

**Taxation of Investment and Finance in an International Setting:  
Implications for Tax Competition**

By

Jack M. Mintz\*

\*Prepared for the Conference on Intertemporal Finance, October 6-7, 2000 at the University of Konstanz, Germany. Arthur Andersen Professor of Taxation, J.L. Rotman School of Management, 105 St. George Street, University of Toronto, Toronto, Canada, M5S 3E6.

## **I. Introduction**

Tax competition and co-ordination is one of the most pressing issues for tax authorities in modern economies. It is also a highly controversial subject.

Some argue that tax competition is beneficial by forcing governments to use efficient tax prices borne by residents for their public services (Tiebout [1956]). In other words, if tax competition leads to less use of source-based taxes (such as taxes on businesses), this would improve the tax policy in competitive economies. Further, some argue that tax competition is also beneficial by limiting the power of governments to levy taxes (Kehoe [1989] and Edwards and Keen [1994]).

Others take a different view. Taxes levied by jurisdictions can impose spillover (or fiscal externality) costs on other jurisdictions (Mintz and Tulkens [1986] and Gordon [1983]). This can take the form of “tax base flight” whereby a jurisdiction’s tax results in mobile factors fleeing to low-tax jurisdictions (Zodrow and Mieszkowski [1986]). Alternatively, unco-ordinated taxes can result in “tax exportation” whereby a government shifts the tax burden of financing local public services onto non-residents (e.g. taxes on foreign corporations). Therefore, in a world without co-ordinated tax policies, governments choose sub-optimal levels of public services financed by inefficient taxes that are either too high or too low by ignoring spillovers imposed on other jurisdictions.

In recent years, the OECD and the European Union have become increasingly concerned about tax competition. Historically, discussions at the OECD led to the development of a model “tax treaty” to limit tax avoidance and reduce “tax exportation” arising from double taxation of income earned by a multinational parent with operations in a capital importing country. A recent OECD project, controversially named “harmful tax competition”, is intended to reduce the scope for “tax base flight” externalities by removing incentives to shift tax bases to low-tax jurisdictions. The European Union has not only been looking to implement a “code of conduct” to limit the scope of the tax competition but the member countries have also been forced to adopt limitations on tax exportation that discriminates between foreigners and domestic owners of capital.<sup>1</sup> Agreements to limit tax competition have not

---

<sup>1</sup>Recent European court cases led to Britain and other EU countries in revising their tax systems for the integration of corporate and personal taxes. Most governments only provided a dividend tax credit for domestic shareholders as an offset for corporate taxes paid on income prior to distribution to shareholders. Effectively, a German company operating in Britain argued that the dividend tax credit should also be extended to German shareholders as part of the European Union. The court determined that a tax credit should be paid to shareholders in

been easily achieved. Even in the latest round of negotiations, some countries like Luxembourg and the United Kingdom have objected to EU or OECD attempts to limit tax competition.

The purpose of this survey is to draw out the most important issues of un-coordinated tax policy at the international level for cross-border transactions. The discussion focuses on mobile tax bases, specifically in relation to investment and financial transactions. Two important caveats are thus in order. The first is that, even though labour is mobile to some degree, there is still relatively little labour mobility at the international level (Helliwell [2000]). Thus, we concern ourselves with tax competition in relation to mobile capital and finance. The second is investment and financial transactions are taxed at the business level and household level. Although there is certainly some significant concern on part of authorities that individual residents can escape taxation on income by investment wealth in low-tax offshore jurisdictions, the most substantial problems arise with respect to business income and financial transactions taxes since most cross-border transactions involve companies and financial intermediaries.

Our main issue for consideration in this survey is whether taxation of income, specifically capital income will survive. Although capital inputs are mobile, our view is that tax competition will only constrain but not result in a shift from taxing real capital inputs such as machinery, land and structures. Instead, the most significant problem is to tax “income”, especially that earned by businesses. Two specific problems are involved. First, income can be readily shifted with the use of financial and other service transactions from a high to low-tax jurisdictions, thereby resulting in the erosion of the income tax base. Second, with the growth of intra-firm transactions at the international level, now almost 50% of trade for industrialized countries (Eden [1998]), taxes that are administered according to the arm’s length pricing principle and separate accounting methods cannot be sustained in the long run.

The outline for the paper is the following. In Section 2, we describe how taxes impact on investment and financial transactions in a closed economy. This provides a benchmark for analysis of an open economy that is provided in Section 3. The question we will be specifically interested in is whether the unco-ordinated taxes

---

other European countries. Rather than try to pay credits to foreign shareholders, the United Kingdom changed its existing system to integrate corporate and personal taxes by abolishing the a corporate level tax on distributions and reducing personal taxes on dividends to a level so that the combined corporate (30%) and personal tax rate (10%) on dividends was approximately equal to the top rate on salary and other income (40%).

imposed at the international level result in greater or less taxation of capital. Section 4 then considers the problem of tax competition and how the role of tax co-ordination. Section 5 concludes the survey.

## II. Taxes on Investments in a Domestic Economy

To begin this survey, we consider the implications of tax policy for investment and financial decisions for a domestic, closed economy. This will serve as a benchmark for the later analysis that considers the impact of taxes on capital in an open economy. A simple model is constructed to bring out the most important issues. More complex issues are left to further elaboration as provided below.

Consider an economy with identical firms that produce output,  $F[K]$ , with non-depreciating capital stock,  $K$ . Prices for capital and output are the same and are treated as the numeraire. We abstract from inflation by assuming prices are constant over time. Capital is financed in the first period with bonds,  $B$ , and equity,  $E$ , which are assumed to be in fixed proportion to capital:

$$(1) \quad K = B + E = \beta K + (1-\beta)K$$

with  $\beta$  denoting the debt to capital ratio. This fixity of debt to capital is clearly an unsatisfactory assumption.

However, this assumption shall be relaxed below.

The contracted interest rate for bond finance is equal to  $i$  and the shareholders' discount rate for evaluating future income is assumed to be the same across all investors and equal to  $r$ . For now, it is assumed that the interest rate on debt bears no relation to shareholders' discount rate – this issue is left for further elaboration below.

The shareholders receive dividends distributed from the firm's profits or they earn capital gains from repurchase of shares<sup>2</sup>. At the end of the second period, the firm realizes profits  $\Pi = F[K] - iB - T$ , with  $T$  denoting corporate taxes paid on equity. The capital stock left at the end of the second period is used to retire the debt's principal,  $B$ . The balance,  $K-B$ , is "paid-up" capital (or the original cost of equity finance) that can be returned as a

---

<sup>2</sup>With this simplified model of two periods, capital gains arise from the increase in the value of the firm due to profits earned but not distributed as dividends in the second period. A dynamic model would allow for reinvestment of profits in capital but in this model "capital gains" are a relabelling of profit distributions as in the case of repurchase of shares. Some countries may deem such capital gains on repurchases as deemed dividends.

tax-free dividend to shareholders. Other capital distributions, which come from the earnings of the company, would therefore be taxed as capital gains earned by shareholders.

The return on capital in the second period is subject to taxation. The corporate income tax, assessed at the rate  $u$ , is applied to income, net of debt financing costs:

$$(3) \quad T = u(F[K] - iB)$$

The personal tax applies to net-of-corporate tax returns on capital. Personal tax rates vary by investor due to progressivity of the personal income tax. Tax rates vary by component of income with effective dividend and capital gains tax rates possibly reduced by tax credits and deductions relative to taxes on interest income. The tax rate on interest is equal to  $m(n)$  ( $n$  an index that increases monotonically with taxable income  $y(n)$ ,  $n \in [0, N]$ ). The dividend tax rate is  $t(n)$  if the return on capital is distributed as a dividend. The capital gains tax rate<sup>3</sup> is  $c(n)$  if the profits are earned as capital gains at the personal level (such as by the repurchase of shares by the company). Assuming that the proportion of profits,  $\alpha$ , is distributed as dividends and, therefore,  $(1-\alpha)$  of profits is earned as capital gains, then the “average” personal tax rate on equity income is  $\theta(n) = \alpha t(n) + (1-\alpha)c(n)$ , the weights depending on the “dividend pay out” ratio of the firm. This tax is applied to income, not the return of capital to the investor.

Each investor owns a share,  $s(n)$ , of equity invested in the firm:  $\int s(n)dn = 1$ <sup>4</sup>. The present value of net wealth for the  $n$ th shareholder is equal to discounted future profits and capital distributions net of the original cost of

---

<sup>3</sup>The capital gains tax rate is expressed as an “effective tax rate on accrued gains”. Governments only tax capital gains on a realized basis, providing an investor an opportunity to defer capital gains taxes to the future. For calculations of accrual-equivalent capital gains tax rates, see Davies and Glenday [1990].

<sup>4</sup>An explicit incorporation of risk in model would allow a determination of the shares according to risk preferences of the owners of the firm. As individuals are identical in all respects except for the personal tax rates,  $s(n) = 1/N$  in the absence of taxation. As discussed below, differential tax rates could lead to different holdings of shares when markets are cleared.

equity invested in the firm:

$$(4) \quad V(n) = s(n) \{((1-\theta(n))\Pi + K-B)/(1+r) - (K-B)\}$$

The investor not only receives income from shareholdings in the firm but also a payment on bonds,  $b(n)$ , held by the individual (the sum of bonds held by investors equals the amount of debt issued by the firm  $\int b(n)dn = B$ ). The net bond wealth,  $W(n)$ , is equal to the discounted repayment of interest and principal (net of personal taxes) net of the cost of borrowing:

$$(5) \quad W(n) = \{(1-m(n))ib(n) + b(n)\}/(1+r) - b(n)$$

Although this is a relatively simple model of investment and finance, the tax system introduces two important complexities in this model:

- Given the deductibility of interest from corporate taxable income, debt finance lowers the amount of corporate tax to be paid. On the other hand, shareholders prefer equity finance since dividend and capital gains are preferentially treated compared to interest income.
- Given differing tax rates on dividends and capital gains, the dividend payout ratio can influence the amount of tax paid on income.

