States[63]. The simple explanation for this focus is not only that the United States is the world's largest economy, but also that the United States collects and distributes much more, and higher-quality, data on FDI activities than does any other country.

The available evidence of the effect of taxation on FDI comes in two forms. The first is time-series estimation of the responsiveness of FDI to annual variation in after-tax

[62] FDI consists of changes in the ownership claims of controlling foreign investors. For example, an American parent firm that establishes a wholly-owned foreign affiliate with $100 million of equity and $50 million of loans from the parent company thereby creates $150 million of FDI. In order for foreign investment to count as FDI, the American investor must own at least 10% of the foreign affiliate. FDI is the sum of parent fund transfers and American owners' shares of their foreign affiliates' reinvested earnings, minus any repatriations to American owners. Reported FDI typically represents book values.

[63] Devereux and Freeman (1995) and Hines (2001) are recent exceptions.

rates of return in host countries[64]. Studies of this type consistently report a positive correlation between levels of FDI and after-tax rates of return at industry and country levels[65]. The implied elasticity of FDI with respect to after-tax returns is generally close to unity, which translates into a tax elasticity of investment of roughly –0.6. The estimated elasticity is similar whether the investment in question is American direct investment abroad or FDI by foreigners in the United States.

Much of this literature is highly aggregate, evaluating, for example, the correlation between annual movements in after-tax rates of return earned by FDI in the United States and annual changes in FDI flows to the United States. Aggregate FDI data distinguish investment financed by retained earnings of foreign affiliates from FDI financed by transfers of parent funds (debt plus equity). Studies that estimate separate (and independent) equations for these two sources of FDI typically find that FDI financed by retained earnings is more strongly influenced by host country after-tax rates of return[66].

It can be difficult to interpret such evidence. Estimated tax effects in aggregate time-series studies are identified by yearly variation in taxes or profitability that may be correlated with important omitted variables. As a result, it is almost impossible to distinguish the effects of taxation from the effects of other variables that are correlated with tax rates.

Two of the time-series studies exploit cross-sectional differences that offer the potential for greater explanatory power. Slemrod (1990) distinguishes FDI in the United States by the tax regime in the country of origin. Investors from countries (of which Slemrod analyzes data for Japan and the United Kingdom) with tax systems similar to that used by the United States receive foreign tax credits for taxes paid to the United States. Investors from certain other countries (of which Slemrod analyzes data for Australia, Canada, France, Germany, and the Netherlands) are more or less exempt from home-country taxation of any profits earned in the United States. Consequently, investors from France and Germany have stronger incentives to invest in the United States during low-tax years than do investors from Japan and the United Kingdom, since Japanese and British investors are eligible to claim tax credits for any U.S. taxes they pay. In his analysis of data covering 1962–1987, Slemrod finds no clear empirical pattern indicating that investors from countries that exempt U.S. profits

[64] Implicit in this estimation is a q-style investment model in which contemporaneous average after-tax rates of return serve as proxies for returns to marginal FDI. In theory, these specifications should also control for after-tax rates of return available elsewhere, though in practice this is infeasible.

[65] See, for example, Hartman (1984), Boskin and Gale (1987), Newlon (1987), Young (1988), Slemrod (1990) and Swenson (1994).

[66] For example, Hartman (1984) reports elasticities with respect to after-tax returns of 1.4 for FDI financed by retained earnings and 0.5 for FDI financed by transfers of parent funds. Similarly, Young (1988) reports elasticities with respect to after-tax returns of 1.89 for FDI financed by retained earnings and close to zero for FDI financed by transfers of parent funds. Boskin and Gale (1987) likewise obtain results that are very similar to Hartman's.

from home-country taxation are more sensitive to tax changes than are investors from countries granting foreign tax credits. This evidence suggests either that home-country tax regimes do not influence FDI, or that time series variation in tax rates is inadequate to identify tax effects that are nonetheless present.

Swenson (1994) considers the tax determinants of industry-level FDI in the United States over the 1979–1991 period. U.S. tax changes often affect industries to differing degrees, based largely on the assets in which they invest; this was particularly true of tax legislation enacted in 1981 and 1986. Swenson finds that industries in which the (U.S.) after-tax cost of capital rose the most after passage of the U.S. Tax Reform Act of 1986 were those in which foreign investors concentrated their FDI in the post-1986 period. This is consistent with the tax incentives of foreign investors from countries granting foreign tax credits, since such investors are the least affected by U.S. tax provisions – but it is also possible that foreign investors chose to concentrate in such industries for any of a number of non-tax reasons. Auerbach and Hassett (1993) lend credence to the latter interpretation with their finding that investors from countries granting foreign tax credits were no more likely than were other foreign investors to concentrate their FDI in tax-disadvantaged industries after 1986.

Other studies of investment location are exclusively cross-sectional in nature, exploiting the very large differences in corporate tax rates around the world to identify the effects of taxes on FDI. Grubert and Mutti (1991) and Hines and Rice (1994) estimate the effect of national tax rates on the cross-sectional distribution of aggregate American-owned property, plant and equipment (PPE) in 1982. PPE differs from FDI in that PPE represents (the book value of) real productive assets held by American-owned affiliates, while FDI equals the annual change in the book value of ownership claims of controlling foreign investors[67]. Grubert and Mutti analyze the distribution of PPE in manufacturing affiliates in 33 countries, reporting a -0.1 elasticity with respect to local tax rates. That is, controlling for other observable determinants of FDI, ten percent differences in local tax rates are associated with one percent differences in amounts of local PPE ownership in 1982. Hines and Rice consider the distribution of PPE in all affiliates in 73 countries, reporting a much larger -1 elasticity of PPE ownership with respect to tax rates. Altshuler, Grubert and Newlon (2001)

[67] The distinction between FDI and PPE ownership of foreign affiliates is perhaps best illustrated by an example. Consider two American-controlled foreign affiliates, each with $100 million of assets entirely invested in PPE. One affiliate is 100% owned by its American parent, while the other is 60% owned by the parent company and 40% owned by investors in its host country. Both affiliates account for $100 million of PPE. Establishing the first affiliate with $100 million of debt and equity from the parent company represents $100 million of outbound FDI from the United States, while establishing the second with parent funds represents $60 million of FDI. If half of the affiliate financing represented funds borrowed from local banks, then establishing the affiliates would represent $50 million and $30 million of FDI, respectively. To the degree that the affiliates' assets were not entirely invested in PPE, then the PPE figures could change without any corresponding change in FDI. Of the two measurement concepts, PPE more closely corresponds to capital stock notions implicit in most economic models than does the stock of accumulated FDI.

compare the tax sensitivity of PPE ownership in 58 countries in 1984 to that in 1992, reporting estimated tax elasticities that rise (in absolute value) from −1.5 in 1984 to −2.8 in 1992. Hines (2001) compares the distribution of Japanese and American FDI around the world, finding Japanese investment to be concentrated in countries with which Japan has "tax sparing" agreements that reduce home country taxation of foreign income. The estimated FDI impact of "tax sparing" is consistent with the tax elasticity of PPE reported by Hines and Rice.

Harris (1993) uses firm-level data to consider the effect of the Tax Reform Act of 1986 on direct investment abroad by American companies. One of the consequences of the 1986 Act was to remove many of the benefits previously enjoyed by taxpayers investing in equipment located in the United States. Harris finds that American firms with higher equipment/structures ratios invested abroad more heavily after 1986, suggesting that the tax change encouraged them to substitute foreign for domestic investment. This evidence is no more than suggestive, however, since unobserved firm characteristics that are correlated with high equipment/structures ratios could also be responsible for greater outbound FDI after 1986.

