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ISSUES IN THE THEORY OF INTERNATIONAL TAX COORDINATION

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ABSTRACT

This paper surveys the theory of international tax coordination. The first part of the paper discusses the optimal method of international double taxation relief from an equity and efficiency perspective. The second part surveys the modern game–theoretic approach to tax coordination, stressing the potential welfare gains from international cooperation in the field of tax policy. Finally, the third part of the paper reviews the theory of international coordination of indirect taxation.

CONTENTS

I. INTRODUCTION

I.1. The subject matter of the theory of international tax coordination

Despite the rapid integration of the western economies in the post–war period, considerable differences in national tax systems still exist. These differences can have substantial effects on the volume and pattern of international trade in goods and factor inputs. For the most part, the cross–country reallocation of resources induced by deviating tax regimes and the ensuing effects on income distribution were not the intended outcome of national tax policies, and governments have therefore made various attempts to neutralize undesirable tax–effects on international economic transactions. The theory of international tax coordination asks what these neutralizing policy measures should be; i.e. it asks how the taxation of border–crossing economic activity should be designed so as to meet acceptable standards of equity and efficiency.

Problems of international tax coordination have become increasingly relevant in recent years, due to the liberalization and integration of world financial markets, and because of several attempts to strengthen regional economic cooperation such as the plan to establish a single internal market in the European Community by the end of 1992. In fact, the renewed momentum of EC integration recently stimulated a series of contributions to the tax coordination literature published in Cnossen (1987), just as the initial successes of the EC and other newly established common markets in the 1960s inspired an important set of contributions edited by Shoup (1967). In addition, interest in problems of international tax coordination seems to have been stimulated by the international wave of tax reforms in the 1980s, in particular by the U.S. tax reforms of 1981 and 1986 which according to Sinn (1985, 1988), Bovenberg et alia (1989), and McLure (1989) have had undesirable and probably unintended side effects on the world capital market.

The issue of international tax coordination has often been seen mainly as a problem of alleviating double taxation. This problem arises because most countries insist on their right to tax all income originating within their borders as well as all income earned by their residents. An individual earning income from abroad may thus be taxed both by the foreign country and by his country of residence, and this double taxation may artificially discourage international economic transactions.

However, since some countries have found it in their interest to play the role of "tax havens", the international tax coordination problem may often be one of preventing tax evasion rather than a problem of double taxation, since it may be very difficult for tax authorities in the residence country to detect income from the tax haven country. Moreover, even if the problems of double taxation and tax evasion were solved, it would still be relevant to ask whether it would be mutually benefical for countries to undertake coordinated changes in the level and structure of taxation. In other words, the problem of international tax coordination cannot just be reduced to a question of avoiding international double taxation.

The present paper seeks to highlight some important issues in the theory of international tax coordination. As a preliminary, the next section offers a more specific definition of tax coordination, contrasting it with the concepts of tax competition and tax harmonization. Part II of the paper then discusses coordination of income taxes, with special emphasis on capital income taxes in general and corporate income taxes in particular, since the most intriguing issues arise in the context of capital taxation, and since capital is the most internationally mobile factor of production. Finally, part III deals more briefly with international coordination of product taxes.

I.2. Tax competition, tax harmonization, and tax coordination

The absence of any attempts at international coordination of national tax systems may give rise to so–called "fiscal externalities" such as "tax exporting" and "tax competition". The idea of tax exporting is to shift part or all of the tax burden from domestic citizens to foreigners. This may involve taxes on international economic transactions with the purpose of turning the terms of trade in favor of the taxing jurisdiction, or it may involve discriminatory taxes on foreign–owned factors of production which are believed to be relatively immobile. On the other hand, under tax competition national governments typically try to attract internationally mobile activities by offering a more favorable tax climate than other countries.

While tax exporting and tax competition occur when national tax policies aim solely at the maximization of national advantage, the term "tax harmonization" refers to situations at the other end of the scale of international cooperation. In this paper we define tax harmonization as a state of affairs in which individual countries have given up national sovereignty with respect to some part of their tax system by accepting

common tax rates and common tax base definitions, and in the extreme case by agreeing to transfer part or all of the tax revenue to a common supranational institution.

Some writers have used the terms "tax harmonization" and "tax coordination" more or less synonymously, but we shall make a distinction between these two concepts. Thus, while tax harmonization involves international equalization of tax rates and tax bases, we shall define "tax coordination" as an adjustment of the tax system, undertaken either unilaterally or in a process of bilateral or multilateral negotiation, with the purpose of attaining equity and efficiency in the taxation of border–crossing economic activities, while at the same time retaining as much national sovereignty as possible.

The definition of tax coordination suggested here is almost identical to the one offered by Richard Musgrave (1969, p. 239). The need to distinguish coordination from harmonization (equalization) arises from the fact that, for historical and cultural reasons, different countries seem to have different preferences regarding the relative size of the public sector, the structure of taxation, and the desirable degree of redistribution via the public finances. Hence, while problems in the field of international taxation could certainly be dealt with by a process of tax harmonization, such a "solution" would involve welfare losses by preventing countries from pursuing different tax policies in accordance with their own preferences. Therefore, the more challenging task is to coordinate national tax policies so that these do not prevent the establishment of an equitable and efficient international economic order, while still leaving individual countries as much room of maneuvre as possible.

Perhaps somewhat surprisingly, the need for international tax coordination is not generally accepted. Inspired by the famous article by Charles Tiebout (1956), some economists believe that tax competition can help to ensure efficiency in the provision of public services. The idea is that with fiscal competition in international markets for capital and labor, superior public sector performance will be rewarded by attracting resources, residents and trade, just as the superior performance of firms in the market results in increased profits. However, the large body of research initiated by Tiebout's contribution has revealed that the conditions for tax competition to ensure a Pareto–efficient allocation of resources within and across jurisdictions are highly restrictive, even if the private sector is perfectly competitive (see e.g. the review by Atkinson and Stiglitz, 1980, ch. 17). Moreover, for the Tiebout–mechanism to work properly, public expenditure must be financed by benefit taxes reflecting the value of public services to individual residents, and this would exclude the possibility of

redistributing economic welfare via the public budget. Thus, while tax competition may sometimes play a useful role at the local government level, it will not be acceptable to a national government trying systematically to influence the personal income distribution.

Another defense of tax competition has been offered by Brennan and Buchanan (1980). They and their followers argue that the existence of rent–seeking politicians and bureacrats implies an inherent tendency for the public sector to expand beyond the "optimal" level identified by traditional welfare economics. In the absence of constitutional constraints on public spending, tax competition may therefore be a second–best means of protecting the private sector from exploitation by revenue–maximizing governments. However, as Peggy and Richard Musgrave (1989) have forcefully argued, the inefficiencies and inequities associated with unfettered tax competition would be an intolerably high price to pay for keeping a check on Leviathan–type governments. Continued efforts at international tax coordination coupled with reforms to make the political process more transparent and less vulnerable to the rent–seeking activities of special interest groups would seem to be a preferable alternative. At least this is the premise on which we shall proceed.

II. COORDINATION OF INCOME TAXES

II.1. Outline of existing rules of international income taxation

Before embarking on our analysis of normative principles of income tax coordination, it is useful to give a brief review of the basic rules of international income taxation which are adhered to in practice.

Income is said to be taxed according to the source principle when it is taxed by the jurisdiction within which it originates, i.e. by the country in which the income is generated. Alternatively, income may be taxed according to the residence principle, i.e. by the country in which the income recipient is resident. Most countries levy taxes according to both principles. Typically, the most important source–based tax is the corporation income tax which is levied on foreign–owned as well as domestically–owned corporations operating in the country. Payroll taxes and

withholding taxes on interest and dividends paid to foreign investors are other examples of source–based income taxes, while the personal income tax is the obvious example of a residence–based tax.

Because of the simultaneous application of source and residence principles, a problem of double taxation arises, as we have already mentioned. To help overcome this problem, organizations like the UN and the OECD have designed socalled model double taxation conventions embodying standards for alleviating double taxation and for the sharing of tax bases among countries, and this has encouraged member countries to establish an intricate web of bilateral tax treaties. In the absence of such treaties, countries typically take unilateral steps to provide at least some amount of double taxation relief.