These observations have spawned a vast literature on optimal choice of financing capital in the presence of taxation. The seminal article of Modigliani and Miller [1958] argued that firms would be indifferent in financing capital with debt or equity. The underlying intuition is that a firm by borrowing one more dollar of debt would cause investors to have more cash flow that could be used to reduce their personal net debt liabilities. As long as the interest rate faced by the household is the same as that faced by the firm, there is no gain or loss in the firm's value if investors adjust their leverage (this has been referred to as the "homemade leverage" theorem). However, Modigliani and Miller [1963] have raised the possibility that the homemade leverage theorem would not hold in that debt finance could increase the value of the firm when interest is deductible from corporate taxable income, leading to further analysis as to developed below.

To begin, it would be useful to first abstract from financial decisions and simply concentrate on the investment decision, to derive some points below. Suppose each shareholder were to "vote" for how much capital should be held by the firm. From equation (4) it can be seen that shareholders, given their differing tax rates, are not

unanimous in choosing optimal investment decisions of firms. Differentiating (4) with respect to  $K$ , keeping financial decisions interest rates and discount rates constant, we obtain the following cost of capital formula as desired for each investor ( $K(n)$  denoting the  $n$ th shareholders “preferred” capital stock):

$$(5) \quad F'[K(n)] = (1-\beta)\rho(n)/(1-u) + \beta i \text{ with } \rho(n) = r/(1-\theta(n))$$

A high-tax investor,  $H$ , prefers less capital compared to a low-tax investor,  $L$ , since  $\theta(H) > \theta(L)$ . This of course cannot be an equilibrium for capital markets. If a firm were decide to invest in capital based on the preferences of investors, with the tax rate  $\theta(n')$ , then another firm could offer a different capital stock to attract investors with other tax rates. Each firm could have one type of investor with differing capital stocks. However, firms that have the lowest cost of capital (smallest personal tax rates) would have a competitive advantage over other firms. This would create an incentive for a firm with high-income investors to increase capital stock to attract low income investors. No capital market equilibrium is therefore possible.

The futility of the above model to establish a capital market equilibrium results from two important restrictions. The first is that financing and portfolio decisions of investors is “fixed” and the second is that the market interest rate for bonds is indeterminate. To establish a capital market equilibrium, several approaches have been developed in the literature.

*The Miller [1977] model:* Miller proposed a simple model that would result in a capital market equilibrium. He invokes three critical assumptions:

- *Household arbitrage:* Investors are indifferent in holding assets as long as after-tax rates of returns are the same. Otherwise, they will sell as much equity short or borrow funds as much as possible to acquire the most favourable taxed asset. Thus, households face arbitrary constraints in selling equity short or borrowing funds.
- *Firm arbitrage:* Firms are unrestricted in issuing financial claims on assets. They face the same after-tax cost of funds.
- *Favourable taxation of dividends and capital gains at the personal level:* Personal taxes on equity returns

are less than the tax rate on interest income and the corporate tax rate.<sup>5</sup>

Given these assumptions, a capital market equilibrium with firms indifferent in issuing equity, debt or reinvesting profits and households receiving the same after-tax rate of return on assets would require, for the marginal investor ( $n=*$ ), the following conditions to hold:

A1 Household arbitrage:  $r(1-c[*]) = i(1-m[*])$  (reinvested profits versus debt)

$r(1-c[*]) = r(1-t[*])$  (dividends versus reinvested profits)

A.2 Firm Arbitrage:  $i(1-u) = r$  (indifference between debt and equity)

---

<sup>5</sup>In 1970s, the US corporate income tax rate was 46% and the personal income tax rates on interest varied from 0% (including tax-exempt pension plans) to over 60%. Miller argued that the effective capital gains tax was 0% since investors could virtually eliminate capital gains taxes by holding assets until death or carrying out financial transactions that would arbitrage differences in the tax treatment of long and short term assets. He also suggested the effective dividend tax rate was zero since, under US tax law, an additional dollar of dividends allowed the investor to deduct one more dollar of borrowing costs from income. When the US lowered personal income tax rates below corporate income tax rates in 1986, it was observed that the Miller model was no longer consistent with the tax system.

For the marginal investor, conditions A.1 and A.2 are only satisfied if the tax rate on interest income is equal to the combined corporate and personal tax rates applied to dividends (new equity issues) or capital gains (reinvested profits):  $m[*] = u + c[*](1-u) = u + t[*](1-u)$ .<sup>6</sup> All other investors would be at “corners”. High income investors would hold equity only (borrow up to limits) since the tax on equity income is less than on interest income (given the favourable treatment of capital gains and dividend taxes). Low income investors would hold only bonds since the tax on interest income is less than the combined corporate and personal taxes on equity. Similarly, by implication, lower income investors might prefer dividends over capital gains compared to high income investors who would prefer that the company reinvest profits in capital assets.

Under the Miller model, therefore, the cost of capital for the firm is equal to

$$(6) \quad F'[K(n)] = \rho/(1-u) = r/(1-u)(1-\theta[*]) = r/(1-m[*]) \text{ with } \theta[*] = c[*] = t[*].$$

---

<sup>6</sup>Miller proposed, based on the discussion in the previous footnote, that  $u=.46$ ,  $c=0$ ,  $t=0$  and  $m=.46$  for arbitrage.

*Static trade-off models:* The Miller model provides an intriguing equilibrium that firms attract “tax clientele” with their debt and dividend policies. However, in equilibrium, all firms have the same cost of capital and are indifferent among sources of finance, an outcome that is not entirely appealing since firms most often use a combination of different sources of finance. Arguments have been made that there are non-tax costs to issuing debt, including bankruptcy costs (Stiglitz [1972]) and “agency” costs arising from the separation of investor ownership and management control as well as tax costs arising from lack of a full refund when tax losses are incurred at the corporate level (DeAngelo and Masulis [1980])<sup>7</sup>. If firms issue debt there may be a marginal cost for debt depending on the debt to equity (or assets) ratio:  $k[\beta]$ . Assuming that the personal tax rate for the marginal investor is less than on equity income compared to interest, the equilibrium debt ratio would be one in which the investor holds assets until the after-tax cost of debt finance, net of attendant costs, is equal to the after-tax cost of equity finance:  $i(1-m) - k = r(1-\theta)$ . The static trade-off model would therefore predict that firms will not be indifferent between issuing debt in equity. Instead, they would minimize the cost of financing trading off tax benefits of deducting interest with the costs of issuing debt. By implication, therefore the combined corporate and personal tax rate on equity income would have to be higher than on debt for an interior debt policy. Given that the interest rate only depends on debt policy, not the firm’s capital stock, the cost of capital for the firm would be the following after the optimal source of finance is determined:

$$(7) \quad F'[K^*] = (1-\beta)\rho/(1-u) + \beta i$$

with  $i = (r + k)/(1-m[^*])$  and  $\rho = r/(1-\theta[^*])$ .

The investment decision therefore depends on the weighted average cost of debt and equity finance. The personal

---

<sup>7</sup>The tax loss argument has been attributed to the loss of tax shields arising from preferences for capital cost writeoffs such investment tax credits and accelerated depreciation. Although tax shields are sufficient to give rise to interior debt to equity ratio in the presence of taxes, it is not necessary to invoke this assumption. The key point is that the personal tax rate on equity returns would be less than the personal tax rate on debt. Thus, for example, suppose the expected corporate tax rate is  $\mu$  and, if the firm incurs losses, there is no value to them in deducting them from other income:  $\mu = pu$  with  $p$  being the probability of taxable profits being earned). The debt decision will affect the probability of profits so that in equilibrium risk-neutral investors will hold debt and equity such that the expected corporate income and personal income tax rate is equal to the tax rate on interest:  $\mu + \theta(1-\mu) = m$ . For example, if a firm is all debt finance, it may never pay corporate taxes. Therefore, with  $\theta < m$ , the firm would be prefer to issue some equity since investors can reduce personal income taxes. If the firm is all equity financed, and the probability of earning profits is one ( $p = 1$ ), then the tax on equity income is greater than on debt:  $u + \theta(1-u) > m$ . Therefore, a firm would want to issue some equity to reduce corporate tax payments although this may result in tax losses being incurred with some probability.

tax rate on equity,  $\theta^*$ , could be either a weighted average of dividend and capital gains tax rates, or, alternatively, the capital gains or dividend tax rate if retained earnings or new equity are respectively the marginal source of equity finance (see Poterba and Summers [1984] for further detail).

*Pecking Order Model:* The pecking order model is based on the notion that firms use a hierarchical ordering for finance, exhausting the cheapest source of finance first. Myers and Majluf [1984] proposed that, given the lack of information available to outside investors about the quality of projects controlled by the “insiders”, companies would first use cash flow (reinvested profits) to finance capital before turning to risky debt (of which interest is tax deductible) and then new equity issues. The argument is based on the Aklerlof [1970] “lemons” model that firms when, issuing equity or debt to attract investment finance, cause their share values to fall since outside investors believe that only bad firms ultimately must come to the market to finance investments. Other models incorporating informational asymmetries among “insiders” and “outsiders” suggest, often in contradiction to each other, that various forms of finance could signal quality: the share of equity financed by reinvested profits (Leland and Pyle [1977]), dividend policy (Battacharya [1979], Miller and Rock [1985] and Berheim and Wantz [199x]) and debt policy (Ross [1977]). Such models have also predicted that investment is constrained by availability of cash flow since firms would give up projects with a marginal product of capital that is higher than the interest cost of finance if they perceived that their values would decline if they tried to issue equity or borrow money from outsiders in capital markets.