A number of cross-sectional studies consider the effects of subnational taxes on the geographic pattern of FDI within the United States[68]. Foreign investors must pay state corporate income taxes, at rates that vary from zero to close to 15%. Coughlin, Terza and Arromdee (1991) estimate the determinants of new plant location by foreign investors during 1981-1983, reporting insignificant effects of local tax rates after controlling for other variables. Ondrich and Wasylenko (1993) analyze a larger sample of new plant establishments over a longer time span (1978–1987), finding significant effects of state tax rates on the location of new plants. Ondrich and Wasylenko fit a model of the probability of locating plants in each state; their estimates imply an elasticity of the number of new plants with respect to state tax rates equal to −0.6. Swenson (2001) estimates separate regressions for differing types of transactions (such as the establishment of new plants, plant expansions, mergers and acquisitions, and joint ventures) undertaken by foreign investors in the United States. The results indicate that tax effects vary with transaction type: high state tax rates are negatively correlated with the establishment of new plants and with plant expansions, while they are positively correlated with acquisitions by foreign investors.

[68] There is also a small literature analyzing the effects of Puerto Rico's special tax status. Prior to legislative changes enacted in 1993, mainland American firms were effectively exempt from U.S. corporate tax on profits earned in Puerto Rico, though they were subject to Puerto Rican tax. Bond (1981) identifies significant effects of expiring Puerto Rican tax holidays on decisions of mainland firms to exit the garment industry over the 1949–1972 period. Grubert and Slemrod (1998) find that mainland firms with attributes associated with intangible assets – such as high R&D and advertising intensities – are the most likely to invest in Puerto Rico. Grubert and Slemrod note that this pattern may reflect the ability of firms with intangible assets to shift profits into their affiliates in low-tax jurisdictions, thereby increasing the attractiveness of locating investment in Puerto Rico.

One of the difficulties facing all cross-sectional studies of FDI location is the inevitable omission of many important determinants of FDI that may be correlated with tax rates and therefore bias the estimation of tax elasticities. This consideration makes it attractive to use empirical specifications that include locational fixed effects, but then the question becomes how it is possible simultaneously to identify the impact of tax differences on investment.

Hines (1996a) incorporates state fixed effects in comparing the distributions of FDI within the United States of investors whose home governments grant foreign tax credits for federal and state income taxes with those whose home governments do not tax income earned in the United States. The inclusion of fixed effects implicitly controls for hard-to-measure state attributes (such as those that make Silicon Valley or midtown Manhattan "special"), as long as the effect of these attributes does not vary systematically between investors from countries with differing home-country tax regimes. Tax effects are identified by comparing, for example, the extent to which investments from Germany (which exempts from tax foreign-source income earned in the United States) tend to be located in lower-tax states than are investments from the United Kingdom (which provides foreign tax credits for state income taxes paid). The evidence indicates that one percent state tax rate differences in 1987 are associated with ten percent differences in amounts of manufacturing PPE owned by investors from countries with differing home-country taxation of foreign-source income, and three percent differences in numbers of affiliates owned. Taken as a structural relationship, the estimates imply a tax elasticity of investment equal to –0.6. It is worth bearing in mind, however, that this estimate reflects the effect of taxation on the identity of ownership of capital as well as on the volume of investment.

The econometric work of the last fifteen years provides ample evidence of the sensitivity of the level and location of FDI to its tax treatment. Indeed, given the pervasiveness of this finding, this research is perhaps too greatly focused on an earlier question – do tax policies influence FDI? – and not enough on more subtle variants such as the role of tax policy in affecting the form that FDI takes, the possible importance of tax policy credibility and enforcement, and the relationship between tax and non-tax determinants of FDI.

Hines (1991) and Collins and Shackelford (1995) consider more dramatic reactions to high tax rates in which firms relocate their corporate homes to countries with more attractive tax climates. They estimate the tax savings available to firms that move from countries (such as the United States) with worldwide tax systems to countries that exempt foreign earnings from taxation. It is striking that, in spite of the appeal of low tax rates, very few multinational firms actually relocate their corporate homes to tax havens. In part, this reflects the tax and regulatory costs of doing so, but in part it also reflects the unwillingness of governments to impose excessively heavy tax burdens that encourage widespread departures.

5.1.2. Tax avoidance

International investors often have at their disposal numerous alternative methods of structuring and financing their investments, arranging transactions between related parties located in different countries, and returning profits to investors. These alternatives have important tax implications, and there is considerable evidence that tax considerations strongly influence the choices that firms make.

Sophisticated international tax avoidance typically entails reallocating taxable income from countries with high tax rates to countries with low tax rates, and may also include changing the timing of income recognition for tax purposes. Many of these methods are quite legal, and closely resemble those used by domestic taxpayers. Dramatic examples of international tax avoidance that qualify as evasion – such as knowingly underreporting income to tax authorities, or filing false documents – are thought to be uncommon among large corporate taxpayers, though possibly more common among individual taxpayers. Very little is known about the determinants or magnitude of international tax evasion, since the self-reported data that serve as the basis of analysis not surprisingly reveal nothing about it.

The financing of foreign affiliates presents straightforward opportunities for international tax avoidance. If an American parent company finances its investment in a foreign subsidiary with equity funds, then its foreign profits are taxable in the host country and no taxes are owed the U.S. government until the profits are repatriated to the United States. The alternative of financing the foreign subsidiary with debt from the parent company generates interest deductions for the subsidiary that reduce its taxable income, and generates taxable interest receipts for the parent company.

Simple tax considerations therefore often make it attractive to use debt to finance foreign affiliates in high-tax countries and to use equity to finance affiliates in low-tax countries[69]. The evidence is broadly consistent with these incentives. Hines and Hubbard (1990) find that the average foreign tax rate paid by subsidiaries remitting nonzero interest to their American parent firms in 1984 exceeds the average foreign tax rate paid by subsidiaries with no interest payments, while the reverse pattern holds for dividend payments. Grubert (1998) estimates separate equations for dividend, interest, and royalty payments by 3467 foreign subsidiaries to their parent American companies (and other members of controlled groups) in 1990, finding that high corporate tax rates in countries in which American subsidiaries are located are correlated with higher interest payments and lower dividend payout rates.

Firms face certain tax and regulatory limits on their abilities to select among alternative methods of financing their foreign and domestic operations. Many host countries limit the extent to which interest payments to foreign parent companies can

[69] Hines (1994) identifies exceptions to this rule that stem from the benefits of limiting equity finance in affiliates located in countries with very low tax rates in anticipation of reinvesting all of their after-tax profits over long periods.

be used to reduce the taxable incomes of local affiliates. Cross-border payments of interest, dividends and royalties are commonly subject to special withholding taxes that can be reduced by the terms of bilateral tax treaties. And, in the years since 1986, American companies with foreign operations have not been permitted to deduct all of their domestic interest expenses in calculating their U.S. tax liabilities. Instead, firms may deduct a fraction of their U.S.-incurred interest expenses in determining taxable U.S. income, with the remainder of their interest expenses used to reduce any U.S. tax liabilities on *foreign*-source income. In practical terms, what this means is that, in the years after 1986, American multinational companies with excess foreign tax credits (those whose foreign income is taxed at rates exceeding the U.S. tax rate) receive only partial interest deductions for their domestic borrowing expenses, the fraction being a function of the ratio of foreign to total assets. American multinational firms with deficit foreign tax credits (those whose foreign income is taxed at rates less than the U.S. tax rate) receive the full benefits of interest deductions for domestic borrowing, since any interest expenses allocated against their foreign-source incomes nevertheless reduce U.S. tax liabilities that they would otherwise incur.