Whether or not a tax treaty between two countries exists, it is almost universally accepted that the source–country has a priority right to tax income originating within its borders. The residence country can then choose among the following three policies:

1. Tax credit. The residence country can tax the taxpayer's foreign income at the same rate as his domestic income but give a credit for taxes paid to the foreign country. In practice, the magnitude of the tax credit is typically limited to that amount of income tax which would have accrued if the foreign income had been taxed only by the residence country, so the taxpayer pays the foreign or domestic tax rate, whichever is higher. Moreover, in the case of foreign income which is reinvested abroad, the residence country usually defers its tax claim until the income is repatriated. Thus, income earned by a foreign subsidiary of a multinational corporation is not taxed by the home country of the multinational until it is repatriated in the form of dividends.

2. Tax exemption. As a simpler alternative, the residence country can exempt from further taxation any income which has already been taxed abroad. Obviously, foreign income is then taxed at the foreign rate, while domestic income is taxed at the rate of the residence country.

3. Tax deduction. Finally, the residence country can allow taxes paid abroad to be deducted from income taxable at home. This system clearly involves some amount of double taxation: At first, income is taxed abroad, and the remaining amount is then subject to tax at home.

Table 1 indicates the methods of double taxation relief applied by the western

Table 1. Relief of double taxation of income from direct foreign investment in various countries

Credit without deferral	*Credit with deferral*	*Exemption*
Austria (b, DTA)[a]	Austria (s, DTA)[b]	Australia (b, s)
Canada (b)	Belgium (s)[c]	Belgium (b, p, DTA)
Denmark (b)	Canada (s)	France (b, s)
Finland (b, DTA)	Denmark (s, DTA*)	Italy (b), for local income tax
Germany (b, DTA)	Finland (s)	Liechtenstein (b)
Ireland (b)	Germany (s)[d]	Netherlands (b, p, s)
Italy (b, DTA), against corporate income tax	Greece (s)	Norway (b, p, DTA)
Japan (b)	Ireland (s)	Switzerland (b, DTA)[e]
Luxembourg (s)	Italy (s), against corporate income tax	
United Kingdom (b)	Japan (s)	
United States (b)	Luxembourg (b, DTA)[f]	
	Norway (s)	
	Spain (b, s)	
	Sweden (s), against the national income tax	
	United Kingdom (s)	
	United States (s)	

s, subsidiaries; b, branches; p, partial; DTA, under all or most double tax agreements provides for full exemption; DTA*, exemption under some double tax agreements.

[a] There are no explicit legal provisions for unilateral double taxation relief but relief may be granted by the Minister of Finance upon application in the form of a credit or an exemption.

[b] Dividends received from a foreign company are exempt from Austrian taxation when there is at least a 25 per cent shareholding.

[c] Underlying profits are exempt and 95 per cent of dividends are exempt if shares are held more than 1 year. Otherwise dividends are taxed, but a credit is allowed equivalent to 15 per cent of value.

[d] Where the shareholding in the foreign company exceeds 10 per cent and treaty tax exemption applies (affiliation privilege), dividends received are exempt from tax but subject to an imputation tax of 36 per cent if distributed.

[e] In the absence of a double tax treaty, income enters into the Swiss corporation's taxable profit net of foreign taxes. There is no credit for foreign income taxes, but certain double tax treaties provide for a credit against Swiss income taxes of the unrelieved portion of foreign withholding taxes on dividends.

[f] Taxes paid abroad in excess of the tax credit are deductible as expenses.

Source: Alworth (1988, Table 4.1). The tax rules are those in force in 1986.

countries in the taxation of income from foreign direct investment. It is seen that the systems of credit and exemption are by far the most prevalent in practice, whereas the deduction system is hardly ever used. Under the credit system, we see that the residence country typically defers taxation of income from foreign subsidiaries until the time of repatriation, whereas no deferral of taxation of foreign branch profits is allowed.

As far as border–crossing interest income is concerned, the credit system is usually applied. The withholding taxes on interest income levied by source countries rarely exceed 15% and are often lower, while withholding taxes on dividends to corporate shareholders fall in the interval between 0 and 30%, with a rate of 15% being quite common.

With this brief sketch of the basic groundrules of the international tax system, we are now ready to discuss the various normative principles of international tax coordination which have been proposed in the literature. Following a long tradition established by the influential works of Richard Musgrave (1969, part III) and Peggy Musgrave (1969), we shall treat these principles under the headings of "internation equity", "taxpayer equity", and "economic efficiency". The review of this "principles–oriented" approach will then be followed by a survey of the more recent game–theoretic approach to tax coordination.

II.2 Internation equity

II.2.1 The concept of internation equity

The problem of internation equity is the problem of ensuring a "fair" international division of the income generated by international economic transactions. It is thus a problem of the distribution of income among countries, whereas the question of taxpayer equity to be dealt with in the next section concerns the distribution of income among individuals. In the final analysis, it is of course a matter of subjective value judgement what consitutes a "fair" international economic order, and the economist may not be particularly qualified to judge in such a matter, but he may at least help to illuminate the policy choices to be made.

Clearly, when the country of source has prior claim to tax the income earned by foreign residents, the inter–country division of the income generated by border–crossing

economic activity such as international investment will be determined solely by the tax levied by the source country, whereas the taxes subsequently imposed by the country of residence will merely determine the division of the residual income between the public and private sectors in that country. Therefore, the first question one might ask is why the source–country should be allowed to tax the income accruing to foreign–owned factors of production operating in the country?

II.2.2. The case for source–based taxes

One popular answer is that the source country should be able to share the gains from international factor trade with the residence country. However, on closer reflection this argument does not really seem convincing. For instance, if a country opens up its capital market to capital imports from abroad, part of the extra income generated by the foreign capital will usually accrue to domestic residents in the form of higher wages and land rents. In the absence of taxation, the foreign investors will (under competitive conditions) receive a rate of return equal to the marginal product of capital, so the difference between the marginal and the average product of foreign capital will represent additional national income to the source country. Thus, since the source country shares in the gains from international investment, there is no obvious ethical basis for the claim that it should be allowed to tax the income accruing to foreigners.

The basis for such a claim becomes stronger if the foreign capital earns above–normal rates of return, for instance by developing scarce natural resources. Clearly, there is no reason why private investors should be allowed to appropriate all of the rents flowing from such activity. This is the socalled "national rental criterion" for levying source–based taxes on the income accruing to foreign–owned factors of production (Musgrave and Musgrave, 1972). The Musgraves also suggest a "redistribution criterion" whereby the rate of tax applied by the country of source would be inversely related to its own level of per capita income. Poor countries might thus be allowed to take a larger tax share of income accruing to foreigners than might rich countries. While this criterion has a lot of appeal as far as foreign investment in developing countries is concerned, it seems less relevant for the relations between the developed countries where most foreign investment actually takes place.

A strong basis for the tax claim of the source country exists when that country provides government services reducing the costs of production in foreign–owned firms. However, in these cases the imposition of "benefit" taxes such as user charges will

often be more appropriate than income taxes which will typically only very inaccurately reflect the value of government services to the firm. On the other hand, it may be argued that foreign firms often benefit from the provision of various public goods which cannot in practice be financed by benefit taxes, so that the use of income taxes may be the only practicable way of ensuring that foreign firms contribute to the financing of the public services from which they benefit.

In summary, even though the analytical basis for the prior claim of source countries to tax income accruing to foreigners may be somewhat shaky, this prior right seems to be universally accepted. Let us therefore go on to address the question how this right can be exercised in an "equitable" manner?. There are two aspects of this question: First, how should one define the territorial tax base of source countries, i.e. how does one determine the "source" of income? Second, what should determine the rate of tax applied by source countries?