When capital gains tax rates are below dividend tax rates, there is an incentive to use reinvested profits rather than issuing shares by the firm even if there are no informational asymmetries in markets. Thus, it is expected in pecking order model that profits would be fully reinvested in capital. However, there is no explanation as to why firms issue dividends unless one reverts to other potential signalling models for dividends.

Taking Myer and Majluf argument, the investment decision of the firm will be governed as follows, ranked according to their preference:

$$(8.1) \quad F'[K^*] \geq r/(1-u)(1-c^*) \quad (\text{reinvested profits as a source of finance})$$

$$(8.2) \quad F'[K^*] = i \quad (\text{risky debt as source of finance})$$

$$(8.3) F'[K^*] = r/(1-u)(1-t[*]) \quad (\text{new equity as a source of finance})$$

The pecking-order models suggest that capital gains taxes may not affect investment decisions if firms underinvest in capital. However, corporate income taxes that reduce cash flow could reduce investment that is constrained by the availability of internal resources (Farazzi, Hubbard and Petersen [1988]).

The above three models provide a basis for evaluating the impact of corporate and personal taxes on capital investments in closed economies. Effectively, the deductibility of interest expense at the corporate level provides an incentive for debt finance. However, low personal taxes on capital gains or dividends encourage investment financed by equity. However, two other important issues play an important role that should be briefly mentioned.

The first is that tax systems generally do not index capital income for inflation except in a few countries (for example, Mexico, Chile, Venezuela and Israel). As a result, the nominal, rather than inflation-adjusted, interest is deductible for tax purposes, thereby providing a gain to the borrower since the purchasing power of the debt's principal has declined. However, asset values are not indexed for inflation. Thus, the cost of replacing assets is based on historical values rather than replacement values (depreciation and inventory costs, which are not incorporated in the above model). Capital gains are not indexed for inflation for tax purposes either. In the static tradeoff model above, the after tax cost of debt finance is  $i(1-u) - \pi$  so that  $F' = \{(1-\beta)r/(1-\theta) + \beta i(1-u) - \pi\}/(1-u)$ . The capital gains tax rate is an effective rate based on real, not nominal gains.

The second point to recognize is that the growth of financial products or financial derivatives (the asset values are based on an "underlying" security) has blurred the distinction amongst different types of assets. Financial transactions involving forward contracts, future markets, options (puts and calls) and multiple payments (swaps and caps), and hedges have been developed not only to reduce risk costs for investors but also to reduce tax payments<sup>8</sup>. Financial derivatives have arisen for tax reasons since taxpayers may be treated differently (e.g. financial traders are taxed on an accrual – "mark to market" – basis, while others are taxed on capital gains only when assets are disposed); some equivalent financial derivative transactions may be treated as income or capital gains; and some

---

<sup>8</sup>See Plambeck, Rosenbloom and Ring [1995] for an comprehensive review of tax issues for financial derivatives. See also Warren [2000].

financial derivatives lead to timing differences in terms of payment of income<sup>9</sup>. If taxes applied to income and accrued capital gains for all taxpayers thereby preventing any possible arbitrage, financial derivatives would impose little problem for tax systems. However, capital gains are taxed when only assets are disposed rather than on accrual basis (as in the case of mark to market) for most taxpayers because it would be difficult to calculate market value many assets to determine accrued capital gains (such as land and private company shares) and taxpayers could be forced to dispose assets to meet liabilities. Given these difficulties, the development of financial derivatives is having a significant impact on the ability of tax authorities to apply income taxes.

### III. Implications of Tax Policies for Debt and Investment in the Open Economy

We can now turn to open economy to see how investment and finance decisions can be affected by tax

---

<sup>9</sup>To take an example, consider a option for a call on stock that can be replicated by transacting in shares financed by bonds (Trigeorgis [1995], pp. 72-75). A end of period call is equal to (s denotes the state of the nature)  $C[s] = NS[s] - (1+i)B$  with  $C[s]$  denoting the end of period call value which is equal to  $\max\{S[s] - E, 0\}$ ,  $E$  being the exercise price and  $S[s]$  being the stock price at the time of exercise.  $N$  is the number of shares and  $i$  is the rate of interest on bonds,  $B$ . The number of shares needed to satisfy the above equation for the case of two states of nature  $S[1] > S > S[2]$  would be  $N = \frac{C[1] - C[2]}{S[1] - S[2]}$ . If  $S[1] = \$180$ ,  $S = \$100$ ,  $S[2] = 60$  and  $E = \$112$ , then  $N = \frac{(68 - 0)}{(180 - 60)} = .56$ . In the presence of taxation, the above equation would need to be adjusted as follows. The call option would be subject to capital gains taxes at a preferential rate. If the investor loses the option, there may be no deduction for losses. Similarly, by holding shares and borrowing money, the sale of shares are subject to capital gains taxes (losses may not be deductible) and interest expense could be deducted at the top marginal tax rate. If capital gains were taxable at the same rate as other income and losses were refundable, there would be no difference in the treatment of call options and transactions in the underlying securities (this can be seen with the valuation with  $N$  since  $1 - m$  would multiply both the numerator and denominator). However, with differential capital gains taxes and limited loss deductions, the call option would be treated differently than transactions of the underlying assets.

policies. The growth of cross-border financial transactions have been explosive over the past twenty years (Edey and Hviding [1995]) and multinational investment has grown substantially. International tax systems require the identification of three specific issues: the jurisdiction where income earned, the residence of the taxpayer and which country taxes the income. Investor residing in one country earn income from sources in another jurisdiction. Both countries could claim the right to tax such income and, depending on their domestic tax regime or tax treaties, may choose to exempt such income or provide some tax relief to reduce taxes paid on income in recognition of taxes paid elsewhere. All this will be further developed below.

In this section, we consider four issues: first, the structuring of debt and equity finance for a company operating in more than one jurisdictions and the implications this could have on the cost of capital; second, the role of foreign tax credits provided by capital exporting nations to encourage foreign investments by multinationals; third, the impact of third country financing on the cost of capital; fourth, determining the source of income and the increasing use of rules to allocate income and costs. Each of these issues complicate the investment and financing decisions of multinationals and play a critical role in tax competition issues.

### Multi-jurisdictional Tax Systems

The financing and investment decisions of multinationals are considerably more complicated to analyze in a multinational setting. The capital exporting (home) country will tax income earned in its jurisdiction and, possibly, the income earned by resident taxpayers in foreign jurisdictions. The capital importing (host) country will tax the income earned at source, including any withholding taxes on income accruing to foreign investors. Potentially, both capital exporting and capital importing countries could assess taxes on the same source of income, resulting in “double taxation”. Most capital exporting countries avoid double taxation either by treaty or by unilateral action<sup>10</sup> by choosing an “exemption” or “foreign tax credit” system. With the exemption system, the capital exporting country simply exempts from tax foreign income earned by the resident taxpayer with the expectation that such income would be taxed in the capital importing country. One could also refer to this as a “source-based” tax system

---

<sup>10</sup>The US, UK and Japan provide a foreign tax credit for taxes paid by residents on income in other jurisdictions on a unilateral basis. Others may exempt foreign income earned in certain treaty countries and provide a foreign tax credit for income earned in a non-treaty country (Canada and Germany, for example).

in that income is only taxed at source (Mintz and Tulkens [1996]). Alternatively, with the foreign tax credit system, the capital exporting country taxes the foreign income but provides a credit for income taxes paid to the capital importing country. This would be consistent with a “residence-based” system in that the taxpayer’s liability is based on income earned both domestically and in foreign countries. Generally, countries do not refund taxes to a taxpayer if the foreign tax is greater than home country tax liability. Sometimes, the host country might even exempt income accruing to non-residents, such as interest income, which would be consistent with a “pure residence-based” system. In a few instances, countries may only allow foreign taxes to be deducted from income before determining the domestic tax liability on foreign sources of income earned by resident taxpayers. This would be a similar to a “partial tax credit system” where the tax credit is equal to the home tax rate times the host country tax rate.

To begin, we consider the effect of source-based and residence-based taxes on portfolio capital and then turn our attention to multinational finance.

### Portfolio Capital

In the presence of capital flows across countries, investors can hold both domestic and foreign assets. To keep matters simple, we ignore debt finance to show how taxes can affect tax arbitrage. Consider two countries, host and home, with the variables characterizing the home country values denoted by \*.

Capital earns a pre-tax rate of return equal to  $R$  and  $R^*$  in the host and home countries respectively. Both are subject to a source-based corporate tax at the rate  $u$  and  $u^*$ , so that the net-of-corporate tax rates of return on capital are equal to  $\rho=R(1-u)$  and  $\rho^*=R^*(1-u^*)$  respectively. Investors pay residence-based taxes on both income received from domestic and foreign sources at the rate  $\theta$  (host country investors) and  $\theta^*$  (home country investors). Thus, investors in the host country earn an after-tax rate of return on domestic and foreign assets equal to  $\rho(1-\theta) = R(1-u)(1-\theta)$  and  $\rho^*(1-\theta) = R^*(1-u^*)(1-\theta)$  respectively. Similarly, investors in the home country receive a rate of return on domestic and foreign assets equal to  $\rho^*(1-\theta^*) = R^*(1-u^*)(1-\theta^*)$  and  $\rho(1-\theta^*) = R(1-u)(1-\theta^*)$  respectively.