Collins and Shackelford (1992) examine financial responses to the introduction of the interest-allocation rules by considering changes in preferred stock issuances by multinational firms after 1986. Preferred stock is a natural substitute for debt, but U.S. law does not treat payments to holders of preferred stock as interest, making such payments nondeductible and also not subject to allocation to foreign source under the terms of the Tax Reform Act of 1986. Collins and Shackelford find that, among the Fortune 100, firms with higher ratios of foreign to domestic assets – for whom higher fractions of interest expense are allocated against foreign income – are more likely than others to issue preferred stock after 1986. Since these issuances coincide with changing tax incentives, they are likely to represent reactions to changing tax rules, but this does not rule out the possibility that at least some of these large multinational firms may have issued preferred stock for reasons unrelated to tax considerations in the years after 1986.

Altshuler and Mintz (1995) examine confidential information provided by eight American multinational firms, finding a high correlation between tax costs imposed by interest allocation and propensities to borrow abroad after 1986. Since foreign and domestic borrowing are substitutes, this correlation is consistent with the results reported by Collins and Shackelford, and suggests that firms respond to higher domestic borrowing costs by actively pursuing financial substitutes.

Froot and Hines (1995) analyze a sample of 416 large American multinationals, finding that firms most adversely affected by the 1986 tax change do the least borrowing (as a fraction of assets) after 1986. They distinguish firms with foreign operations located in high-tax countries from firms with foreign operations located in low-tax countries. For all firms, the 1986 change reduces interest deductions allocated against domestic income and increases interest deductions allocated against foreign income. This reallocation has no effect on taxes paid to foreign governments, while it increases domestic tax liabilities if firms have excess foreign tax credits. In the absence

of changing tax incentives, there is no particular reason to expect firms in these two groups to exhibit differing borrowing patterns around 1986. The estimates imply that firms with excess foreign tax credits and half of their assets abroad borrow five percent less annually after 1986 than do firms without excess foreign tax credits. Affected firms also exhibit slower rates of accumulation of plant and equipment after 1986, and are more likely than other firms to lease plant and equipment after 1986.

Contractual arrangements between related parties located in countries with different tax rates offer numerous possibilities for sophisticated (and unsophisticated) tax avoidance. It is widely suspected that firms adjust transfer prices used in within-firm transactions with the goal of reducing their total tax obligations. Multinational firms typically can benefit by reducing prices charged by affiliates in high-tax countries for items and services provided to affiliates in low-tax countries. OECD governments require firms to use transfer prices that would be paid by unrelated parties, but enforcement is difficult, particularly when pricing issues concern unique items such as patent rights. Given the looseness of the resulting legal restrictions, it is entirely possible for firms to adjust transfer prices in a tax-sensitive fashion without even violating any laws.

The evidence of tax-motivated transfer pricing comes in several forms. Grubert and Mutti (1991) and Hines and Rice (1994) analyze the aggregate reported profitabilities of U.S. affiliates in different foreign locations in 1982. Grubert and Mutti examine profit/equity and profit/sales ratios of U.S.-owned manufacturing affiliates in 29 countries, while Hines and Rice regress the profitability of all U.S.-owned affiliates in 59 countries against capital and labor inputs and local productivities. Grubert and Mutti report that high taxes reduce the reported after-tax profitability of local operations; Hines and Rice find considerably larger effects (one percent tax rate differences are associated with 2.3% differences in *before*-tax profitability) in their data.

The reported low profit rates of foreign-owned firms in the United States over the last 20 years is a source of concern to observers who suspect foreign investors of transferring profits earned in the United States to low-tax jurisdictions offshore. Grubert, Goodspeed and Swenson (1993) use firm-level tax return data to compare the tax liabilities of foreign-owned firms in the United States with the tax liabilities of otherwise-similar American-owned firms in 1987. They report that approximately 50% of the difference in the reported U.S. tax obligations of foreign and domestic firms is explainable on the basis of observable characteristics such as firm sizes and ages. The other 50% may reflect the use of aggressive transfer pricing by those foreign investors with stronger incentives than American firms to shift taxable income out of the United States, though it may also simply capture the effect of important omitted variables.

Harris, Morck, Slemrod and Yeung (1993) report that the U.S. tax liabilities of American firms with tax haven affiliates are significantly lower than those of otherwise-similar American firms over the 1984–1988 period, which may be indirect evidence of aggressive transfer-pricing by firms with tax haven affiliates. As Grubert and Slemrod (1998) observe, it is difficult to attach a structural interpretation to this pattern,

since firms endogenously select the locations of their foreign affiliates; nevertheless, this evidence suggests an important role for tax havens in facilitating international tax avoidance. Collins, Kemsley and Lang (1998) analyze a pooled sample of U.S. multinationals over 1984–1992, finding a similar pattern of greater reported foreign profitability (normalized by foreign sales) among firms facing foreign tax rates below the U.S. rate. The reduction in the U.S. statutory corporate tax rate from 46% in 1986 to 34% in 1988 offers another method of identifying propensities to shift reported profits internationally. Klassen, Lang and Wolfson (1993) find that American multinationals report book returns on equity in the United States that rose by 10% over this time period relative to reported book returns in their foreign operations. The very limited nature of publicly available data on even the location of foreign operations makes it difficult, however, to discern the extent to which this change is attributable to changing economic conditions in the United States and abroad.

Patterns of reported profitability are consistent with other indicators of aggressive tax-avoidance behavior, such as the use of royalties to remit profits from abroad and to generate tax deductions in host countries. Hines (1995) finds that royalty payments from foreign affiliates of American companies in 1989 exhibit a –0.4 elasticity with respect to the tax cost of paying royalties, and Grubert (1998) also reports significant effects of tax rates on royalty payments by American affiliates in 1990. Clausing (2001) finds that reported trade patterns between American parent companies and their foreign affiliates, and those between foreign affiliates located in different countries, are consistent with transfer-pricing incentives. Controlling for various affiliate characteristics, including their trade balances with unaffiliated foreigners, Clausing finds that ten percent higher local tax rates are associated with 4.4% lower trade surpluses with parent companies. This pattern is suggestive of pricing practices that move taxable profits out of high-tax jurisdictions.

Multinational firms can adjust the timing of their dividend repatriations from foreign subsidiaries to reduce the associated tax liabilities, and there is considerable evidence that they do. Many countries, including the United States, tax the income of foreign subsidiaries only when repatriated as dividends, so multinational firms are able to defer home country taxation by reinvesting their profits abroad. Hines and Hubbard (1990) examine tax return information for the foreign subsidiaries of American firms in 1984, finding that only 16% paid positive dividends to their parent companies in that year. Foreign subsidiaries were more likely to pay dividends to parent companies if the associated tax costs were low and if parent companies also paid sizable dividends to their common shareholders. Altshuler and Newlon (1993) report similar findings in their analysis of tax return data for 1986. Desai, Foley and Hines (2001) compare the behavior of American-owned foreign subsidiaries, whose dividend repatriations may trigger U.S. tax liabilities, with the behavior of American-owned foreign branches, whose income is taxable by the United States whether or not it is repatriated as dividends. Foreign subsidiaries in low-tax locations are significantly less likely to repatriate dividends than are either branches in the same countries or subsidiaries in high-tax locations; the results indicate that one percent higher repatriation taxes are

associated with one percent lower dividend payments. Altshuler, Newlon and Randolph (1995) find transitory tax costs to have much larger effects on dividend payments than do permanent tax costs in their panel of American-owned foreign subsidiaries in 1980, 1982, 1984, and 1986. This estimated difference between the effects of transitory and permanent tax costs is consistent with Hartman's (1985) insight that, while transitory tax costs should affect the timing of dividend repatriations, permanent costs should not, since permanent costs must be paid ultimately and are not reduced by deferral. It remains an open question, however, to what extent permanent tax costs can be accurately identified in a panel covering four years.