II.2.3. Delineating territorial tax bases

The greatest difficulties regarding the delineation of territorial tax bases arise when the worldwide profits of a multinational corporation have to be allocated among the countries in which the multinational operates. The tax code has traditionally relied on separate accounts for each branch or subsidiary of the multinational group to determine where profits have been earned, and has required adherence to the so–called "arm's length" principle according to which transactions between the various parts of the firm should be priced in the same way as transactions with other firms. Unfortunately the proper "arm's length" prices are often very hard to determine because there are no comparable open market prices for the transactions in question. In addition, it is often impossible to undertake an objectively correct allocation of common overhead costs among the various parts of the multinational. For these reasons the traditional separate accounting method can result in a rather arbitrary apportionment of worldwide profits, leaving considerable opportunities for profit–shifting from high–tax to low–tax jurisdictions by over– or under–invoicing ("transfer–pricing") and by allocation of overheads to subsidiaries in low–tax countries.

As an answer to this problem, some tax economists have advocated that total profits be allocated among jurisdictions according to some commonly agreed apportionment formula, equivalent to the practice in some federal countries where subnational governments levy local corporate income taxes. If one favors a "supply–based" view of

income creation, according to which income is generated in the country where the factors of production are employed, one is naturally led to suggest an allocation of income in proportion to the amounts of capital and labor employed in the various countries. Alternatively, one might take a "supply–and–demand" view of income creation and base the apportionment of worldwide profits not only on the distribution of productive inputs, but also on the distribution of sales across countries, perhaps with equal weights on supply and demand factors.[1]

While the use of such "formula apportionment" could solve the problem of cross–country profit–shifting via transfer–pricing, it could on the other hand create new distortions and inequities in the taxation of multinationals. To see this clearly, it is useful to apply a bit of formal analysis, using the following notation:

Y_i = output in country i
K_i = input of capital in country i
L_i = input of labor in country i
w_i = wage rate in country i
c_i = cost of finance in country i
t_i = corporation income tax rate in country i
T_i = total tax liability in country i
Π_i = profits before tax in country i
Π = total worldwide profits

For simplicity, consider a multinational corporation operating in only two countries (i=1,2), taking the prices of output and factor inputs as given. If we denote the production function in country i by F_i and normalize output prices at unity, pre–tax profits in country i will be

$$(1) \qquad \Pi_i = F_i(K_i, L_i) - w_i L_i - c_i K_i , \qquad i = 1,2$$

Total worldwide profits of the corporation before tax will of course be

$$(2) \qquad \Pi = \Pi_1 + \Pi_2$$

Suppose now that the two countries practice double taxation relief by means of exemption, and that they have agreed to apportion global profits according to a supply–based formula giving equal weights to the inputs of capital and labor in each

country. Suppose further that the cost of finance is tax–deductible. The total tax bill in country i will then be equal to

$$(3) \qquad T_i = (t_i \Pi/2)\left[(K_i/(K_1+K_2)) + (L_i/(L_1+L_2))\right] \ , \ i = 1,2$$

Maximizing global after–tax profits, using equations (1) through (3), one finds the following first–order optimum conditions with respect to employment of capital and labor in country 1:

$$(4) \qquad (F_{1K}-c_1)(1-t^*) - [\Pi K_2(t_1-t_2)/2(K_1+K_2)^2] = 0$$

$$(5) \qquad (F_{1L}-w_1)(1-t^*) - [\Pi L_2(t_1-t_2)/2(L_1+L_2)^2] = 0$$

$$t^* \equiv (t_1/2)\left[(K_1/(K_1+K_2)) + (L_1/(L_1+L_2))\right]$$

$$+ (t_2/2)\left[(K_2/(K_1+K_2)) + (L_2/(L_1+L_2))\right]$$

In equations (4) and (5), F_{1K} and F_{1L} are of course the marginal products of capital and labor in country 1, respectively, while t^* is the weighted average corporate tax rate in the two countries, with weights being based on factor inputs. Compared to the standard optimum conditions for investment and employment in a closed economy, the second term on the left–hand sides of (4) and (5) is unusual. This term reflects the fact that a higher level of investment or employment in country 1 will ceteris paribus increase the fraction of global profits which is taxed in that country. In particular, we see from (5) that if $t_1 > t_2$, the use of formula apportionment will discourage employment of labor in country 1, because higher employment in that country will increase the fraction of worldwide profits which is taxed at the high rate t_1. Thus, if input of labor is part of the basis for apportionment, the corporation tax in countries with above–average tax rates is not only a tax on capital, but will work in part like a tax on labor, as pointed out by McLure (1980). Conversely, the corporate income tax will of course work partly like a subsidy to labor in countries with tax rates below average.

In deriving the optimum conditions above, we assumed that the two countries had agreed to use the same apportionment formula. If they were to use different formulas,

part of the multinational's global profits would either be taxed twice or would go untaxed, resulting in further distortions. On the other hand, if all countries applied not only the same formula, but also the same tax rates, the first–order conditions (4) and (5) would simplify to

(7) $$F_{1K} = c_1$$

(8) $$F_{1L} = w_1$$

and the distortionary effect of formula apportionment would disappear. Another way of avoiding distortions stemming from apportionment would be to provide double taxation relief by means of unlimited credit without deferral, since in that case the tax rate in the home country of the multinational would also apply to all of its foreign income. Finally, the direct distortion of the demand for labor (or other factor inputs) might be avoided by using formula apportionment based solely on the input of capital in the various countries, although this would not eliminate distortions in the demand for capital, as long as tax rates differed across countries.

II.2.4. Identifying the proper rate of source tax

Assuming that a solution to the problem of defining the territorial tax bases of source countries has been found, the next question is which rate of tax these countries should apply to income accruing to foreigners? A time–honored answer to this problem has been that source–countries should practice "nondiscrimination" between domestic and foreign taxpayers, i.e. that the two groups should be taxed at similar rates in the source–country. In the field of corporate taxation the principle of nondiscrimination has traditionally been interpreted to imply that foreign–owned and domestically–owned corporations operating in the country should be subject to the same corporate tax rate. The underlying idea seems to be that foreign and domestic corporations should compete on equal terms in the capital–importing country, i.e. that so–called "capital–import neutrality" should prevail. Implementation of nondiscrimination thus seems to call for double taxation relief via the exemption system rather than via the credit system, since in the latter case foreign–owned corporations would be taxed at the rate of the capital–exporting country.

However, as Sato and Bird (1975) pointed out, the application of identical corporate

tax rates to foreign and domestic corporations will not guarantee capital–import neutrality if the degree of integration of corporate and personal income taxes varies across countries. For instance, countries providing full or partial relief of the double taxation of dividends by means of the so–called imputation system rarely extend their (partial) credit for the prepaid corporate income tax to foreign shareholders. Thus, if the capital–importing country has an imputation system, while the capital–exporting country has a classical corporate income tax involving full double taxation of dividends, the capital–exporting corporation will face a higher cost of equity capital than domestic corporations in the capital–importing country. On the other hand, the capital–exporting country favoring the classical corporate income tax system would hardly find it acceptable that its resident shareholders should receive imputation credits related to corporate investment abroad while being subject to full double taxation of dividends from domestic corporate investment.

With different degrees of corporate–personal income tax integration across countries, the implementation of effective nondiscrimination may thus be very difficult. Sato and Bird therefore propose a principle of "effective reciprocity" as an alternative norm of internation equity. According to this criterion, all source countries should tax income accruing to foreigners at the same effective rate. This means that a country with a relatively low corporate income tax rate might employ a relatively high withholding tax on dividends to foreign shareholders, while a country with a high corporate tax rate should apply a low or zero withholding tax, so that the total source–country tax on foreign–owned capital is approximately the same in the two cases.

In the absence of withholding taxes, the reciprocity criterion would of course call for identical corporate tax rates (based on identical definitions of taxable corporate income) in all countries, as advocated by Peggy Musgrave (1987). In such a tax regime the effective tax rate on domestic and foreign corporate investment would be the same in each country, whether that country applied an integrated or a classical corporate income tax, and whether it applied the exemption system or the credit system to foreign–source income. As we have seen above, the use of formula apportionment to delineate the tax bases of source countries would then cause no distortion of factor demands, and the requirements of efficiency and internation equity would thus happily coincide. On the other hand, individual countries would have to give up sovereignty in setting their corporate tax rates. Thus it would seem that a satisfactory solution to the problem of ensuring internation equity would require tax harmonization rather than just tax coordination, in the sense of these terms defined in section I.2.