For a capital market equilibrium in an open economy, we can consider three forms of arbitrage:

*Household Arbitrage:* After-tax rates of return on foreign and domestic assets are equal for investors in both countries:

Host Country Investor:  $\rho(1-\theta) = \rho^*(1-\theta)$

Home Country Investor:  $\rho(1-\theta^*) = \rho^*(1-\theta^*)$

*Firm Financing Arbitrage:* The cost of finance, net-of-corporate taxes, should be the same across countries:  $\rho = \rho^* = R(1-u) = R^*(1-u^*)$ .

*Firm Mobility Arbitrage:* Firms locate across countries so that the pre-tax rates of return are the same:  $R=R^*$ .

Given these three arbitrage conditions<sup>11</sup>, the only capital market equilibrium that would satisfy all three conditions would be for corporate tax rates to be equal across countries,  $u=u^*$ . Therefore, a pure-residence based tax system with  $u=u^*=0$  would imply the pre-tax and post-personal tax rates of return would be same across domestic and foreign assets for each resident investors. However, with differential corporate tax rates across countries, the above three conditions for arbitrage cannot hold simultaneously.

Thus, one difference that the international portfolio model illustrates that differs from the closed economy presented earlier is that multiple corporate tax rates leads to even more restrictive arbitrage assumptions. Some have argued, therefore, that a source-based corporate tax could not exist in a model of perfect capital mobility (Razin and Sadka [1991]). Another approach is that one of the arbitrage conditions – firm location arbitrage – could be dropped so long as domestic and foreign investment projects are not perfect substitutes (Mintz and Tulkens [1996]) so that  $R \neq R^*$  in equilibrium.

The above model can be extended to recognize a number of other tax-induced arbitrage issues:

*Personal tax rates on assets ( $\theta$ ):* Investors could face different personal tax rates on domestic and foreign assets, therefore resulting in the tax rate varying according to the source of income. Capital importing countries might impose withholding taxes on income paid to non-residents. The withholding taxes could be higher than the personal

---

<sup>11</sup>There is a potential fourth condition that would imply that residents move across jurisdictions so that the rate of return on capital after personal tax are equal:  $\rho(1-\theta) = \rho(1-\theta^*)$  and  $\rho^*(1-\theta) = \rho^*(1-\theta^*)$ . However, given the assumption that residents are not mobile, this form of arbitrage would not hold.

tax liability that would be paid to the resident's government. Similarly, some countries might provide tax relief for income received from domestic assets, not foreign assets, thereby resulting in differing personal tax rates on assets according to source.

*Corporate Tax Rates (u):* Government may tax worldwide income of corporations, perhaps providing a foreign tax credit for taxes paid to host countries. Therefore, corporate tax rates on businesses might vary according to ownership (domestic versus foreign-owned companies). Further, corporate tax rates on foreign and domestic source income imposed by the parent's government might differ. For example, the US typically gives tax preferences, such as investment tax credits, for only domestic investments of US multinationals, not foreign investment.

*Differential Tax Treatment of Investors:* Within each country, and therefore across jurisdictions, some investors are subject to tax while other may be exempt (such as pension funds) or treated differently than other lenders (financial institutions). This is similar to the closed economy case but magnified by the differences across countries in the tax treatment of assets.

*Differential Tax Treatment of Securities:* As discussed in the closed economy context, interest on debt is deductible for corporate income, therefore leading to differences in pre-tax rates of return. Further, taxes may vary for different types of security income (dividends, capital gains, interest, swaps and options). Although this is no different than the closed economy in principle, the arbitrage possibilities are exponentially greater by the number of jurisdictions.

International tax arbitrage is therefore an even more challenging issue to consider in developing financial models. Tax rates can vary by individual, country, location of business and source of income.

#### Multinational Investment with the Exemption System with Simple Financial Arbitrage

As discussed above, multinational companies may be taxed on their worldwide income (domestic and foreign sources) or on domestic sources of income (exemption system). To begin, we consider the impact of taxes in

the presence of the “exemption” system so that a taxpayer only pays corporate income taxes to the government where income is earned at source. In the next section, the more complicated foreign tax credit regimes are considered.

A multinational’s investment is financed by investors residing in several jurisdictions. Similarly, the multinational company could operate “branches”, “partnerships” or “subsidiaries” in each jurisdiction. Generally, the organization of a business as a branch, partnership and subsidiary results in differences in liability and ownership rights. Multinational parents are responsible for the liabilities of branches, and, often, partnerships. Liability in subsidiaries are limited to the original investment made by the multinational.

To keep the model simple, consider a multinational with two sources of profits in two countries (home country values denoted with an asterisk):

$$(9) \quad \Pi = \pi - T + \pi^* - T^*$$

with taxes paid to host and home governments respectively equal to  $T = u\{F[K]-iB\}$  and  $T^*=u^*\{F[K^*]-i^*B^*\}$ .

Therefore,  $\Pi = \{F[K] - iB\}(1-u) + \{F[K^*] - i^*B^*\}(1-u^*)$ .

Corporate taxes are paid on profits in each jurisdiction. Note that the interest rates on debt in each country are taken as different values. Further, investors pay tax on income earned by the multinational. Assuming equity income is taxed at the rate  $\theta(n)$  ( $n$  denoting the  $n$ th taxpayer) and interest at the rate  $m(n)$ , then the value of the firm is equal to the following which is multinational case similar to equation (4), with  $s(n)$  denoting the investor’s  $n$ th share of the firm:

$$(10) \quad V(n) = s(n)[\{(1-\theta(n))(\pi + \pi^*) + K-B + K^*-B^*\}/(1+r(n)) - (K+K^*-B-B)]$$

After-tax income earned from bonds is equal to  $i(1-m(n))$  or  $i^*(1-m(n))$  for each investor.

So far this model is almost identical to the model presented for the closed economy. But, there are some important exceptions, as discussed above. Investors vary not only in terms of income or type, as in a closed economy, but also according the country they reside (the type of tax system in each country). Further, with withholding taxes, a resident may pay tax on foreign-source income that is different than the tax on domestic-source income. Nonetheless, Gordon [1986], showed, there is a similarity between the Miller model described earlier and international financial flows<sup>12</sup>. As discussed above with respect to portfolio income, one can still envision that a

---

<sup>12</sup>Gordon includes inflation in his model that results in capital gains tax treatment of foreign exchange

marginal investor indifferent among equity and bond assets at the international level with other investors either borrowing money, as much as possible, to sell domestic or foreign shares short or to sell short equity, as much as possible, to purchase bonds. However, there are many corporate tax rates, depending on where income is earned. Thus, there is possible tax arbitrage among firms, not just investors and this can affect the cost of capital.

---

income. As capital gains is more favourably treated than interest income, the high tax investors would wish to hold assets of countries with low inflation (and appreciating currencies).

The tax arbitrage among businesses facing differing corporate tax rates can be seen from equation (10) for the marginal investor (we drop the variable  $n$ ). A multinational can finance all of its capital from one country and transfer equity funds to the foreign entity. It would do so if there are tax benefits from this strategy. Suppose interest rates are equivalent to the two countries so  $i^*=i$  (debt borrowed in home and host countries are perfect substitutes) and there are no withholding taxes. If the corporate tax rate in the host country is less than the home country tax rate ( $u < u^*$ ), then it is obvious that the optimal financial policy is to finance capital in the home and host country with borrowing in the home country and a transfer of equity to the home country so that  $B=0$  and  $B^*=\beta^*(K+K^*)$ . The deductibility of interest expense for borrowing through the parent for investments in the host country result in tax savings equal  $i(1-u^*)$  which is better than the cost of financing debt by borrowing through the subsidiary ( $i(1-u)$ ), given the higher tax rate faced by the parent. The cost of capital for multinational investment in the each country would be the following in the static-tradeoff model<sup>13</sup>:

$$(11) \quad F'(K) = \beta^*i(1-u^*)/(1-u) + (1-\beta^*)\rho/(1-u) \quad (\text{host country})$$

$$F'(K^*) = \beta^*i + (1-\beta^*)\rho/(1-u^*) \quad (\text{home country})$$

Compared to equation (7), the significant different is that the host country has a lower cost of capital if the assets are partly financed by tax deductible debt in home country where the tax rate is higher.

### Foreign Tax Credit Regimes

An alternative approach is for countries to tax the worldwide income of a corporation and provide a tax credit for taxes on income and profits. Normally, governments do not refund taxes when the host country tax liability is more than the home country tax liability. Under the foreign tax credit system, the government will levy tax on income earned in or repatriated from the foreign jurisdiction by a multinational reduced by a foreign tax credit for taxes paid to the host country. Under the *accrual* system, a tax is imposed on income earned abroad whether or not it is repatriated back to the home country. This treatment is commonly used for the taxation of branch income and

---

<sup>13</sup>If withholding taxes were imposed by the host country on dividends, at the rate  $w$ , then the transfer of funds from the foreign subsidiary to the parent (that would cover interest payments) would be taxed at the withholding tax rate. Profits in the host country would bear a tax equal to  $u+w(1-u)$  so that the after tax income is  $(1-u)(1-w)$  for each dollar received the parent. The host cost of capital with withholding taxes and an exemption system is equal to  $F'(K) = \beta^*i(1-u^*)/(1-u)(1-w) + (1-\beta^*)\rho/(1-u)(1-w)$ .

passive income earned by controlled-foreign corporations. Under the *deferral* system, income is only taxed if repatriated back to the home country. The tax will therefore be imposed on dividends but not on profits reinvested in foreign entities.