The form of a business organization can affect its tax obligation, thereby creating incentives for tax avoidance through the endogenous selection of organizational forms. The U.S. Tax Reform Act of 1986 introduced an important distinction between the tax treatment of income received from majority-owned foreign affiliates of American companies and income received from foreign joint ventures owned 50% or less by Americans. After 1986, Americans were required to calculate separate foreign-tax-credit limits for dividends received from each minority-owned joint venture. This change greatly reduces the attractiveness of joint ventures, particularly those in low-tax foreign countries. Desai and Hines (1999a) report that American participation in international joint ventures fell sharply after 1986, in spite of rising joint venture activity by non-American multinational firms. The drop in American joint venture activity is most pronounced in low-tax countries, which is consistent with changing tax incentives, and for which there is no obvious non-tax explanation. Moreover, joint ventures in low-tax countries use more debt and pay greater royalties to their American parents after 1986, reflecting their incentives to economize on dividend payments.

The location and intensity of R&D activity also appears to reflect tax avoidance incentives. Hines (1993) compares changes in the growth rate of R&D spending from 1984–1989 by firms with and without excess foreign tax credits in a sample of 116 multinational companies. The U.S. R&D expense allocation rules are similar to those for interest: multinational firms with excess foreign tax credits faced higher tax costs of performing R&D in the United States after 1986, while firms without excess foreign tax credits were unaffected. What distinguish firms in these two groups are their average foreign tax rates, which are more or less randomly distributed (in the sense of being uncorrelated with R&D spending in the years before 1986). R&D spending levels of firms in the first group grew more slowly than those of firms in the second group, the implied elasticity of demand for R&D lying between -0.8 and -1.8 in alternative specifications of the R&D demand equation.

International differences in royalty withholding taxes offer evidence of the substitutability of R&D in different locations. Higher royalty taxes raise the cost of imported technology, which in turn stimulates local R&D if imported technology and local R&D are substitutes, and discourages local R&D if they are complements. Hines (1995) finds that American-owned foreign affiliates are more R&D-intensive if located in countries that impose high withholding taxes on royalty payments, and similarly, that foreign firms investing in the United States are more R&D-intensive if they are subject to

higher royalty withholding tax rates. These results suggest that imported technology and locally produced technology are substitutes, and that multinational firms respond to tax rate differences by undertaking such substitution. Hines and Jaffe (2001), however, find that American multinational firms for which the tax cost of performing R&D in the United States became most expensive after 1986 exhibited the slowest subsequent growth in foreign patenting, which suggests a complementary relationship between domestic and foreign research.

International tax avoidance is evidently a successful activity. The reported profitability of multinational firms is inversely related to local tax rates, a relationship that is at least partly the consequence of tax-motivated use of debt financing, the pricing of intrafirm transfers, royalty payments, and other methods. It is important not to lose sight of the fact that, in spite of the demonstrated ability of multinational firms to arrange their affairs to avoid taxes, these large corporations nevertheless pay enormous sums in taxes each year. Tax avoidance appears to be limited by available opportunities and the enforcement activities of governments.

5.2. Reconciling theory and evidence

This section considers the degree to which the behavior of multinational firms is consistent with the implications of theoretical models, an exercise that serves to identify useful and promising directions in which to extend existing theory.

5.2.1. Multinationals as financial intermediaries

Consider first a model in which multinationals are simply vehicles through which domestic residents can invest abroad. In particular, assume that multinationals possess the same technology as other firms, operate in a competitive environment, cannot avoid reporting to the tax authorities their true incomes from investments in each location, and face no uncertainty.

If multinationals serve simply as financial intermediaries, then individuals will invest abroad through multinationals rather than through portfolio investment if the transactions costs of doing so are cheaper, there are tax savings from use of multinationals, or multinationals are better able to locate the most profitable investments. For example, when countries have dividend imputation schemes, then investors face strong tax incentives to invest abroad through multinationals. Rather than exploring the relative advantages of portfolio investments vs. direct investments, however, we take as given here the total amount invested abroad through multinationals and focus instead on the location of this investment. By assumption, multinationals have access to the same constant-returns-to-scale technology as other firms, so that their investments are equivalent to the purchase of equity in local firms. It is useful to consider whether this model's implied pattern of multinational behavior is consistent with the observations summarized in the previous section.

If the corporate tax in all countries simply taxed the return to capital physically located in that country, then in equilibrium the rate of return on capital net of local corporate tax rates should be equilibrated across countries[70]. More formally, $f_k^i(1-\tau_i)$ should be the same for all i, where f_k^i is the marginal product of capital in country i and τ_i is the corporate tax rate in that country. This condition reflects the impact of international mobility of portfolio capital. Based on tax considerations alone, therefore, all multinationals would be indifferent to where they locate, regardless of their home countries.

Many capital exporting countries include any income from foreign subsidiaries in the parent firm's taxable corporate income, and in compensation offer credits for income and withholding taxes paid to foreign governments[71]. It is worth considering whether this complication explains observed investment patterns. In order to simplify the setting, and at the expense of some realism, suppose that the home country taxes foreign income at accrual rather than at repatriation, and also that foreign tax credits are applied only against tax liabilities created by the income stream associated with the credits. Then if the marginal product of capital net of local corporate tax is equated across countries, so that $f_k^i(1-\tau_i)$ is the same for all i (and therefore can be denoted r), the availability of the foreign tax credit implies that the net-of-corporate-tax return to a multinational investor from country j equals $f_k^i(1-\max(\tau_i, \tau_j)) = r - \max(\tau_j - \tau_i, 0)$. This condition implies that a multinational firm will earn a return r in all countries with corporate tax rates above the firm's home country tax rate, but will face domestic tax surcharges and therefore earn a lower rate of return when investing in countries with lower corporate tax rates. With a sufficient number of available investments earning r, multinationals should be indifferent among countries with higher tax rates than the domestic rate, and avoid investing in countries with a corporate tax rate below the domestic rate. This forecast is clearly counterfactual, given the evidence that FDI is a declining function of tax rates in host countries.

With a sufficient volume of investment abroad by multinationals from countries with high corporate tax rates, it is possible that some FDI will be located in lower tax rate countries despite the tax penalty. Specifically, the equilibrium might include multinationals from country k investing in countries with tax rates above some τ_j, with $\tau_j < \tau_k$. For all host countries with $\tau < \tau_k$, the pretax return to capital in equilibrium will be the same as that available in country k, despite their lower tax rates, in order to be able to attract FDI from these multinationals. Portfolio investors from country k, however, then have a tax advantage over multinationals when investing in these

[70] In particular, the local wage rate must drop by enough to compensate for a higher corporate tax rate, so that firms can still pay investors the same after-corporate-tax rate of return available elsewhere.

[71] This foreign tax credit can be used to offset taxes due on foreign-source income but cannot be used to offset any taxes due on domestic-source income. Home-country taxation of the income of separately-incorporated foreign subsidiaries is typically deferred until the income is repatriated in the form of dividends.

countries with $\tau < \tau_k$, since they do not face the corporate surtax at repatriation[72]. Also, local investors in these host countries would earn a higher after-tax return at home than in countries with higher corporate tax rates. Only under extreme conditions, however, would this theory be able to explain why FDI is located in tax havens.

With worldwide averaging of repatriated profits, these forecasts need to be modified. If a multinational now invests K_l in a country with a low corporate tax rate, say τ_l, it simply needs to invest enough in some country with high corporate rate, say τ_h, so that the excess credits received from taxes paid in the high-tax country at least offset any domestic taxes due on the investments in the low-tax country. This occurs if $\tau_h K_h f_k^h + \tau_l K_l f_k^l \geq \tau_j [K_h f_k^h + K_l f_k^l]$ where τ_j is the home country tax rate. If all investments earn r net of local taxes, then this investment strategy earns r net of all taxes. Now FDI can occur in tax havens, but only if matched by enough FDI in high-tax countries.