II.3. Taxpayer equity

II.3.1. Concepts of taxpayer equity

While the criterion of internation equity relates to the distribution of income among nations and calls for the use of impersonal source–based taxes, the criterion of taxpayer equity relates to the distribution of income among individual taxpayers and requires the use of personal residence–based taxes.

In the context of income taxation, taxpayer equity is said to be achieved when two individuals with the same total real net income pay the same amount of tax ("horizontal equity") and an individual with a higher real net income pays a higher amount of tax than an individual with a lower income ("vertical equity"). It is rather obvious that these goals can be realized only if taxes are levied on total personal income from all sources with appropriate deductions for costs of earning income, and that the residence country is normally in the best position to calculate such taxable income.

II.3.2. The internationalist view of taxpayer equity

When taxpayers earn income from foreign as well as domestic sources, the question arises how foreign income should be treated for tax purposes? According to the internationalist view one should simply add together income from all domestic and foreign sources to arrive at total taxable income and calculate the total tax liability according to domestic tax rules on this basis. From this tax liability one should then subtract any taxes which might have been paid to source countries to arrive at the final tax liability to the residence country, granting tax refunds if foreign taxes exceed the calculated total tax liability. In other words, double taxation relief should be provided by means of full credit without deferral. In this way, two persons with the same worldwide income will pay the same total amount of tax to domestic and foreign authorities, and persons with higher global incomes will have higher global tax bills. This arrangement can be said to be internationalistic, since it is quite immaterial for the magnitude of the total tax liability whether taxes are paid at home or abroad.

II.3.3. The nationalistic view

By contrast, one might take a nationalistic view and consider taxes paid abroad as a cost of doing business abroad. Under this view, the tax liability to the residence country would be calculated on the basis of total worldwide income net of foreign taxes, i.e. double taxation relief would be granted by means of the deduction system. The philosophy would thus be that two taxpayers generating the same net national income to the residence country should pay the same amount of tax to the domestic treasury.

Clearly it is a matter of value judgement whether one should adopt the nationalistic or internationalistic view of taxpayer equity. As we shall see in the next section, under certain circumstances efficiency considerations and considerations of taxpayer equity lead to identical tax policy recommendations under the internationalistic view, just as the two types of considerations have the same policy implications under the nationalistic view.

II.3.4. Taxpayer equity in the taxation of corporate income

However, before turning to questions of efficiency, let us round off our discussion of equity issues by making two minor points. First, note that the criterion of taxpayer equity is motivated by concern with the distribution of economic welfare among individuals. Since all taxes must in the end be borne by individuals, a logical and consistent implementation of taxpayer equity would seem to call for full integration of corporate and personal income taxes. In other words, only considerations of administrative feasibility could justify deviations from the rule that all corporate income, including retained earnings, should be imputed to individual shareholders and be taxed as personal income, with full credit being granted for corporate income taxes already paid. Thus, under a fully consistent income tax system, the corporate income tax should serve only as a preliminary withholding tax and as a means of implementing the right of the source country to tax income accruing to foreign shareholders.

Second, note that the reciprocity criterion of internation equity discussed in the preceding section only requires that each source country take the same tax share of income accruing to non–residents, but it does not imply that this share should correspond to the tax burden placed on the income of residents in that country (P. Musgrave, 1987, p. 207).

II.4 Efficiency

II.4.1. The social opportunity cost of capital

The final requirement of a "good" international tax system is that it should not interfere with an efficient allocation of resources across national boundaries. In exploring the implications of this criterion for the taxation of capital income, it is useful to introduce the concept of the social opportunity cost of capital (c). Inspired by Harberger (1976) and Horst (1980), we shall define this variable as

$$c = sr_a + (1-s)r_b \tag{9}$$

where r_a and r_b are the after–tax and the pre–tax rates of return to capital, respectively, and s is the fraction of an additional unit of capital exports which is financed by an increase in domestic capital supply, with (1–s) representing the fraction which is financed by a decrease in domestic capital demand. To understand the definition of c, note that r_a reflects the consumer rate of time preference, i.e. the rate of return to savings required to compensate consumers for a decrease in current consumption of one unit, while under competitive conditions r_b reflects the marginal product of capital. The social opportunity cost of supplying an extra unit of capital to the world market is thus defined as a weighted average of the opportunity cost of domestic savings and the opportunity cost of domestic investment. As noted by Horst (1980, p. 795), the weight s can be written as

$$s = \frac{e_s}{e_s + (D/S)e_d} \tag{10}$$

where D is domestic demand for capital, S is domestic supply of capital, e_s is the elasticity of capital supply with respect to the after–tax rate of return, and e_d is the elasticity of capital demand with respect to the pre–tax rate of return. Equation (10) indicates that the more elastic the supply of capital relative to the demand for it, the more an increase in capital exports will be financed by increased domestic supply, rather than by reduced domestic demand.

II.4.2. Efficient capital income taxation from a national viewpoint

When capital mobility is perfect, private investors will reallocate their capital until the after–tax rate of return on investment at home equals the after–tax rate of return on investment abroad. Hence we have the equilibrium condition

$$(11) \qquad r_a \equiv (1-t)r_b = (1-T)r_b^* \qquad \text{(11)}$$

where t is the domestic tax rate on capital income, r_b^* is the pre–tax rate of return on foreign investment, and T is the combined foreign and domestic tax rate on foreign investment income.

If the level of capital exports is to be efficient from a national point of view, and if the domestic economy is so small that its capital exports do not appreciably affect the foreign rate of return, the domestic tax rate must be set to ensure that

$$(12) \qquad sr_a + (1-s)r_b = (1-t^*)r_b^* \qquad \text{(12)}$$

where t^* denotes the foreign tax paid on foreign investment income. Equation (12) says that in a national optimum, the domestic social opportunity cost of capital must be equal to the rate of return on foreign investment after payment of foreign taxes, since the latter do not add to domestic welfare. Inserting (11) into (12) and solving for the combined tax rate on foreign investment income, one finds that

$$(13) \qquad T = \frac{t^* + t(1-t^*) - st}{1 - st} \qquad \text{(13)}$$

From the definition of s in (10) we see that (13) implies

$$(14) \qquad T = t^* + t(1-t^*) \qquad \text{for } e_s = 0 \qquad \text{(14)}$$

In other words, when the domestic supply of capital is completely inelastic, the optimal national tax treatment of foreign investment income is to allow foreign taxes to be deducted from foreign income taxable at home, since the combined foreign and domestic tax burden on foreign investment income will then be equal to the expression in (14). To understand this result, note that when the domestic supply of capital is completely inelastic, there is no way tax policy can distort savings decisions, even if it involves some amount of double taxation of foreign investment income. The optimal

tax problem is therefore reduced to the problem of ensuring that no gains can be made by reallocating the given stock of national wealth. This is achieved when domestic national income cannot be increased any further by repatriating foreign investment, i.e. when

$$r_b = (1-t^*)r_b^* \tag{15}$$

Inserting (14) into (11), the reader may verify that (15) will indeed be met under the deduction system of international double taxation relief.

The point that a deduction system can maximize national welfare was first made by Peggy Musgrave (1969), but as we have seen, it is based on the assumption that the supply of capital is completely inelastic with respect to the net rate of return. As an alternative, let us consider another benchmark case where capital supply is elastic, whereas the demand for capital is completely inelastic with respect to the cost of capital, as would be the case if production were characterized by fixed technical coefficients, leaving no possibilities for substitution between capital and labor. Thus, setting e_d equal to zero, we see from (10) that s=1, and (13) then implies that

$$T = t^* \quad \text{for } e_d = 0 \tag{16}$$

It follows from (16) that foreign investment income should be exempt from further taxation at home after having being taxed abroad. Again this result is not difficult to understand: If the domestic authorities try to induce repatriation of capital invested abroad by imposing taxes on foreign investment income, this will only serve to reduce national wealth by discouraging savings, whereas it will not cause any increase in national product, since the domestic economy cannot absorb any more capital, due to the inelastic demand for capital.

In general the elasticities of supply and demand in the capital market will be positive, but finite, and it can be shown that the optimal combined tax rate on foreign investment income will then lie somewhere in between the rates implied by the systems of exemption and deduction, respectively. Thus it will generally be optimal from a national point of view to impose some domestic tax on foreign investment income in addition to the tax which has already been paid abroad.