### The Accrual System

In the case of accrual taxation, the tax on profits is equal to  $u^*\pi$  ( $\pi$  being the foreign-source income in the host country). The tax is reduced by a foreign tax credit equal to  $u\pi$  (assuming no withholding taxes). As long as the host and home government define the multinational tax base as the same in both countries, the tax on income earned by the multinational in the host country is equal to  $T = u\pi + (u^*-u)\pi = u^*\pi$  if  $u^*\geq u$  (deficient tax credit position) and  $T = u\pi$  if  $u^*<u$  (excess tax credits). Thus, the tax rate on foreign source income is  $\max\{u, u^*\}$ .

The profits of the multinational are equal to the following under the accrual system:  $\Pi = \{F[K] - iB\}(1 - \max\{u, u^*\}) + \{F[K^*] - i^*B^*\}(1-u^*)$ . If  $u^*>u$ , there are not gains to shifting debt from the host country entity to the parent since all profits are taxed ultimately at the rate  $u^*$  (otherwise, the analysis would not be different from the earlier discussion of the exemption system if  $u>u^*$ ). In the case that  $u^*>u$ , the cost of capital is equal to the following:

$$(12) \quad F'(K) = \beta^*i + (1-\beta^*)\rho/(1-u^*) \quad (\text{host country})$$

$$F'(K^*) = \beta^*i + (1-\beta^*)\rho/(1-u^*) \quad (\text{home country})$$

### The Deferral Tax System

The deferral tax system generally applies in the case that the multinational business is organized as a foreign subsidiary in the host country. Dividends and other charges remitted to the parent are subject to tax by the home country. Assuming no withholding tax on dividends, the home country tax is equal to  $u^*D$  ( $D$  denoting dividends paid by the subsidiary to the parent). The foreign tax credit is equal to the corporate income taxes deemed to be paid on distributed profits:  $v=dT$ ,  $d$  being the dividend payout ratio of the subsidiary and  $T$  being corporate taxes paid in the host country. If the profits measured for tax purposes by the home country is the same as that taxed by host country ( $\pi$ ), then the dividend payout ratio is simply dividends divided by after-tax profits in the home country:

$d=D/\pi(1-u)$ . Therefore, the foreign tax credit is  $v = (D/\pi(1-u))u\pi = uD/(1-u)$ . The repatriation tax paid to the home country on each dollar of dividends is  $T' = u^*D - uD/(1-u) = \Theta D = (u^*-u)D/(1-u)$  (see also Sinn [1987]). The variable  $\Theta$  is therefore the repatriation tax on the dividends.

The multinational's income in the presence of the deferral tax system is equal to the following:

$\Pi = \{F[K] - iB\}(1-u) - \Theta D + \{F[K^*] - i^*B^*\}(1-u^*)$ . It is clear, therefore, that the optimal financial strategy is for the subsidiary not to pay dividends to the parent in order to avoid the repatriation tax. With reinvestment of profits (therefore deferral of the home country tax), the cost of equity finance would be equal to the discount rate for equity finance.

The deferral method therefore results in a model somewhat similar to the pecking order model in that reinvestment of profits is preferable to financing investment with new equity. As Sinn [1990] points out, a firm in its gestation phase of growth may not have sufficient internal cash flow to finance investment. It must either rely on tax deductible debt or take equity transfers from the parent. If transfers of equity are used, the multinational anticipates that the income is "trapped" in the subsidiary in that any future dividends paid would attract the repatriation tax. Therefore, the cost of equity finance is greater for parent transfers compared to reinvested earnings. However, debt finance may still be more attractive to use than retained profits to finance the subsidiary's capital investments. Some countries have try to limit deferral through limitations on the amount of reinvested profits that qualify for exempt taxation (Weichenrieder[1996]).

If the firm is in its mature stage (and debt is also used to finance investment as in the static-tradeoff model), the cost of capital for the multinational for the deferral case would be the following:

$$(13) \quad F'(K) = \beta^*i + (1-\beta^*)\rho/(1-u) \quad (\text{host country})$$

$$F'(K^*) = \beta^*i + (1-\beta^*)\rho/(1-u^*) \quad (\text{home country})$$

Compared to the accrual method (equation (12)), the cost of capital is lower in the host country since the subsidiary avoids payment of home country taxes on the income earned in the foreign subsidiary.

### Some Complications

The above characterization of multinational finance in the presence of the foreign tax regime is typically

used for analysis. However, it fails to account for some important tax planning complexities, depending on the existing regime.

One issue is that home countries may define the income of the foreign subsidiary in the same way as the host country (Leechor and Mintz [1993]). For example, the US and the UK use a different definition of income to determine the tax base of the subsidiary than that used by host country. For example, suppose  $y$  is the taxable income of the subsidiary as defined by the host country tax authorities (for example, some income could be exempt or cost deductions differ from accounting cost measures). Suppose further that the home country defines taxable income of the subsidiary as  $y^*$ . The repatriation tax would therefore be equal to  $T^* = \Theta D = u^* D - uyD/y^*$ . Since  $y \neq y^*$ , the repatriation tax is no longer exogenous – instead the ratio of  $y/y^*$  will depend on the capital stock and financing decisions of the subsidiary. Therefore, the cost of capital for the subsidiary should incorporate the impact of capital stock decisions on the repatriation tax. In some situations, the cost of capital could be lower if the capital stock decision expand taxable income of the host country so much more than that defined by the home country such that the repatriation tax declines. Further, it is no longer case that it may optimal to only reinvest profits -- instead, it might be optimal to repatriate dividends especially if it permits greater use of debt finance that has its own tax benefits.

A further complication is that foreign tax credit systems often permit multinationals to calculate tax liabilities on income remitted from various sources on a “global basis”. Income received from several sources (different countries or different types of income such as interest and dividends) are aggregated to calculate the home country’s tax liability and foreign tax credits. Thus, excess tax credits on high-tax foreign sources of income (due to high foreign tax rates) can be used to offset the repatriation tax owing on income lightly taxed by foreign tax jurisdictions. Thus, multinationals when repatriating income earned from abroad average foreign tax rates to avoid paying the repatriation tax (see Altshuler and Newlon [1993]). This can be achieved, for example, by simultaneously repatriating dividend and host country tax deductible charges paid by the subsidiary such as royalty income (the latter often subject to low withholding tax rates). They will also try to repatriate income with as little excess tax credits as possible – otherwise, they are paying too much tax to foreign income. Thus, multinational in an excess tax credit position will push up leverage in foreign subsidiaries that are subject to high levels of tax.

### Third Country Financing

A typical international tax planning strategy at the international level is to route financing through third countries rather than the parent transferring directly funds to finance subsidiary investments. An example of this strategy is the following:

1. The parent borrows to finance a transfer of equity to a subsidiary operating in a jurisdiction with a low tax regime (the tax preference provided is possibly limited to income earned by international financing entities). Usually, the jurisdiction chosen is one with a tax treaty with the home country.
2. Little or no withholding taxes are imposed on dividends repatriated from the entity to the parent. The parent may be exempt from paying corporate tax on the dividends or may be in an excess credit position if the home country tax foreign income with a credit on a global basis.
3. The financing entity in the intermediary country lends funds to a subsidiary in the host country.
4. The subsidiary remits interest, often exempt from withholding tax by treaty. Such interest earned by the subsidiary is exempt from taxation by the home country since the interest is viewed as paid from active business income rather than passive income (passive income may be subject to accrual taxation by the home country).
5. Effectively, the multinational is able to deduct interest incurred to finance a subsidiary in two jurisdictions – in the host country and home country.

Other structures similar to the above are used for insurance receipts, factoring and service charges. Many possible third country regimes are available to multinationals to take advantage of the tax benefits provided through intermediary financing. Depending on treaty arrangements, these include low-tax regimes in Barbados, Ireland, Belgium, Netherlands, Switzerland, Cyprus and Mauritius. The key elements are little or no withholding taxes imposed on dividends and other remitted income, low taxes imposed by the intermediary country and the absence or low taxes levied by the home country on income earned in the intermediary country. It is frequent to route income through many countries, creating multiple deductions for interest expense for one investment project.

The implications of the such financing schemes is to lower the cost of capital. Effectively, for each dollar of borrowing by the subsidiary, interest expense is written off at the rate  $u$  in the host country and then at the rate  $u^*$  in

the home country. Ignoring some small transaction and tax costs for routing income through intermediary country, the effective cost of debt finance for investment in the host country is  $i(1-u-u^*)$ . This implies that the cost of capital is the following (assuming that debt finance is fixed proportion of total worldwide assets:  $\beta^*(K+K^*)$ ):

$$(14) \quad F'(K) = \beta^*i(1-u-u^*)/(1-u) + (1-\beta^*)\rho/(1-u) \quad (\text{host country})$$

$$F'(K^*) = \beta^*i + (1-\beta^*)\rho/(1-u^*) \quad (\text{home country})$$

### Source Rules

Corporate taxes are a source-based levies. A significant issue therefore is for countries to determine the source of income in a jurisdiction. Countries rely on legal concepts of “carrying on business” and “permanent establishment” in order to determine whether a business is connected to the territory. These issues are increasingly important as economies become more integrated at the global level.

Source rules are becoming quite complex, especially for financial transactions. If a financial trader engages in trades involving persons located in different jurisdictions, source rules become quite problematic. For example, a loss on a swap in a one country cannot be written off income earned in another. Unless all income is attributed to a single jurisdiction, the source rules could result in a barrier to the development of financial markets in a country. For this reason, countries now use an allocation method to split the worldwide income earned by global financial traders across jurisdictions (the weights used to allocate income can depend measurable variables such as salary costs or assets).