The evidence indicates, however, that multinational investments are concentrated in countries with low corporate tax rates, and that the rate of investment is a declining function of the local corporate tax rate. This evidence is therefore inconsistent with forecasts of models in which multinational firms are simply financial intermediaries.

One possible explanation for the existence of FDI in low-tax countries was proposed by Hartman (1985). He notes that standard models focus on foreign investments financed by funds provided by parent firms, even though most FDI is financed by retained earnings of existing subsidiaries. When an existing subsidiary considers whether to repatriate a dollar of profits now or reinvest this dollar and repatriate profits later, it will choose whichever option generates the highest present value of repatriations. If the new investment earns the going rate of return, and the repatriation tax rate is constant over time, then Hartman shows that the firm will be indifferent between the two[73]. The key insight, drawn from the model of dividend behavior of Auerbach (1979) and Bradford (1981), is that the opportunity cost of the investment to the parent firm and the future profits earned on the investment are both equally reduced by the repatriation tax, so that the required rate of return on the investment is unaffected by the size of the repatriation tax. As a result, once a subsidiary is located in a low-tax-rate country, it has no incentive to move.

It is useful to examine the properties of this model of the firm, since they illustrate several aspects of the behavior of profit-maximizing multinational firms[74]. Consider the incentives of a firm that produces output with a concave production function $Q = f(K_t^*)$, in which K_t^* is the capital stock employed by the subsidiary in year t, and the $f(\cdot)$ function subsumes profit-maximizing choices of labor and other inputs. Q is output net of capital depreciation, and home and host countries' tax systems apply

[72] For evidence that portfolio investment does to some degree crowd out multinational investments in such countries, see Gordon and Jun (1993).

[73] If the repatriation tax rate varies over time, then the model forecasts that the incentive to invest is high when the repatriation tax rate is high, while repatriations will be high when the tax rate is low.

[74] The following analysis relies on Hines (1994).

true economic depreciation for tax purposes. Output is sold locally at an unchanging price taken to be unity and parametric to the firm.

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. Let β represent the (annual) factor used to discount future after-tax cash flows (in the hand of the parent corporation). Denote by D_t the dividend payment from the subsidiary to the parent in period t; by definition, $D_t \geqslant 0$. Home-country taxation of foreign-source income, together with provision of foreign tax credits, reduces the after-tax value of a dividend payment of D_t to $D_t(1-\tau)/(1-\tau^*)$. For firms with mature foreign investments that use accumulated foreign profits to finance dividends paid to the parent company and any future foreign investments, the value (V_a) of their interest in the foreign affiliate is given by:

$$V_a = \left(\frac{1-\tau}{1-\tau^*}\right)\sum_{t=0}^{n}\beta^t D_t. \tag{5.1}$$

From Equation (5.1), it is clear that the policies that maximize V_a are identical to those that would maximize the present value of dividends in the absence of home-country taxation. Specifically, firms have incentives to reinvest foreign profits in their foreign operations up to the point that the after-foreign tax rate of return equals the opportunity cost of funds, or $f_k^*(1-\tau^*) = \frac{1-\beta}{\beta}$. Since the repatriation tax is unavoidable to a firm financing investments out of foreign retained earnings, then its presence does not affect repatriation policies. This argument is identical to that in the corporate tax literature on "trapped equity" models of corporate dividends [see Auerbach (2002), Chapter 19 in Volume 3 of this Handbook]. As in the corporate tax literature, firms would incur unnecessary tax costs if they were simultaneously to inject equity funds from the parent company while remitting from subsidiaries dividends on which net home country tax liabilities are due.

Of course, repatriation taxes reduce the after-tax value of foreign investments, and thereby tend to reduce *ex ante* investment levels, since firms demand higher pre-tax rates of return in settings with significant repatriation taxes. In selecting initial foreign investment levels, forward-looking firms that anticipate future repatriation taxes have incentives to keep the capitalization of foreign affiliates at modest levels, since doing so prolongs the period before dividends are paid and home country taxation incurred. Sinn (1993) and Hines (1994) generalize the Hartman model to include this consideration, and Hines (1994) notes that this initial underinvestment makes it profitable for multinational firms to use significant levels of debt finance, even in low-tax countries. Of course, this consideration applies only to the extent that multinational firms actually incur repatriation taxes, since, as Hines and Rice (1994), Weichenrieder (1996) and Altshuler and Grubert (2002) note, there may be a large supply of attractive foreign investment opportunities to which foreign retained earnings might be devoted. Hines (1988, 1994) and Leechor and Mintz (1993) further generalize the Hartman model to situations in which home-country taxation uses a different tax base definition than does taxation by foreign governments. In this setting,

marginal foreign investments have the potential to affect home-country taxation of inframarginal dividends received from abroad, and therefore repatriation taxes may influence repatriation patterns. Illustrative calculations presented by Hines (1988) suggest that this effect may be sizable enough to remove much of the value of popular foreign investment incentives such as accelerated depreciation.

There are a number of other clear inconsistencies between this initial theory and data on multinationals. If investments in equilibrium all yield the same rate of return r, net of source-based taxes, then the pre-tax rate of return in a country should be higher when the local corporate tax rate is higher. Yet, as described above, reported pretax rates of returns of subsidiaries appear to be a *decreasing* function of the local corporate tax rate, with particularly high rates of return reported in tax havens. Another important inconsistency is that the simple model cannot easily explain why countries have adopted such tax systems. Worldwide averaging produces outcomes in which the allocation of capital might be the same as would have arisen with source-based corporate taxes in each country, in spite of home-country attempts to tax income at repatriation. Yet such source-based taxes remain inconsistent with the forecasts from the Diamond–Mirrlees (1971a,b) framework.

5.2.2. Multinationals as corporate tax avoiders

The most striking inconsistency between this initial theory and observation is the very high reported rates of return in "tax havens". As noted above, the evidence suggests that multinationals actively make use of their abilities to reallocate taxable income from subsidiaries in countries with high corporate tax rates to those in countries with very low corporate tax rates. There are several possible methods of reallocating income, including judicious choices of prices, interest rates, and royalty rates used for transactions between related parties, substitution between debt and equity finance, and careful consideration of where to locate investments that might become unusually profitable.

The following framework is useful in understanding the empirical work on tax-motivated profit shifting, since much of this work relies on the premise that the stringency of government enforcement of international tax rules is a function of the extent to which reported profits differ from those actually earned in each jurisdiction. Consider the case in which a multinational firm earns true profits $\rho_i > 0$ in location i, but arranges transfer prices in order to report an additional profit of ψ_i in the same location (in which ψ_i might be negative). The firm incurs compliance costs equal to $\gamma \frac{\psi_i^2}{\rho_i}$, with $\gamma > 0$. Consequently, reported profits in jurisdiction i equal:

$$\pi_i = \rho_i + \psi_i - \gamma \frac{\psi_i^2}{\rho_i}. \tag{5.2}$$

The firm chooses ψ_i to maximize worldwide profits:

$$\sum_{i=1}^{n} (1 - \tau_i)\, \pi_i = \sum_{i=1}^{n} (1 - \tau_i) \left[\rho_i + \psi_i - \gamma \frac{\psi_i^2}{\rho_i} \right], \tag{5.3}$$

subject to the constraint that

$$\sum_{i=1}^{n} \psi_i = 0. \tag{5.4}$$

The first-order conditions for ψ_i imply

$$\psi_i = \rho_i \left[\frac{1 - \tau_i - \mu}{2\gamma(1 - \tau_i)} \right], \tag{5.5}$$

where μ is the Lagrange multiplier corresponding to the constraint (5.4)[75]. We find, as expected that $\psi_i > 0$ in low-tax countries, where $\tau_i < 1 - \mu$, and conversely.