II.4.3. National efficiency in the large economy

We have so far assumed that the domestic economy is small relative to the world economy. However, if domestic capital exports are so large that they significantly depress the marginal product of capital obtainable in the rest of the world, the optimal tax rate on foreign investment income from a national point of view will be higher than the one derived for a small economy. The reason is that by imposing additional taxes on foreign investment income, thereby discouraging capital exports, the large capital–exporting country can raise the rate of return to capital in the capital–importing countries, thus improving the terms on which it can sell capital services abroad (see Feldstein and Hartman, 1979, pp. 618–619). The national optimum in a large country will be reached when the tax rate on foreign investment income is so high that the marginal revenue product of foreign investment after payment of foreign taxes is equal to the social opportunity cost of capital in the domestic economy.

The above simplified analyses of the optimal nationalistic tax policy also abstract from the possible impact of foreign direct investment on the commodity terms of trade between the domestic economy and the rest of the world. To allow for such effects, Hartman (1980) constructed a two–sector general equilibrium model of a two–country world economy. In the Hartman model multinational firms invest abroad because they possess cost advantages over foreign producers, and not necessarily because the capital–exporting country has a relative abundance of capital. The model is able to account for the substitution between foreign production and international trade. Parameterizing this model, Hartman performed a number of simulations to study the optimal taxation of foreign investment income from a national point of view. He found that the optimal tax rate can vary quite considerably, depending on the fraction of foreign investment financed by borrowing abroad, on the size of the cost advantage possessed by multinationals, and on the factor–intensity of production of the good produced abroad by the multinationals.

II.4.4. International efficiency in capital income taxation

Just as the national and international views of taxpayer equity lead to different policy prescriptions, the policy required to ensure national efficiency does not generally coincide with the policy ensuring worldwide efficiency. From an international point of view, welfare is maximized when the social opportunity cost of capital at home and

abroad are equalized, i.e. when

$$(17) \qquad s(1-t)r_b + (1-s)r_b = s^*(1-t^*)r_b^* + (1-s^*)r_b^*$$

where the definition of the foreign parameter s^* is of course quite analogous to the definition of s in (10). When (17) is met, the marginal cost of international investment to the domestic capital–exporting country equals the marginal benefit to the foreign capital–importing country. Solving the arbitrage condition (11) for r_b, inserting the resulting expression into (17) and performing a few manipulations, one finds the following expression for the optimal combined tax rate on foreign investment under the international view:

$$(18) \qquad T = t - \frac{(1-t)\,[\,s\,(t-t^*)+t^*\,(s-s^*)\,]}{1 - s\,t}$$

Equation (18) was originally derived by Horst (1980), who used it to identify the four benchmark cases summarized in table 2. It may be useful to relate the results stated in the table to the popular concepts of "capital export neutrality" and "capital import neutrality".

Capital export neutrality prevails when the tax system imposes the same total tax burden on investment at home and abroad. This is achieved when double taxation relief is granted by means of full credit without deferral, ensuring that both foreign and domestic income will always be taxed at the rate of the home country. Capital mobility will then tend to equalize the required pre–tax rates of return across countries, thereby eliminating cross–country differences in the cost of capital. A regime of capital export neutrality will thus avoid international distortions in the demand for capital.

Capital import neutrality is said to prevail when foreign and domestic suppliers of capital to any given country face the same total rate of tax on their investment in that country. If the capital–importing country taxes foreign and domestic investors at the same rate, and the capital–exporting country exempts foreign income from domestic tax, this criterion will be met. In section II.2.4. we mentioned that the requirement of capital import neutrality may be seen as an equity criterion, based on notions of "fair" competition on equal terms. However, it is also an efficiency criterion, since capital mobility under an exemption system will tend to equalize the after–tax rates of return obtained by savers in different countries, thus avoiding international distortions in the supply of capital.

Table 2. Methods of double taxation relief ensuring worldwide efficiency in the taxation of foreign investment income

		CAPITAL-EXPORTING COUNTRY	
		Inelastic supply of capital	Inelastic demand for capital
CAPITAL-IMPORTING COUNTRY	Inelastic supply of capital	Credit system	Worldwide exemption[a)]
	Inelastic demand for capital	Deduction system	Exemption system

a) Worldwide exemption implies that neither foreign nor domestic taxes are levied on foreign investment income.

Note: The table summarizes the findings of Horst (1980)

If capital income tax rates at home and abroad are the same, and if countries have decided to impose no special taxes on or grant no special subsidies to international investment, both capital export neutrality and capital import neutrality may be achieved either by a credit system or by an exemption system. There will then be no distortions in the international pattern of saving and investment. However, in the general case where marginal effective capital income tax rates differ across countries, we must turn to the analysis of Horst summarized in equation (18) and table 2 to determine the optimal method of double taxation relief.

Consider first the special case of inelastic capital supply in all countries ($s=s^*=0$). In that case it is intuitively obvious that tax policy cannot distort savings decisions, and hence there is no need to worry about capital import neutrality. From an efficiency point of view the policy problem reduces to that of promoting an optimal cross–country allocation of the given world stock of capital. One would expect this to be achieved under a regime of capital export neutrality, ensuring identical pre–tax marginal products of capital in all countries. Equation (18) confirms this expectation, since for $s=s^*=0$ it implies that $T=t$. In other words the total tax on foreign investment should equal the domestic capital income tax rate, as would be the case under a pure credit system.

Notice the happy coincidence of equity and efficiency goals in the preceding analysis. In section II.3 we saw that the international view of taxpayer equity calls for double taxation relief by means of the credit system, and now we have just found that international efficiency in the presence of inelastic capital supply also requires reliance on the credit system. As a parallel, the nationalist viewpoint was found to favor the deduction system both on efficiency grounds (given inelastic capital supply) and on grounds of taxpayer equity.

Consider next the alternative benchmark case of elastic capital supply but completely inelastic capital demand ($e_d=e_d^*=0$). From (10) we then have $s=s^*=1$, implying from (18) that $T=t^*$. In other words, international efficiency then calls for tax coordination by means of tax–exemption of foreign–source income. Again, the explanation is rather obvious: When the demand for capital in all countries is unresponsive to the cost of capital, tax policy cannot distort the international pattern of capital demand, and the goal of capital export neutrality becomes irrelevant. Instead, only capital import neutrality is needed to avoid international distortions in the supply of capital. It is worth recalling from section II.4.3 that capital import neutrality (the exemption

system) is also required for national efficiency in a small country with inelastic capital demand. Thus, when countries are small relative to the rest of the world and capital demand is inelastic, the national and international efficiency goals coincide, whereas they were found to be in conflict when capital supply is inelastic.

Table 2 also reports on optimal tax policies in cases of asymmetric demand and supply elasticities. Thus, with inelastic capital demand in capital–importing countries and inelastic capital supply in capital–exporting countries, we have $s^*=1$ and $s=0$, and (18) then implies $T=t^*+t(1-t^*)$. This means that a capital–exporting country should apply the deduction system in the taxation of foreign investment income. To understand this result, notice that when the demand for capital in the capital–importing country is quite inelastic, the tax system cannot distort the demand for capital imports. Hence, even from an international viewpoint, Pareto–optimality only requires that the fixed stock of capital owned by the capital–exporting country is allocated in a way which is optimal for that country. As we have seen previously, this national goal is achieved by the deduction system.

As a final special case, suppose the demand for capital in the capital–exporting country is fixed ($s=1$) while the capital–importing country has a fixed supply of capital ($s^*=0$). According to (18) we then have $T=0$. This means that so–called worldwide exemption is optimal, i.e. international investment income should be fully exempt from taxation. Thus, if the capital–importing country imposes a tax, the capital–exporting country should exempt foreign income from domestic tax and credit the foreign tax against its tax on domestic income. Once more, the result is quite intuitive: When only the supply of capital in the capital–exporting country and the demand for capital in the capital–importing country are elastic, worldwide optimality is achieved when the consumer rate of time preference in the former country (equal to the net rate of return $r_b^*(1-T)$ on the marginal unit of saving) is equated to the marginal product of capital r_b^* in the latter country, i.e. when $T=0$. If T were greater than zero, a unit increase in foreign investment in the capital–importing country would generate additional output r_b^* in excess of the net return $r_b^*(1-T)$ required by foreign investors. Hence a Pareto–improvement would be possible, since additional foreign investment would disturb neither the demand for capital in the capital–exporting country nor the domestic supply of capital in the importing country.