In recent years, the determination of where a business is located is becoming more difficult for tax authorities to deal with the advent of electronic commerce (McLure [1999]). If a business is able to transact with customers or suppliers located in a different jurisdiction through the Internet, the question is whether the country where the customer or supplier resides is entitled a portion of the income earned by the business operating elsewhere. Further, questions arise as to whether the location of the server or the web site constitutes “carrying on business” in a jurisdiction. However, in practice, any country trying to tax web sites or servers would easily lose the tax base to another jurisdiction which does not have similar source rules.

Even when it is possible to determine that business is connected to a jurisdiction, several other difficult

problems arise to determine the amount of income earned within a jurisdiction. These include transfer prices for non-arm's length transactions and cost allocations.

With intra-firm trade, non arm's length prices used for transactions among entities in a corporate group can be manipulated to shift profits from one country to another to minimize taxes. In recent years, governments have agreed upon, by practice, with a set of rules to determine prices for non-arm's length prices. To determine the price (or interest rate in the case of finance), a price of a comparable transaction between unrelated parties will be used as a basis for determining transfer prices. As a comparable uncontrolled price may not be available, especially for intangibles such as royalty payments and service fees, other methods are possible to use for each transaction: cost plus on purchased inputs, sale price margins for sold products, profit split and comparable profit methods. The latter two methods involve a formula for allocating profits to two jurisdictions to determine the transfer price.

Cost allocations are often required for determining income earned by corporate groups across jurisdictions. Overhead costs, especially interest expense, could be incurred by one corporate member that benefit the operations of other members of the group. Cost allocations are required between the parent and branches and subsidiaries in order to determine the amount of income earned at source. Interest expense is particularly important. Many countries have restricted the deduction for interest expense with "thin-capitalization" rules that limit deductions to be no more than a certain percentage of profits or for debt in excess of a certain percentage of equity.

Some countries, particularly United States and Japan, have recently adopted interest allocation rules that require domestic interest incurred by the parent to be allocated to foreign source income. The US rule, for example, uses the "water-edge" formula whereby domestic interest expense is allocated to foreign income according the ratio of foreign net holdings to world wide assets (domestic assets plus foreign net assets):  $\gamma = (K-B)/(K^*+K-B)$ . The allocated interest expense would be used to increase domestic income and reduce the foreign-source income for home country tax purposes. Under the exemption method, this would effectively increase the cost of capital since part of interest expense would be allocated to exempt foreign earnings that are not subject to tax by the home country. With a foreign tax credit method, the allocated interest would not have an impact if the parent is in a deficient tax credit position since the reduction of the home country's repatriation tax would offset additional taxes on domestic income. However, if the parent is in an excess credit position, the allocation of interest expense would

simply increase tax paid on domestic earnings as the repatriation tax rate is zero in value.

Altshuler and Mintz [1995] modelled the interest allocation rule using the static trade-off model. The derived costs of capital for host and home country investment are the following:

$$(15) \quad F'(K) = \beta^*i + (1-\beta^*)\rho/(1-u) + u\beta^*(1-\beta^*)(1-\gamma)^2/(1-u) \quad (\text{host country})$$

$$F'(K^*) = \beta^*i + (1-\beta^*)\rho/(1-u^*) + \beta^*i(1-u^*)(1-\gamma^2)/(1-u^*)(\text{home country})$$

The last two terms in each of the expression in equations (15) are related to the tax penalty that is imposed by allocating interest expense to foreign-source income. It is clear from the formula for  $\gamma$  that an increase in foreign assets in the host country (K) would require more allocated interest, thereby increasing the cost of capital for subsidiary in the host country. However, the cost of capital would also rise for the parent in the home country. Even though a decline in home assets (K\*) would reduce allocated interest (thereby lowering the cost of capital for the parent), this would be more than offset by a higher cost of debt finance since some interest is allocated abroad. For example, if 50% of interest is allocated to a foreign jurisdiction, a parent investing in capital in the home jurisdiction would find that the 50% of its borrowing costs are non-deductible.

### Summary

Although there are some significant issues involved with modelling the cost of capital and finance for multinational investments, it is clear that there are a number of international tax planning issues that result in either higher or lower costs of capital for multinationals relative to companies only investing in domestic markets. Thus, depending on circumstances, taxes could either favour or discourage cross-border investments relative to domestic investments.

To gain some insight on this issue, we use an example to calculate the effective tax rate on capital, using equations (7) and (11) to (15). The effective tax rate is computed as  $\tau = (F' - r(0))/r(0)$  with  $r(0) = \beta i + (1-\beta)\rho$  (the net of tax return on capital). Clearly, the choice of value for interest rates and the cost of finance depends on the type of financial equilibrium that is specified as discussed in the closed economy case. We take the weighted average rule to compare most easily the different cases, although in principle one could vary the financial structure according the particular case.

The calculations are reported in Table 1. Common values for all cases and both host and home countries are taken equal to  $u=0$ ,  $u^*=.4$ ,  $\beta^*=.4$ ,  $i= \rho=5\%$  and  $\gamma=.25$ . Although these numbers would not be consistent with a fully specified financial equilibrium, they provide an opportunity to understand the directional effect on investments by each of the cases.

**Table 1: Effective tax rates for capital based on multinational tax planning**

<u>Case</u>	<u>Host Country</u>	<u>Home Country</u>
Domestic only	15%	40%
Accrual (branch)	40%	40%
Exempt with arbitrage	5%	40%
Deferral	15%	40%
Third Country Financing	-5%	40%
Interest Allocation	18.8%	41%
Interest Allocation and Third Country Financing	-1.2%	41%

The example illustrates that effective tax rates on multinationals vary considerably in the host country depending on the tax regime. The accrual system results in taxes on multinationals much higher than for domestic operations in the host country. Tax benefits arising from financing obtained in high-tax countries under the exempt system or through low-tax third countries result in much lower effective tax rates on capital for multinationals in the host country in comparison with domestic companies. On the other hand, restrictions on the deductibility of debt, such as interest allocation, can result in higher effective tax rates on multinationals compared to domestic companies, although this can be substantially altered if third country financing entities are used.

The example also illustrates a significant issue that is faced by countries levying corporate taxes. It is clear that the accrual method can result in “capital export neutrality” whereby a multinational would face the same tax

burden on foreign and domestic investments. On the other hand, effective tax rates can vary significantly among domestic and multinational companies in the host and home countries, violating “competitiveness” among them. The existing corporate tax structures with its many complex international tax planning regimes, clearly results in significant distortions that can affect the global efficiency of capital markets.

#### **IV. Implications for Tax Competition**

With the lack of co-ordination of capital income taxes at the global level, there are two critical issues raised. First, what is the best policy that can be achieved by a country with cross-border flows of investment and finance? Second, given the administrative problems in levying corporate income taxes, what is feasible for a country to achieve? In this section, we first define tax competition. We then consider optimal corporate tax policies in the presence of capital income tax competition.

##### What is Tax Competition?

Typically, tax competition is defined to be the process in which governments choose to lower taxes in reaction to low competitive tax rates chosen by other countries. However, this definition confuses the outcome of tax competition – namely the impact of competition on tax rates – with the process.

A definition of tax competition based on game theory would be the following (Mintz and Tulkens [1986]). Suppose the  $i$ th government maximizes a payoff in terms of national welfare  $W(t[i], t[j \neq i])$  subject to a budget constraint  $R(t[i])=0$ . For a Nash equilibrium, the vector of optimal tax rates  $t^*(i)$  are chosen to be the best reply to the optimal tax rates chosen by other governments,  $t^*[j \neq i]$ . Thus, tax competition is the process by which governments strategically compete with other jurisdictions with tax policies.

The outcome of a tax competition game is that tax rates may be chosen too high or too low, depending on the nature of fiscal externalities. A fiscal externality is defined as the change in welfare associated with the perturbation of tax rates of other countries at the Nash equilibrium, given that country  $i$  optimally chooses its tax rate

to maximize welfare. Using therefore the envelope theorem, a *fiscal externality* in terms of an increase in the  $j$ th country's tax rate is defined as follows ( $\lambda$  is the marginal cost of funds):

$$(16) \quad FE = \partial W^*[i]/\partial t(j) - \lambda \partial R^*/\partial t[j]$$

Generally, the fiscal externality can be either positive or negative in value (Gordon [1983]). If it is positive, the tax rates chosen by a government in an unco-ordinated game are chosen too low since other countries would benefit if the tax rate is increased. If the fiscal externality is negative, the tax rates are chosen too high. Below, we will discuss several models of capital tax competition that give rise to both positive and negative fiscal externalities.

### Capital Tax Competition Models

To begin, we provide a simple capital tax competition game normally presented in the literature. This is used for illustrative purposes. We then consider other factors in terms of how they impact on the results that would be obtained in more elaborate models.

To specify the tax competition game, we need to first model the equilibrium of competitive markets. We then consider the optimal tax decision of the government, given tax rates chosen by other governments. This is followed by the analysis of the Nash equilibrium.

*Market Equilibrium:* Consider a world economy with  $n$  identical small open economies. Let  $K$  be capital,  $r$  the return paid to portfolio holders and  $t$  the tax on capital. Capital is used to produce output in each country equal to  $F[K]$  (production is strictly concave). The profits of identical firms in each country that are paid to labour (which is fixed) is equal to the following:

$$(17) \quad \Pi = F[K] - (r+t)K$$

We note for later purposes that the optimal amount of capital employed by firms is determined by the first-order condition derived from equation (17) that the marginal product of capital is equal to the tax-inclusive cost of capital:  $F'[K] = r+t$ . Further, an increase in the tax rate causes capital investment to decline:  $\partial K^*/\partial t = -1/F''$ , given that  $r$  is fixed to the small open economy.