If firms invest facing an opportunity cost of funds of r, then the true marginal product of capital (denoted f_K) will satisfy:

$$f_K = \frac{r}{\left[(1 - \tau_i)\left(1 + \frac{\gamma\psi_i^2}{\rho_i^2}\right)\right]}. \tag{5.6}$$

Without evasion, we instead would have found that $f_K = r/(1 - \tau_i)$. This is also the investment condition that would be faced by local firms, who cannot make use of foreign operations to reduce taxes. A multinational firm's avoidance opportunities therefore give it a competitive advantage over local firms to the extent that $\psi_i \neq 0$. Equation (5.5) implies that the size of this competitive advantage is larger in countries with more extreme tax rates, both small and large. The investment pattern of multinationals should therefore be a U-shaped function of the local tax rate[76].

Reallocating income into a tax haven avoids current tax liability. However, home country taxes are deferred but not altogether avoided as long as profits must ultimately be repatriated. Some investors may nevertheless be able to avoid repatriation taxes as well. One approach is to locate the parent firm itself in a tax haven. Another approach is to remove profits from the tax haven subsidiary in a way that does not generate tax liabilities for the parent firm. For example, the subsidiary can finance directly the expenditures (either at home or elsewhere abroad) that the parent firm would otherwise finance itself. Alternatively, the firm can simply continue investing abroad in other financial or real assets, earning the going rate of return pretax, thereby postponing any domestic taxes due at repatriation indefinitely. A number of countries have adopted rules trying to restrict deferral to real investments only[77].

[75] The value of μ adjusts to ensure that Equation (5.4) holds with equality.

[76] In countries with high tax rates, multinationals have advantages over local firms, because they are able to reallocate taxable profits to reduce the impact of the high local taxes. Their advantage over local firms in tax havens stems from the desirability of tax haven operations as recipients of taxable income reallocated from elsewhere.

[77] For example, the U.S. Subpart F rules impose tax at accrual on any income earned on financial investments abroad. As noted by Weichenrieder (1996), these provisions make real investments abroad more attractive, distorting allocation decisions.

Many but not all aspects of the behavior of multinationals are consistent with this focus on the role of multinationals as tax avoiders. Certainly, income reallocation efforts can explain the low observed pretax profit rates in high-tax countries, and the high profit rates in low-tax countries. However, income reallocation also implies that multinationals will invest more heavily in countries with extreme tax rates, both low and high. While the evidence does indicate substantial investment in tax havens, it is not consistent with the forecast of substantial investment as well in high-tax countries.

The theory also does not easily rationalize observed tax policies. Standard models indicate that the optimal source-based tax rate on capital income is zero. If firms can easily reallocate profits in response to tax rate differences, this only reinforces a country's incentive to reduce its source-based tax rate – and these incentives were sufficient, even without income shifting, to drive tax rates to zero. Given the evidence reported by Gordon and Slemrod (1988) and Kalambokidis (1992) that capital taxes in the United States (between the mid-1970's and the mid-1980's) collected no net revenue, perhaps tax policy in practice is not all that distant from the forecasts of the theory. Actual policy, however, generates a wide range of more detailed distortions, however, that are also inconsistent with the theory.

One further complication is that multinational firms can avoid taxes not only on their capital income but also on the income generated by the ideas and efforts of the entrepreneurs responsible for the firm. In particular, rather than receiving wage payments in return for their efforts, which are then taxable under the personal income tax, entrepreneurs can instead leave their earnings within the firm, so that they are taxed as corporate income[78]. Through adept income reallocation, the earnings might then even be taxed at as low a rate as that available in a tax haven, rather than the domestic corporate tax rate. Under an optimal labor income tax, this return to entrepreneurial effort would be taxed at the same rate as applies to the return to efforts expended elsewhere[79].

Gordon and MacKie-Mason (1995) explore ways in which tax policy can be designed to deal with this threat of tax avoidance on the earnings of entrepreneurs. In a closed economy, the solution would be simply to impose a corporate tax at a rate equal to the top personal tax rate. In an open economy, in which firms can reallocate taxable profits between countries, enforcement is more difficult. If any foreign profits must ultimately be repatriated, then Gordon and MacKie-Mason argue that the same outcome is achieved by including the cash-flow between the parent and the subsidiary in the corporate tax base, e.g., tax all repatriations in full but allow a deduction for all funds sent abroad. If foreign profits cannot be fully taxed at repatriation, however, perhaps due to detection problems, then the corporate tax rate should be set below

[78] When earnings are retained, entrepreneurs may then owe taxes on realized capital gains at some point in the future when they sell their shares in the firm.

[79] If entrepreneurial effort generates positive externalities, however, then a reduced tax rate on this form of effort could be justified. See Gordon (1998) for further discussion.

the labor income tax rate but above the corporate tax rates in tax havens, trading off domestic and international income shifting.

5.2.3. *Multinationals as owners of intangible capital*

Another theoretical modification suggested by the data is that multinational firms possess intangible capital, in the form of unique technologies or products, which they can profitably exploit in foreign countries[80]. As a result, multinationals earn returns on their intangible capital as well as on any physical capital they own. This modification is commonly used outside the tax literature in order to explain the economic role of multinationals[81].

When multinational firms possess such intangible capital, competition need not eliminate all pure profits. Multinationals therefore face even greater pressure to locate any pure profits in countries with low corporate tax rates. For example, if the fixed factor responsible for diminishing returns to scale is a limited number of skilled and trusted managers, these managers along with their subsidiary can in principle be relocated between countries. Consider the case in which the costs of relocating are zero, e.g., all other employees are perfect substitutes across locations. In particular, let the subsidiary earn the same pure profits, π, regardless of the country in which it is located. Due to the scarcity of managers available to oversee the technology, the multinational will invest in only those few countries that yield the highest net-of-tax return. Ignoring the repatriation tax, a subsidiary would earn a net-of-tax income of $[f(K_n)+\pi](1-\tau_n)$ in country n, leaving it a net profit of $\pi(1-\tau_n)$ after compensating investors at the going rate of return[82]. Without a repatriation tax, the firm would then want to locate all of its subsidiaries in tax havens.

In contrast, if profits are repatriated every year and subject to tax at repatriation, then the firm's net-of-tax income from its foreign subsidiary becomes

$$\left(\frac{rK}{1-\tau_n}+\pi\right)[1-\max(\tau_h,\tau_n)], \tag{5.7}$$

in which τ_h is the corporate tax rate in the home country. Now the firm strictly prefers to establish subsidiaries in countries with corporate tax rates just equal to τ_h – net of tax profits are lower in countries with both lower and higher corporate tax rates. As a result, FDI should be greatest in countries with "average" corporate tax rates.

[80] Leasing technology is an alternative to FDI, but encounters many difficulties. The lessee cannot easily be assured that they will gain access to all the information that is valuable in operating the unique technology effectively, while the lessor will fear competition from the lessee both in the product market and in the market for access to the technology.

[81] See, e.g., Dunning (1985).

[82] This is based on the assumption that, in equilibrium, $f(K_n)(1-\tau_n)=r$.