In general, the elasticities of capital demand and capital supply are probably all positive but finite, and the optimal tax on international investment income will then lie somewhere between the "four corners" delineated in table 2. In the absence of strong

empirical evidence on these elasticities, the most plausible assumption – at least as far as the developed western economies are concerned – may be that the elasticities are roughly identical across countries, i.e. $s=s^*$, as suggested by Horst (1980, p. 797). Closer inspection of (18) then reveals that the combined tax rate on international investment income should fall between that in the capital–exporting country and that in the capital–importing country. Thus, a high–tax capital–exporting country (satisfying $t>t^*$) would restrict international investment too much from an international perspective if it applied a credit system, whereas it would be too generous if it were to exempt foreign investment income from domestic taxation. On the other hand, a low–tax capital exporter ($t<t^*$) would be too generous if it applied an unlimited foreign tax credit, while it would be too restrictive if it were to practice exemption.

II.4.5. The efficiency effects of tax harmonization and tax unions

We have noted earlier that both capital import neutrality and capital export neutrality will obtain when capital income tax rates are the same in all countries. Thus one would expect that an international agreement to move capital income tax rates towards some common average would enhance world–wide efficiency, even if it did not imply complete equalization of tax rates. A recent study by Devereux and Keen (1989) supports this hypothesis. The two authors set up a two–country general equilibrium model with perfect capital mobility, in which the supply of capital in each country is fixed, and where capital income taxation is based on a pure source principle, as would be the case if international double taxation relief were granted through the exemption system. Drawing on duality theory, Devereux and Keen then demonstrate that partial harmonization of capital income tax rates in this setting will generate a potential Pareto–improvement for the world as a whole. This result is not surprising, for under the exemption system the capital market equilibrium condition in a two–country world is

$$(19) \qquad r_1(1-t_1) = r_2(1-t_2)$$

where r_i is the pre–tax rate of return in country i and t_i is the capital income tax rate. The previous section demonstrated that, when capital supply is inelastic, worldwide efficiency requires equalization of pre–tax rates of return, and as (19) makes clear, the difference between gross rates of return will in fact be smaller, the smaller the gap between tax rates.

Indeed, one could argue that the result of Devereux and Keen is not very interesting, since under their assumptions a first–best allocation of resources could be achieved by adoption of a credit system, so that there is no need at all for harmonization of tax rates. This judgement would be unfair, however, for in practice countries have been unwilling to provide unlimited foreign tax credits. As we explained in section II.1, this means that foreign–source income is taxed at the domestic or the foreign tax rate, whichever is higher. In capital–exporting countries with relatively low tax rates, the credit system thus works exactly like an exemption system. Moreover, in practice the tax credit mechanism is not activated until profits are repatriated, so as long as earnings are reinvested abroad, they are taxed only at the foreign tax rate. Under these circumstances, a harmonization of (effective) corporate income tax rates may be the only way to achieve efficiency, and it is reassuring to know that even partial harmonization will improve allocation[2].

At the present stage of international cooperation, a worldwide tax harmonization agreement encompassing all countries seems rather unrealistic, but regional agreements among a subset of nations such as the EC–countries may be possible to implement. Yet, as Richard Musgrave (1969, p. 251) pointed out, such tax unions will not necessarily improve world efficiency. This may be illustrated by a simple example: Suppose the world consists of three countries which all apply the source principle (exemption system) of capital income taxation. Suppose further that country 1 has the highest capital income tax rate, and country 3 has the lowest rate. Denoting countries by subscripts, we then have the arbitrage condition

$$(20) \qquad r_1(1-t_1) = r_2(1-t_2) = r_3(1-t_3)$$

and the relationship

$$(21) \qquad t_1 > t_2 > t_3 \implies r_1 > r_2 > r_3$$

In other words, the gross rate of return to investment is the highest in country 1 and the lowest in country 3. Now suppose that countries 1 and 2 form a tax union and agree to harmonize their capital income tax rates at some common rate t^* which is somewhere in between t_1 and t_2. Capital mobility will then tend to equalize gross rates of return in the two countries, so efficiency will be achieved within the tax union (assuming inelastic savings behavior). There will also be a flow of capital from country

Table 3. Example of required real rates of return (%) on foreign and domestic corporate investments.

Financing of subsidiary's investment	Required rate of return on subsidiary's investment			Required rate of return on domestic investment by parent company
	Exemption system	Credit with deferral	Credit without deferral	
1. Borrowing in the host country	5.0	5.0	5.0	
2. Retention by subsidiary	4.7	4.7	5.6	
3. Share issues by subsidiary to minority shareholders in host country	8.3	8.3	10.0	Finance by borrowing 5.0
4. Borrowing by parent and lending to subsidiary	5.0	5.0	5.0	
5. Retention by parent and lending to subsidiary	5.6	5.6	5.6	
6. Share issues by parent and lending to subsidiary	7.5	7.5	7.5	Finance by retentions 5.6
7. Borrowing by parent and purchase of shares from subsidiary	4.6	5.0	5.0	
8. Retention by parent and purchase of shares from subsidiary	5.2	5.6	5.6	Finance by share issues 7.5
9. Share issues by parent and purchase of shares from subsidiary	6.9	7.5	7.5	

Note: See text for an explanation of assumptions. The formulae used in the calculations are derived in the appendix.

3 to country 1 which has lowered its tax rate, and this too will improve efficiency. However, because country 2 has raised its tax rate, some capital will flow from that country to country 3 which now offers a higher after–tax rate of return, but since the pre–tax rate of return in country 3 is lower, this capital flow is inefficient. Thus, without further quantitative analysis one cannot say whether or not the formation of the tax union generates a potential worldwide Pareto–improvement.

II.4.6. The importance of financial decisions for the effects of tax policy

Most of the previous analysis has been carried out at a rather abstract level, referring to "capital income" and "foreign investment" without specifying very precisely the type of income and the mode of investment finance. Implicitly many of our arguments have assumed a uniform, non–discriminatory tax treatment of all forms of capital income and modes of finance. In the real world this assumption is not satisfied, however, and as Alworth (1988) has stressed, the effects of the tax system – including the system of international double taxation relief – may therefore depend critically on the way investment is financed. Moreover, the tax rules themselves will influence the mode of finance preferred by firms.

This point is particularly important for the study of foreign direct investment, because multinational corporations can generally choose from a wider array of alternative financial policies than a company with no operations abroad. Following Alworth (op.cit.), table 3 identifies nine different ways in which investment in a foreign subsidiary of a multinational corporation can be financed. First of all, there are three ways in which the subsidiary may obtain funding without relying on the parent company: It may borrow in the host country (or in the international capital market), it may retain its profits instead of remitting them to the parent, or it may issue shares to minority shareholders in the host country or elsewhere. Second, the subsidiary may obtain a loan from the parent company, which in turn may provide this finance either by borrowing, by retaining its own profits, or by issuing new shares. Finally, the subsidiary may issue new shares to the parent, and again the parent may provide the funding either by incurring new debt, by retentions, or by share issues.

The first three columns of table 3 offer numerical examples of the required real rate of return before tax on the subsidiary's investment under these alternative financial policies, and for comparison, the last column of the table indicates required real rates of return on the parent company's domestic investment, financed by borrowing, by

retained earnings, or by share issues. The required rate of return was calculated by means of the standard neoclassical cost–of–capital formula used in King and Fullerton (1984). Since we wish to focus on the effects of asymmetric tax treatment of the different forms of finance, the calculations in table 3 abstract from the complicating effects of inflation and investment subsidies such as accelerated depreciation etc. Thus we have set the inflation rate at zero, and we have assumed true economic depreciation for tax purposes. The discount rates applied by the corporation under the different modes of finance were derived from arbitrage conditions ensuring that the shareholders of the controlling parent company would always obtain an after–tax rate of return on the subsidiary's investment equal to the net rate of return obtainable on passive investment in the bond market.