At the global level, world savings is equal to world capital demand. Assume that savings is fixed and equal to  $A$  per country. Let  $F$  be capital inflows for each country. Therefore, a national capital market equilibrium implies

$K = A + F$ . At the global level, therefore,  $nK = nA + nF$ . However, since all countries are identical, then it must be the case that no country can be a borrower or lender ( $F=0$ ) for the world wide capital market equilibrium to be satisfied. Therefore,  $K=A$  in equilibrium for each and every country.

*Optimal Tax Decision:* Governments maximize a welfare payoff equal to national welfare, subject to the budget constraint that lump sum transfers to the individuals is paid from capital taxes:  $T=tK$ . In this model, national welfare equal after-tax profits plus tax revenues and the return on savings (which is fixed in supply). This implies:

$$(18) \quad W = \Pi + T + rA = F[K] - (r+t)K + tK + rA = F[K] - rF.$$

In other words, welfare can be expressed as GDP less interest paid on borrowed funds from other markets.

The optimal tax rate is chosen to maximize welfare in (18). Using the condition that  $F = K - A$  and that the rate of interest is fixed to a small open economy, the optimal tax rate is obtained as follows:

$$(19) \quad \partial W^*/\partial t = (F' - r) \partial K^*/\partial t = t \partial K^*/\partial t$$

Given that any increase in capital tax causes capital demand to decline, then welfare declines so long as  $t \geq 0$ . Of course if the tax rate is negative (a subsidy) welfare can increase if the subsidy rate is reduced. However to maximize welfare, we require  $\partial W^*/\partial t = 0$ , which implies that  $t^*=0$  for the optimal choice.

*The Nash Equilibrium:* The Nash equilibrium is the set of optimal tax rates,  $\{t^*[i], t^*[j \neq i]\}$ , such that no player would wish to deviate from the equilibrium. One approach is to derive the reaction functions which are the response of the best reply to tax rates of other jurisdictions:  $t^*[t[j]; i]$ . The point(s) at which the reaction functions meet (or at points where they converge as zero values for some tax rates) can be used to determine the Nash equilibrium. A perturbation of tax rates from the equilibrium can be checked to determine if any player wishes to deviate. In this example, the Nash equilibrium is easily derived. Since  $t^*=0$  for each country, we can ask whether there is any value to a country to increase or lower its tax rate. The answer to this question is clearly “no” since welfare will decline. Thus, the outcome of this Nash game is that small open economies would not tax capital.

A further issue is whether governments would wish to tax capital if they co-ordinated their actions. To

answer this, we need to go beyond the analysis of a game in a non-co-operative setting. Suppose that governments agree to maximize a common payoff function which is simply the sum of their individual payoffs. One could constrain this problem that each government must balance their own budget constraints (transfers are not possible between governments) but, given that governments are identical, it will be the case that all governments will balance their budgets.

With co-ordination, the payoff for all governments is equal to the following:

$$(20) \quad nW = n\Pi + nT + nrA$$

However, governments are constrained by capital markets, implying that

$$(21) \quad nK[r'] = nA (r' = r + t).$$

If equation (21) is totally differentiated with respect to  $t$ , we obtain the following “incidence” result, given  $A$  is fixed:

$$(22) \quad \partial K^* / \partial r' \{1 + \partial r / \partial t\} = 0 \text{ which implies } \partial r / \partial t = -1 \text{ and } \partial r' / \partial t = 0.$$

In other words, with fixed savings, an increase in the corporate tax rate (identical for all countries) causes the net-of-tax cost of capital to decline, point for point. This implies that in global economy, with fixed savings, capital taxes are fully shifted back in terms of reducing the after-tax return on capital, leaving the gross of tax return unchanged. Capital fully bears taxes in this model.

Taking account of equation (22), we can now find the impact of capital taxes on welfare in the co-ordinated equilibrium:

$$(23) \quad \partial W / \partial t = nF' \{ \partial K^* / \partial r' \} \partial r' / \partial t = 0$$

In other words, increasing the capital tax rate in a co-ordinated equilibrium does not affect welfare since capital taxation at the international level is not distortive, akin to a lump sum (head) tax on individuals.

Thus, many observers have remarked that the co-ordination of corporate tax policies would make tax systems less distortive since capital is fixed in aggregate even though each country might view capital to perfectly mobile. Tax competition leads to a competing away of the capital tax base that would be efficient to tax. In fact, the problem faced by governments in this model is that fiscal externalities are positive in the sense that if a country raises its tax rate other governments would benefit from greater capital investment in their jurisdiction that would be subject to tax. We term this fiscal externality as “tax base flight”.

However, the above model is fairly simple, ignoring many of the complexities discussed in Section III. The literature has dealt with some of these complexities and these are discussed briefly below.

#### Taxation of Foreign Capital

Many capital importing countries like to tax capital since a significant portion of their capital stock is owned by foreigners (Mintz and Tulkens [1996] and Huizinga and Neilsen [2000]). If foreign investment earns rents that accrue to foreigners then a capital tax may be used to extract rents otherwise paid to foreigners. The optimal tax in this case could be a “rent” tax rather than a corporate “income” tax since the former allows the imputed cost of equity finance, as well as debt finance to be deductible from income.

However, there is a further issue. Given that capital exporting governments may provide a foreign tax credit, it may be optimal for a capital importing country to levy a corporate tax that is credited against similar foreign taxes (Feldstein and Hartman [1979], Bond and Samuelson [1988], Gordon [1992], Janeba [1995] and Mintz and Tulkens [1996]). If the capital exporting country imposes a corporate income tax, the capital importing may wish to follow suit to maximize foreign tax credits.

However, the taxation of foreign capital results in a negative fiscal externality in the following sense. When the host imposes a tax on foreigners, foreign investors lose income and governments may lose tax revenues due to crediting. Effectively, a host country can “export” taxes paid by non-residents who benefit little, if at all, from public services provided by a government. Tax exportation in a non-cooperative game leads to taxes that are too high relative to the co-ordinated outcome.

#### Endogenous Cost of Capital

The small open economy result is often challenged as being too extreme. Feldstein and Horioka [1981] found that savings and investment rates among countries are correlated. Helliwell [2000] suggests that an increase in domestic savings by one dollar would increase capital investment in a jurisdiction by 30 cents. Helliwell and McKittrick [1999] also find in earlier work that capital and savings flows are uncorrelated among Canadian provinces even though such correlations are found at the international level. Many finance studies have shown that there is

some segmentation in capital markets in that equity prices may be influenced by domestic factors, such as dividend tax rates (see McKenzie and Thompson [1996]). The net-of-tax cost of equity finance may be affected by taxation, in part due to country-specific risk (Gordon and Varian [1987]) and informational asymmetries in markets when domestic investors have more information than foreign investors.

If the cost of equity capital is influenced by domestic capital and savings, then there is a role to tax capital. A capital importing country can drive down the cost of borrowing by taxing capital (and by subsidizing savings). This would increase welfare. Similarly, a capital exporter would wish to increase the return on capital exports by subsidizing capital and taxing savings. The subsidization of capital exports may in part explain why capital exporting countries are reluctant to curtail international tax planning as illustrated by the example of third country financing described in Section III. The complementarity of foreign and domestic capital (Lipsey [1996]) would also suggest that there are economic gains to a capital exporter to subsidize exports.

#### Terms of Trade

Small open economy models are based on the assumption of fixed prices for traded goods as well as an exogenous cost of capital. However, many countries often have some market power in export and import markets. If so, there may be gains to taxing capital if export prices can be pushed upwards in world markets (Burgess [1986]) or subsidize capital to force import prices downwards.

#### Rent Shifting

Foreign direct investment often takes place in international markets that are not perfectly competitive. Thus, as Brander and Spencer [1985] suggest, it may be optimal to subsidize capital if it allows for the shifting of rents into a jurisdiction. Capital importing countries may wish to tax capital if it make foreign multinationals less competitive domestic firms that are able to earn greater economic rents. In this light, restrictions on interest deductibility as discussed in Section III could favour resident firms over foreign multinationals. Janeba [1996] suggests that capital exporting countries may provide a foreign tax credit if it results in rents shifted to resident multinationals from competing non-resident multinationals.

### Income Shifting

The small open economy model illustrated above assumes that taxes cause profits to fall only by reducing capital demand. However, as discussed in Section III, it well possible to shift income from high to low tax jurisdictions by restructuring financing and transfer prices, without moving real inputs. As it is much easier to shift profits than capital, it would be expected that tax competition to reduce taxes on profits might be quite different than for real capital. Mintz and Chen [2000] have observed that there has been substantial tax competition in statutory tax rates among OECD countries in the past twenty years resulting in a decline in the average OECD rate from about 47% to 33% today. However, corporate income tax collections as a proportion of GDP has been stable at 3% of GDP or 8% of revenues in the same period. In part, this is a result of policy changes that have resulted in the broadening of corporate tax bases to ensure that corporate tax revenues would not decline. Further, governments have been shifting business taxes from profit-sensitive to profit-insensitive taxes to maintain tax revenues on the corporate sector. No model has yet considered tax competition in tax rates and tax incentives as separate policies.

With income shifting, governments would not only reduce statutory corporate income taxes but also restrict international tax planning opportunities for base erosion, such as restricting interest paid to foreign jurisdictions and tightening up transfer pricing rules. Transfer pricing models have suggested that governments might choose rules to protect their tax base although the rules might impact on trade (Schjelderup and Weichenrieder [1999]) or with the efficiency of the multinational enterprise (Elitzur and Mintz [1996]).