If instead repatriation is postponed until date T, then the net return to investing in the subsidiary equals

$$[1+r+\pi(1-\tau_n)]^T - \left\{[1+r+\pi(1-\tau_n)]^T - 1\right\} \max\left(\frac{\tau_h - \tau_n}{1-\tau_n}, 0\right). \tag{5.8}$$

In the limit as T becomes large, this expression will again be largest for subsidiaries located in tax havens, and the shift occurs at a lower T for firms earning greater fractions of their returns in the form of pure profits. The observed FDI in tax havens could then represent investments by multinationals that earn high pure profits and that can postpone repatriating these profits for a considerable period of time.

If subsidiaries earning the highest pure profits are pushed into tax havens, whereas those earning closer to a normal rate of return are confined to countries with corporate tax rates above the domestic tax rate, then this model helps explain the higher reported rate of return in tax havens. If many multinationals do earn large pure profits, then it also explains their observed concentration in tax havens.

This argument assumes that subsidiaries are costlessly mobile. The alternative extreme assumption is that the firm can profitably sell its output in a country only by locating a subsidiary there, as might be true when exports from operations elsewhere incur very high transportation costs. The firm then establishes a subsidiary in a country only if local taxes are not too high[83]. Assume, for example, a world of monopolistic competition among multinationals, where each multinational in equilibrium earns just enough profits, aggregated across all its operations, to offset its initial R&D costs[84]. Assume, for example, that a subsidiary in country i earns profits of $\pi_i \equiv f(K_i, R) - rK_i$ before royalty payments, in which K_i is the subsidiary's capital stock, R is the amount of R&D it has undertaken, and $f(\cdot)$ is a concave production function. The multinational could then face a cost function $c(R)$, and choose R to maximize worldwide profits.

This model implies that the government in a small country i would want to impose a 100% cash-flow tax on the subsidiary, i.e., not allow any deductions for royalty payments or R&D expenses[85]. The tax collects revenue yet creates no offsetting

[83] Note that the relevant tax rate is then the average tax rate, since the firm faces a zero-one decision. For further discussion, see Devereux and Griffith (1998).

[84] Firms in principle would then report zero profits in each location, after R&D costs are divided appropriately across locations. However, there are no clear rules for dividing these R&D expenses across subsidiaries. The purpose of the analysis is to analyze what effective tax rates host countries would prefer to impose on local subsidiaries. Such taxes (if positive) may then be implemented through restrictions on deductions for royalty payments and R&D expenses, or withholding taxes on royalty payments.

[85] In general, a cash-flow tax falls only on any existing assets of the firm, since new investment is deductible. By the same logic a government may attempt to expropriate such existing assets through a 100% cash flow tax. If anticipated, however, the original investment would not have occurred. R&D is different, since the investment is a public good from the perspective of each country, so should be only modestly affected by any one country's cash-flow tax, even if anticipated.

efficiency costs from the perspective of a small country, since a cash-flow tax does not distort the subsidiary's choice of K_i and a small country can ignore the implications of the tax for R[86]. Taken together, however, these tax policies make R&D unattractive, leading to an inefficient outcome.

While multinational firms can select the locations of their foreign subsidiaries, some countries may prove to be significantly more attractive than the next best alternatives, perhaps due to high costs of producing elsewhere and shipping to local customers. In such countries profits taxes on multinationals can survive in equilibrium. However, the maximum profit tax rate that avoids inducing subsidiaries to relocate varies by firm. As tax rates rise, a larger fraction of potential investment moves elsewhere. This relocation causes local wage rates to fall and local customers to face higher prices. These costs will limit the size of the optimal tax rate on multinationals.

Another issue that arises when multinationals own intangible capital is the difficulty of enforcing intellectual property rights. Multinational firms cannot necessarily rely on host governments to prevent local firms from learning and making use of its subsidiary's proprietary technology. It is not even clear that the rigorous enforcement of intellectual property rights is the most efficient policy, since the incentives for R&D activity need to be balanced against the efficiency gains from having existing technologies employed widely in production[87]. Even if rigorous enforcement were the most efficient policy from a global perspective, however, this does not mean than every country individually would gain from such rigorous enforcement – countries with no technologies to sell would almost surely lose from it. As a result, if a country is in a position to impose some additional cost on local subsidiaries without inducing exit, then it may choose to do so by aiding domestic firms to gain use of the technology owned by the foreign multinational instead of collecting cash payments from the firm. The choice between these alternative "taxes" would largely depend on the size of the gain to local firms from access to the technology compared to the cost to the multinational from the resulting additional competition. If local firms produce noncompeting goods, for example, then the leakage of information imposes little or no cost on the multinational. When the losses to the multinational from leakage of information about its proprietary technology to local firms is large enough to prevent it from entering, yet the gains to these local firms exceed the loss to the multinational, the host government may even want to subsidize multinationals to locate subsidiaries there.

The above arguments assume, however, that financial profits π_i must be reported in the same location as the physical capital K_n responsible for production. To some

[86] Huizinga (1992) and Mintz and Tulkens (1990) explore a closely related problem in which the host country is restricted to taxing the return to capital investments at the same rate as applies to pure profits, and also find that the optimal tax rates on foreign-owned subsidiaries are positive.

[87] Because of fixed factors of production, the multinational may not be able to pursue all profitable uses of its technology, yet find it difficult to design a contract to sell or lease the information to other firms that can profitably employ the technology.

degree, the multinational firm can relocate its financial profits independently of its physical operations. For example, if its subsidiary in a tax haven owns the key patents, the firm can then make royalty payments from its operations elsewhere to this tax haven subsidiary in an attempt to have π_i taxed at a low rate while maintaining flexibility over the physical location of the rest of its operations[88]. Firms with excess foreign tax credits are in even simpler situations, since they are effectively untaxed by their home countries on any foreign-source royalty income, and therefore have incentives to locate patent ownership in parent firms.

5.2.4. Testing alternative explanations

There remain two plausible – and nonexclusive – explanations for the dominant role of FDI, particularly in tax havens, and the high reported profit rates of subsidiaries that do locate in tax havens: tax avoidance activity and multinational ownership of intangible capital. Their forecasts differ sharply, however. Multinational ownership of intangible capital implies that tax havens would attract subsidiaries from industries earning the highest rates of pure profits, whereas tax avoidance implies that tax havens would instead attract firms that can most easily reallocate profits without detection. Also, the subsidiaries located in high tax countries would report below normal profit rates if profit reallocation were important, while they would report normal profits if the explanation for the dominant role of FDI were the existence of intangible capital. Another difference between the two explanations is that the gain from adjusting transfer prices is the same whether FDI takes the form of acquiring an existing firm or establishing a new firm (greenfield investment), as long as the ease of profit reallocation is the same. If multinational investment instead occurs because of the important role of intangible capital, then multinationals would again be indifferent between acquisitions and greenfield investment when investing in high-tax countries. They would invest in low-tax countries, however, only if it is possible to earn a high enough profit rate, which rules out acquiring an existing firm[89]. Therefore, FDI in tax havens would be limited to greenfield investment. Finally, predicted FDI is a U-shaped function of the local tax rate with income reallocation, but an L-shaped function of the local tax rate in the presence of intangible capital.

Another source of evidence on the relative merit of competing explanations for the dominant role of FDI and the large multinational presence in tax havens is the response to the U.S. Tax Reform Act of 1986. Following this Act, FDI in the United States increased substantially [Hines (1996a)]. One explanation proposed by Scholes,

[88] Host governments, however, may attempt to limit this process, for example by restricting the size of royalty payments or imposing withholding taxes on them.

[89] The existing owner would value a firm earning $[rK + \pi(1 - \tau_L)]$ at $[K + \pi(1 - \tau_L)/r]$. If the multinational acquired the firm, it would end up with lower profits net of tax because of the taxes due at repatriation yet would still face a required rate of return of r. Therefore, it could not afford to pay enough to convince the current owners to sell.