The figures in table 3 are merely intended as a particular numerical example of the differences in capital costs across modes of finance which might be generated by plausible tax parameters. The specific assumptions regarding tax rules are as follows: The host country of the subsidiary has a corporate income tax rate of 40% and applies a classical system of corporation tax, providing no relief of the so–called double taxation of dividends. The marginal personal income tax rate for the representative (minority) shareholder in the host country is 50%, and the host country levies a withholding tax of 10% on dividends remitted from the subsidiary to the parent. The home country of the parent company applies an imputation system of corporate income tax. The corporate tax rate is 50%, but via a tax credit shareholders are compensated for half of the corporate tax on distributed corporate profits. The shareholders' marginal personal income tax rate on dividends and interest is 55%, and the effective personal tax rate on accrued capital gains on shares is 20%. The latter tax rate is substantially lower than the former, because capital gains are taxed only on realization, implying a postponement of the tax on accrued gains. Finally, the (real) rate of interest on debt instruments in the open market is 5%, and the rate of interest on loans from the parent to the subsidiary is set such that the shareholders of the parent company earn a net return equal to that obtainable on passive investment (due to asymmetric tax rules, this may imply some deviation of the interest rate on intra–company loans from the open market rate).

Although the specific figures in table 5 do of course reflect these special assumptions on tax rates, the table nevertheless illustrates the following points of general validity:

– The system of international double taxation relief for corporate equity income – be it exemption, credit with deferral, or credit without deferral – is immaterial for the

subsidiary's cost of capital when its investment is financed by loans from the parent. The reason is that the return to the parent takes the form of interest payments from the subsidiary. Regardless of the mode of double taxation relief for equity income, these interest payments are almost always taxed at the corporate tax rate of the parent company, with a credit being given for any withholding tax on the interest which may have been levied by the host country of the subsidiary. In other words, limitations on these credits are hardly ever effective, because withholding tax rates on interest are typically much lower than corporate income tax rates.

– A system of credit with deferral is quite equivalent to an exemption system when the subsidiary does not rely on finance from the parent company. Even if the subsidiary remits some profits to the parent after having financed its investment by its own retentions, the tax rates of the parent's home country do not affect the subsidiary's cost of capital under a credit system allowing deferral. This point was stressed by Hartman (1985), and it may be explained as follows: When the subsidiary remits a dollar of dividends, the home country applying the credit system will "gross up" the dividend by the corporate tax paid abroad (at rate t_s) and subject the resulting pretax income $1/(1-t_s)$ to tax at the domestic corporate rate t_p, finally deducting the taxes already paid abroad from the domestic tax liability. This procedure will leave an after–tax income of $(1-t_p)/(1-t_s)$ in the hands of the parent company, so this is the opportunity cost for the parent if the subsidiary retains an extra dollar of profits for investment abroad. If the pre–tax rate of return on the subsidiary's investment is ρ, and the after–tax return $\rho(1-t_s)$ is subsequently repatriated, the net income accruing to the parent will be $\rho(1-t_s)[(1-t_p)/(1-t_s)]$. Obviously the ratio between the after–tax income foregone by the parent in the first period and the after–tax income it receives in the second period is independent of the parent's tax rate t_p and depends only on the subsidiary's corporate tax rate t_s. By contrast, under a credit system without deferral the subsidiary would immediately be taxed at the effective rate t_p regardless of the timing of remittances, and t_p would thus always be the relevant corporate tax rate on foreign as well as domestic corporations.

– As a direct consequence of the previous point, and as one may see from table 5, foreign investment in low–tax countries financed by the subsidiary's own retentions may be quite favorable, not only under an exemption system, but also under a credit system with deferral. Thus, while debt is normally the most attractive source of finance for domestic investment – because the coexistence of corporate tax and personal taxes on dividends and capital gains implies some double taxation of equity–financed investment – it may be more attractive to finance foreign investment by retentions in

the subsidiary, if the personal tax on the resulting capital gains accruing to home country shareholders is not so high as to outweigh the advantage of a lower corporate tax rate abroad.

– Under an exemption system debt–financed purchase of shares from a subsidiary in a low–tax country by a parent in a high–tax country can also be a very attractive mode of investment finance, as witnessed by the first figure in the seventh row of table 5. If a parent can deduct its interest payments against a corporate tax rate which is higher than the combined corporate and dividend withholding tax rate in the host country of the subsidiary, such a financial policy will involve an investment subsidy in the sense that the cost of capital in foreign investment is reduced below the market rate of interest. This is an example of an attractive financing opportunity which may be available to a multinational corporation but unavailable to firms with purely domestic operations.

– Finally, we see from table 5 that even a system of credit without deferral will not guarantee identical costs of capital in domestic and foreign investment (capital export neutrality), if the two types of investment are financed in different ways. Full investment neutrality across all countries and modes of finance would require a symmetric and uniform taxation of all kinds of capital income[3].

II.4.7. The elusive goal of capital export neutrality

Even though a regime of full capital export neutrality will not guarantee worldwide efficiency when private savings are elastic with respect to the rate of return, most of the influential writers on the topic of international tax coordination like Richard Musgrave (1969), Peggy Musgrave (1987), and Sato and Bird (1975) have in fact supported such a regime, sometimes also termed "locational neutrality". Capital export neutrality likewise seems to be the underlying goal of several proposals by the EC–Commission for corporate tax harmonization in the European Community, although these proposals are also sometimes promoted as means of ensuring "fair" and undistorted competition.

On this background, it may be worthwhile at this point to provide a restatement and elaboration of the difficulties of obtaining capital export neutrality. First, such neutrality requires that the home country ("residence" country) of the parent company

grants unlimited tax credits, thus providing a refund to the company when taxes paid abroad exceed the domestic tax liability on foreign–source income. In practice residence countries limit their tax credits to the amount of domestic tax for the very good reason that the granting of unlimited credits would provide an incentive for source countries to impose very high (in principle infinitely high) taxes on foreign–owned capital, thereby soaking revenue from residence countries at zero cost to their own citizens. Because of this incentive problem, it is unlikely that residence countries would ever commit themselves to offering unlimited tax credits on a broad scale.

Second, we have seen that the practice of deferral means that the credit system will work like an exemption system – implying capital import neutrality rather than capital export neutrality – when the profits of subsidiaries are reinvested abroad instead of being repatriated. The natural solution to this problem would of course be to abolish deferral, but as Mutén (1983, pp. 327–331) has argued at great length, this would involve a number of technical difficulties. For instance, proper ways of accounting for foreign exchange gains and losses on foreign operations would have to be found, and there would be the general problem that the home–country tax authorities would have to rely on the accounts submitted by foreign subsidiaries without being able to check this information through proper field audits. Moreover, neutrality would require that investment incentives offered by the home country such as accelerated depreciation, investment tax credits etc. should also apply to foreign investment and not just to domestic capital formation, as it is usually the practice today.

Third, because of tax discrimination across different modes of finance, we saw in the previous section that even a system of unlimited tax credit without deferral will not guarantee capital export neutrality, if for some reason investment at home and abroad has to be financed in different ways.

Fourth, application of the credit system in corporate taxation requires that one can define the "residence" of the multinational firm. While it makes sense to ask where an individual is resident, it seems rather meaningless to ask in which particular country a multinational group of corporations is "resident", as noted by Kay and King (1989, ch. 14). Usually, the country of residence is taken to be the place of legal incorporation of the parent company company or the place of effective management and control. However, as worldwide economic integration proceeds and the means of communications continue to improve, it will become still easier for multinationals to change their country of legal residence to minimize the overall tax burden. This might be done by setting up a financing company (holding company) in a tax haven country

or by shifting the headquarter from a higher–tax to a lower–tax country. If all countries provided unlimited tax credits without deferral, such maneuvers would imply a tendency for all multinationals to become "resident" in the country with the lowest tax rate, but there would still be no violation of capital export neutrality. However, in the realistic case of limited tax credits, the shifting of residence would imply a gradual movement from a regime of capital export neutrality to one of capital import neutrality, because the "parent" companies in the low–tax jurisdictions would be in an excess credit position.