### **V. Conclusions**

The interaction of corporate income taxes and international capital flows suggests that the source-based capital taxes potentially result in quite significant distortions in the allocation of capital at the international level. Much economic analysis has viewed that capital taxes will disappear if real capital is perfectly mobile at the international level. However, given that this view assumes that economies are small and there are no impediments to the free flow of capital, reality would suggest that competition for real capital is less extreme than what typical

economic models would suggest. There are good reasons for countries to tax mobile capital if governments can “export” taxes paid by non-residents. Competitiveness may make it more difficult for countries to tax income earned by foreigners but there is virtually no economic study that would suggest that real capital is perfectly mobile.

Instead, the problems with corporate taxation are much deeper than what would be suggested by models with perfect mobility of real capital. One issue is that taxable profits are highly mobile, leading to the “tax base flight” fiscal externality dominating other fiscal externalities in this case. Governments have been trying to protect their tax bases by imposing restrictions that lead to an erosion of profits as well as reducing statutory tax rates. The other issue is that it is increasingly difficult to impose a tax on income earned in a jurisdiction by a growing multinational sector in a more integrated global economy. New technology and financial transactions makes it more problematical to define profits earned in one country alone. Governments have been increasing their reliance on profit-based measures of transfer prices since these can rely more on allocation methods for global profits of multinationals rather than transaction-based rules. Nonetheless, administrative practices will require considerable co-operation amongst governments if they are to maintain the corporate income tax.

Therefore, many have suggested that governments will need to rely more on consumption taxes in the future since capital income taxes are too difficult to administer. The most important consumption tax is the VAT (value added tax) used in over 80 countries today. However, some administrative problems for VATs will become increasingly important in future years to prevent value-added shifting from high to low tax countries. However, this is another topic that is left for future analysis.



## References

- Akerlof, G. (1970), "The market for 'lemons': Quality and the market mechanism", *Quarterly Journal of Economics*, 84, 488-500.
- Altshuler R. and J. Mintz (1994), "United States interest allocation rules: Effects and policy", *International Tax and Public Finance*, 2, 7-36.
- Altshuler R. and S. Newlon (1993), "The effects of U.S. tax policy on the income repatriation patterns of U.S. multinational corporations", in *Studies in International Taxation*", edited by A. Giovannini, R. G. Hubbard, and J. Slemrod, National Bureau of Economic Research, University of Chicago Press, Chicago.
- Battacharya, S. (1979), "Imperfect information, dividend policy and the 'bird in the hand' fallacy", *Bell Journal of Economics*, 10, 259-70.
- Bernheim, D. and A. Wantz (1995), "A tax-based test of the dividend signalling hypothesis", *American Economic Review*, 85, 532-51.
- Bond, E. W. and L. Samuelson (1989), "Strategic behaviour and the rules for international taxation of capital", *Economic Journal*, 99, 1099-1011.
- Brander, J. A. and B. J. Spencer (1985), "Export subsidies and international share rivalry", *Journal of International Economics*, 18, 83-100.
- Burgess, D. (1988), "On the relevance of export demand conditions for capital income taxation in open economies", *Canadian Journal of Economics*, 21, 285-311.
- Davies, J. and G. Glenday, "Accrual-equivalent marginal tax rates for personal financial assets", *Canadian Journal of Economics*, 13, 189-202.
- DeAngelo, H. and R. Masulis (1989), "Tax asymmetries, the cost of capital and investment", *Journal of Financial Economics*, 8, 3-29.
- Eden, L. (1998), *Taxing multinationals: Transfer pricing and corporate income taxation*, University of Toronto Press, Toronto.
- Edey, M., and K. Hviding, (1995), "An assessment of financial reform in OECD countries", OECD, Economics Department, Working Paper No. 154.
- Edwards, J. and M. Keen (1994), "Tax competition and Leviathan", *European Economic Review*, 40, 113-134.
- Elitzur, R. and J. Mintz (1996), "Transfer pricing rules and corporate tax competition", *Journal of Public Economics*, 60, 401-422.
- Fazarri, S., G. Hubbard, and B. Petersen (1988), "Financing constraints and corporate investments", *Brookings Papers on Economic Activity*, 1, 141-195.
- Feldstein, M. and D. G. Hartman (1979), "The optimal taxation of foreign source investment income", *Quarterly Journal of Economics*, 94, 613-629.
- Feldstein, M. and C. Horioka (1981), "Domestic savings and international capital flows", *Economic Journal*, 90,

314-29.

Gordon, R. H. (1983), "An optimal taxation approach to fiscal federalism", *Quarterly Journal of Economics*, 98, 567-586.

Gordon, R. H. (1992), "Can capital income taxes survive in open economies?", *Journal of Finance*, 47, 1159-80.

Gordon, R. H. (1986), Taxation of investment and savings in a world economy", *American Economic Review*, 76, 1086-1102.

Gordon, R. H. and H. Varian (1989), "Taxation of asset income in the presence of a world securities market", *Journal of International Economics*, 26, 205-226.

Helliwell, J. (2000), *Benefactor's Lecture*, C.D. Howe Institute, Toronto.

Helliwell, J. and McKittrick (1999), "Comparing capital mobility across provincial and national borders", *Canadian Journal of Economics*. 32(November), 1164-1173.

Huizinga, H. and S. B. Neilson (2000), "The taxation of interest in Europe: A minimum withholding tax?", in S. Cnossen, ed., *Taxing capital income in the European Union*, Oxford University Press, 135-160.

Janeba, E. (1995), "Corporate income tax competition, double taxation treaties and foreign direct investment", *Journal of Public Economics*, 56, 311-325.

Janeba, E. (1996), "Foreign direct investment under oligopoly: Profit shifting or profit capturing?", *Journal of Public Economics*, 60, 423-445.

Kehoe, P. J. (1989), "Policy co-operation among benevolent governments may be undesirable", *Review of Economic Studies*, 56, 289-96.

Leechor, C. and J. Mintz (1993), "On the taxation of multinational corporate investment when the deferral method is used by the capital exporting country", *Journal of Public Economics*, 51, 75-96.

Leland, H. and D. Pyle (1977), "Informational asymmetries, financial structure and financial intermediation", *Journal of Finance*, 32, 371-88.

McKenzie, K. and A. Thompson (1996), "The economic effects of dividend taxation", Working Paper No. 96-7, Technical Committee on Business Taxation, Department of Finance, Ottawa.

McLure, Jr., Charles E. (1999), "Electronic commerce and the state retail sales tax: A challenge to American federalism", *International Tax and Public Finance*, 6(2),

Miller, M. (1977), "Debt and taxes", *Journal of Finance*, 32, 261-75.

Miller, M. and K. Rock (1985), "Dividend policy under asymmetric information", *Journal of Finance*, 40, 1031-1051.

Mintz, J. and D. Chen (2000), "Will the corporate income tax wither?", *World Tax Conference Report*, Canadian Tax Foundation, Toronto.

Mintz, J. M. and H. Tulkens (1986), "Commodity tax competition between member states of a federation: Equilibrium and efficiency", *Journal of Public Economics*, 29, 133-172.

- Mintz, J. M. and H. Tulkens (1996), "Optimality properties of alternative systems of taxation of foreign direct investment", *Journal of Public Economics*, 60, 373-400.
- Modigliani, M. and M. Miller (1958), "The cost of capital, corporation finance and the theory of investment", *American Economic Review*, 48, 261-97.
- Modigliani, M. and M. Miller (1963), "Corporate income taxes and the cost of capital: A correction", *American Economic Review*, 53, 433-43.
- Myers, S. C. and N. S. Majluf (1984), "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics*, 13, 187-221.
- Razin, A. and E. Sadka (1991), "International tax competition and gains from tax harmonization", *Economic Letters*, 37, 69-76.
- Plambeck, Rosenbloom and Ring (1995), "General Report", *Tax aspects of derivative financial instruments*, Studies on international fiscal law, International Fiscal Association, Kluwer, Netherlands.
- Poterba, J., and L. Summers (1985), "The economic effect of dividend taxation", in E Altman and M. Subrahmanyam, eds., *Recent Advances in Corporate Finance*, Dow Jones, Irwin.
- Ross, S. (1977), "The determination of financial structure: the incentive signalling approach", *Bell Journal of Economics*, 8, 23-40.
- Schjelderup, G. and A. Weichenrieder (1999), "Trade, multinationals and transfer pricing", *Canadian Journal of Economics*, 32, 817-834.
- Sinn, H.-W. (1987), *Capital income taxation and resource allocation*, North Holland, Amsterdam.
- Sinn, H.-W. (1990), "Taxation and the birth of foreign subsidiaries", Discussion Paper No. 90-30, University of Munich.
- Stiglitz, J. (1972), "Some aspects of the pure theory of corporate finance, bankruptcy and takeovers", *Bell Journal of Economics*, 2, 458-82.
- Tiebout, C. M. (1956), "A pure theory of local expenditures", *Journal of Political Economy*, 63, 103-115.
- Trigeorgis, L. (1996), *Real Options*, MIT Press, Cambridge, Mass.
- Warren, A. (2000), "Income Taxation and Financial Innovation", manuscript, Harvard Law School.
- Weichenrieder, A. J., "Transfer pricing, double taxation, and the cost of capital", *Scandinavian Journal of Economics*, 98, 445-452.
- Zodrow, G. R. and P. M. Mieszkowski (1986), "Pigou, property taxation and the under-provision of local public goods", *Journal of Urban Economics*, 19, 356-370.