Wolfson, Erickson, Maydew and Shevlin (2002) is that U.S. firms faced an effective tax increase as a result of the tax reform, but that foreign-owned subsidiaries who owe further home-country taxes when they repatriate their profits would not be as much affected by the tax increase, since they receive extra credits against their home-country taxes to compensate for the extra U.S. tax payments. This explanation does not clarify, however, why the foreign subsidiaries are located in the United States. If foreign investors do in fact owe additional taxes at repatriation, then they would not want to locate in the United States if by doing so they earn no more than the going net-of-tax rate of return r. If opportunities for income reallocation were the reason for their presence in the United States, then the reduction in the *statutory* tax rate in 1986 would reduce the gains from transfer pricing, making U.S. investment less attractive. If foreigners invest in the United States in order to earn pure profits by exploiting firm-specific intangible assets, then the drop in the U.S. statutory tax rate could well leave them with a larger share of these pure profits after tax, making further investment in the United States more attractive than before. This explanation most likely predicts an increase in greenfield investments, however, since any firms wishing to make use of a unique technology would normally find it cheaper to build a plant incorporating the technology directly rather than convert an existing plant. Yet the observed increase in FDI primarily took the form of acquisitions [Auerbach and Hassett (1993)]. One factor that does help explain the observed jump in foreign acquisitions of U.S. equity is simply that the fall in U.S. personal income tax rates, and the rise in capital gains taxation, induced American investors to shift their portfolios away from equity towards bonds. In equilibrium, foreign residents facing high personal tax rates would then acquire this equity. The importance of dividend imputation schemes abroad, for example, could then explain why foreigners acquired U.S. equity through FDI rather than portfolio investment. This portfolio reallocation process is very much consistent with a jump in acquisitions but not greenfield investment.

6. Understanding existing international tax provisions

Tax systems in the world today differ substantially from those implied by the simple theories reviewed in Section 2. Source-based corporate income is taxed at high rates by all major capital importing countries, and has been so for years, in spite of any competitive pressures to reduce tax rates to zero. While personal taxes on capital income typically apply to the worldwide dividend and interest income of domestic residents, as forecast by the theory, in practice capital flight significantly reduces the effective taxation of this source of income for residents of many countries. The persistence of capital income taxation therefore also requires an explanation, since the threat of capital flight should exert substantial pressure to reduce or eliminate existing personal taxes on dividend and interest income. This section considers directions in which the theory of international taxation might be modified in order to account for observed international tax practices.

The discussion in Section 5 draws attention to two important considerations that are not addressed by simple theories, the ability of multinational firms to reallocate taxable profits between countries, and the use of FDI to exploit firm-specific intangible assets. Simply adding these complications to the initial models, however, only increases the implied pressure to reduce source-based capital tax rates. The ability of firms to reallocate taxable income and to earn pure profits from intangibles gives countries incentives to select corporate tax rates just below those prevailing elsewhere, since doing so increases the tax base both by attracting firms earning larger pure profits and by encouraging firms to report higher taxable incomes. If countries are symmetric, the only resulting equilibrium is one in which all countries have zero source-based corporate tax rates.

The pressure to reduce tax rates describes a form of tax competition that arises due to fiscal externalities. When a country succeeds in increasing its tax base through a cut in its tax rate, much of this increase in tax base occurs through a reduction in the tax base elsewhere. While in theory foreign individual workers and investors are indifferent at the margin to the resulting changes in investment patterns, foreign governments are not, since their tax bases fall and with them their tax revenues. One government's action therefore imposes a fiscal externality on other governments. In the presence of such externalities, the resulting equilibrium pattern of tax rates will be too low from the perspective of the various governments. In particular, while each government would be indifferent to a marginal increase in its tax rate starting from the equilibrium values, other governments would benefit from the increase, leading to a Pareto improvement[90]. However, observed attempts at policy coordination through bilateral tax treaties uniformly involve reductions rather than increases in tax rates, suggesting that fiscal externalities somehow produce tax rates that are too high rather than too low.

Modifications to the simple theory of international taxation may help to explain the use of source-based taxes on capital income. One modification is to incorporate the fact that capital once invested is commonly sunk. While *ex ante* a country may not want to distort investment incentives through a source-based tax, *ex post* it would want to seize past investments, a classic time consistency problem. This seizure is particularly tempting when the owners are foreign, so that their own welfare is of minimal policy concern. Given the time inconsistency, however, a government would want to commit not to tax capital in the future, if possible, despite actually wanting to seize assets currently. Other governments (of countries in which foreign investors reside) also would want to see such a commitment. Both pressures are consistent with binding bilateral tax treaty agreements to reduce tax rates.

A second modification, as in Huizinga (1992), is to posit that firms with unique technologies or other intangible assets may be able to earn rents in a country only by locating a subsidiary there. The host country then can impose tax obligations as

[90] See Razin and Sadka (1991b) for further discussion.

up to the size of these rents without changing the firm's location decision[91]. This tax discourages investment in R&D, but the resulting costs are shared worldwide. Equilibrium tax rates are therefore too high relative to those that would arise if countries could coordinate their policies. When firms have market power, as well as pure profits, additional complications arise in any model of optimal taxes, even in a closed economy[92].

A third modification, explored in Gordon and MacKie-Mason (1995), concerns the implications of possible income shifting between the domestic personal and corporate tax bases. While a source-based corporate tax encourages firms to reallocate taxable profits abroad, it discourages employees from shifting their personal incomes into the corporate tax base. If there were no tax on repatriated profits, then it would be possible to avoid taxes even on labor income. While there is no incentive per se in this model to tax foreign investors in the domestic economy, such taxes may still be needed to deter residents from disguising themselves as foreign investors. This generates an efficiency gain from using information sharing to detect foreign-source income rather than relying on taxes on "foreign" investors, consistent with the provisions of many tax treaties.

A final modification, suggested by the empirical findings of Feldstein and Horioka (1980) and the home bias literature and explored for example in Gordon and Varian (1989) and Gordon and Gaspar (2001), is to posit that capital investments are not so easily mobile across countries, due for example to risk diversification or hedging reasons. If capital investments are less than perfectly mobile, then countries may find some taxation of capital investments to be attractive. Gordon and Gaspar argue, however, that this scenario provides only weak theoretical support for significant capital taxation by optimizing governments.

7. Conclusion

Economies are rapidly becoming more open, not only to trade in goods and services, but also to capital flows and even to labor migration. This paper considers the effect of taxation on international business activity, and the implications of open borders for the taxation of capital income. There is considerable evidence that international taxation influences the volume and location of foreign direct investment, and is responsible for a wide range of tax avoidance. The observed responsiveness of international economic activity to its taxation carries direct implications for the formation of international tax policy and indirect, but no less important, implications for the formation of domestic tax policy. Indeed, given the extent to which international considerations influence

[91] Since the country has no incentive to discourage local capital investment, it prefers to impose a cash-flow tax.

[92] See Devereux and Hubbard (2000) for a recent attempt to extend such results to an open economy setting.

domestic tax choices, it is not clear whether countries are any longer able to pursue purely domestic tax policies.

Any analysis of capital taxation in an open economy that seeks to be consistent with observed behavior and actual tax policies must consider the implications of tax avoidance, and should recognize the potential importance of investment driven by firm-specific intangible assets. Even these added complications do not explain certain aspects of individual behavior, such as "home bias" in financial portfolios, and are insufficient to rationalize easily the current tax treatment of capital income. Since international considerations were afterthoughts in the design of most countries' tax systems, it may be that policies around the world have yet to catch up with events. There is a bright future for research on international taxation, not only because there are many unanswered questions and a worldwide laboratory to use in answering them, but also because the formulation of domestic as well as international tax policy turns on the answers.

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