Finally, part of the cross–country flows of portfolio investment is channelled through tax–exempt institutions such as pension funds, trusts, life insurance companies and the like. For these investors the tax credit mechanism cannot ensure capital export neutrality, since they have no domestic tax liabilility against which their foreign taxes can be credited. If the home country were to grant a refund of taxes paid abroad, this would involve the same incentive problem as a system of unlimited credit. Thus it would seem that capital export neutrality for international portfolio investment is unattainable as long as governments wish to maintain tax–exemption for certain institutional investors.

II.4.8. A proposal for international capital income tax coordination

In rounding off this lengthy discussion of problems of capital income tax coordination, it is worth reviewing an interesting coordination proposal recently offered by Sinn (1987, pp. 349–367). The Sinn proposal aims at ensuring a zero effective marginal tax on capital income and an equalization of capital's marginal product and the consumer rate of time preference at a common level throughout the world. If this is achieved, an efficient international allocation of savings as well as investment will materialize, and the tax system will not reduce the steady state capital intensity of production. According to Sinn, these ambitious goals could be realized by introducing a flat uniform tax rate on all types of income from capital, by allowing immediate expensing of all business investment, and by adopting the source principle in international interest income taxation. More precisely, Sinn proposes that the total (corporate and personal) tax rate on business profits should be set equal to the personal tax rate on domestic interest income, and that interest earnings from abroad should not be taxed by the residence country, but only by the source country.

It is fairly easy to see that such a tax regime would effectively exempt capital income

from taxation at the margin: Suppose a firm undertakes an investment with a pre–tax rate of return ρ and suppose the uniform capital income tax rate is t. The government would then tax away a proportion t of the gross return, but because it allows immediate expensing of investment expenditure, it would in effect finance a similar share t of the investment outlay. Therefore the net–of–tax return to the firm would still be ρ. In the case of debt finance, the after–tax cost of finance would be r(1–t), with r denoting the interest rate, because interest payments would still be deductible. In the alternative case of equity finance, the opportunity cost of finance would also correspond to the after–tax interest rate which the owners of the firm could obtain on passive financial investment. Regardless of the mode of finance it would thus be profitable for the firm to go on investing until ρ=r(1–t), i.e. until the pre–tax rate of return equals the net return obtained by savers. While capital income taxation would thus raise no net revenue from the marginal investments, it would still serve to capture part of the profits from intramarginal projects. One could also say that the Sinn proposal elegantly eliminates the tax wedge between the marginal product of capital and the consumer rate of time preference without resorting to the rather radical measure of abolishing taxation and deductibility of interest.

The interesting international aspect of Sinn's scheme is the proposed transition to the source principle of interest income taxation. Under this regime capital mobility will tend to equalize the after–tax rates of interest across countries, and given immediate expensing and uniform capital taxation within each country, consumer rates of time preference and marginal products of capital would then be equalized at a common level throughout the world even in the presence of cross–country differences in capital income tax rates. In this situation there would be no potential Pareto gain from an international reallocation of savings or investment.

One problem with the Sinn proposal is that it relies on purely proportional capital income tax rates. If governments wish to retain a progressive tax schedule for labor income, they would in principle have to devise administrative procedures to split the total income of self–employed businessmen into the two types of income. In Denmark, which has tried to introduce proportional taxation of capital income combined with progressive taxation of labor income, the attempt to set up such a splitting system has met with many technical obstacles.

At the more basic level, one might note that a tax system like Sinn's involving a zero marginal effective tax rate on capital income is "optimal" only in the case of inelastic labor supply. If the (compensated) elasticity of labor supply is positive, it may be

preferable to accept some tax distortions in the capital market in order to avoid too much tax distortion of the labor market. However, according to the analysis in King (1980), it might well be optimal to subsidize rather than tax capital at the margin, given the prevailing empirical estimates of the relevant elasticities, so this objection to the Sinn proposal should probably not be given too much weight.

II.4.9. Efficient international taxation of labor income

Because labor is still much less mobile across borders than capital, the need for international coordination of taxes on labor income seems much less urgent, and the theoretical literature on this problem is in fact very scarce. However, the issue may become more relevant in the future, e.g. because of the current tendency towards greater internationalization of national systems of higher education. Moreover, for some workers living in border areas and for certain strategic groups such as business managers and academics the degree of international mobility can be quite high already today.

The requirements for efficient international taxation of labor income has recently been studied by Ulph (1987). He distinguishes between two types of internationally mobile labor: (a) "Frontier workers" who live on one side of the nearby border and may choose to work on the other side, and (b) "Other non–resident workers" who spend part of the year living and working in a foreign country, and the remaining time living and working in their home country.

Frontier workers are assumed by Ulph to have no specific preferences for working on the domestic side of the border. International efficiency in the cross–country allocation of this type of labor therefore simply requires that the value of the pre–tax marginal product of labor in the residence–country be equated to the pre–tax marginal value product of labor on the foreign side of the border, net of the extra transport costs of crossing the border. If wages reflect marginal productivities, Ulph finds that this efficiency condition will be met when there are no source–based payroll taxes, when transport costs are tax–deductible, and when the personal income tax system of the residence country allows unlimited credit for any personal income tax which may have been paid to the source–country.

The "other non–resident" workers in the Ulph framework are persons who temporarily live abroad to work there for some time, even though they have a preference for living

in their home country. Ulph's analysis implies that in practice it would be almost impossible to ensure complete international efficiency in the allocation of such labor. Thus, even a pure residence–based personal income tax with an unlimited foreign tax credit would not guarantee efficiency. Essentially, this is because there is no way in which the tax system can give exemption to the "physic costs" of working in a foreign country.

If efficiency is taken to mean that the decision to work in one country or another should be unaffected by tax considerations, the question arises whether the country entitled to tax the taxpayer's global income should be the country of residence (as is mostly the case) or the country of citizenship?[4] In answering this question, let us assume that the taxpayer has to live in the country where he works and where he consumes government services. Now, if in each country there is a fairly close relationship between the tax paid by the individual taxpayer and the government services he receives, taxpayers would have no great incentive to live and work in a low–tax rather than a high–tax country, if the income tax were based on the residence principle. By contrast, if the income tax were highly progressive, individuals with high incomes and low needs for public services would have an incentive to move to countries with low average tax levels, whereas low–income individuals with high needs for government services would have the opposite incentive, if the income tax were based on the residence principle. In this case tax–induced international migration of labor might be reduced if the country of tax allegiance were instead defined on the basis of citizenship, since people are usually less willing and able to change their citizenship than their residence.

II.5. The game–theoretic approach to tax coordination

II.5.1. General characteristics of the game–theoretic approach

The preceding sections have surveyed some of the main issues in the traditional normative theory of international tax coordination. As we have seen, this body of theory typically asks how the international tax system should be designed so as to be equitable and efficient from a global perspective. One problem with this approach is that there is in fact no supranational world government which can systematically pursue the "world interests" identified by the tax theorists. In reality tax reforms have to be carried out by more or less sovereign national governments, and each individual

government is unlikely to engage in coordinated reform efforts unless it perceives some national advantage from doing so.

As a response to this problem, and as a result of the general tendency to incorporate basic elements of game theory into the various branches of economic theory, a game–theoretic approach to the study of tax coordination has emerged in recent years. This approach investigates the nature of the world equilibrium which will materialize if countries do not coordinate their tax policies; it identifies the Pareto–inefficiencies which typically characterize such non–cooperative equilibria, and it is often able to describe a coordinated policy package which would improve the welfare of all the countries involved. In other words, the game–theoretic approach goes beyond the description of some idealized state of affairs in pointing out the mutual potential welfare gains involved in a transition from an uncoordinated to a coordinated international tax system. Thus, whereas the traditional approach to tax coordination has often emphasized the potential conflicts between national and "international" interests, the game–theoretic approach tends to focus on the potential Pareto–gains from certain specified coordinated policy changes. Moreover, the game–theoretic analysis will often be able to determine whether it will in fact be in the interest of all the countries involved to adopt a tax system satisfying certain criteria of "world equity" or "world efficiency".

The next section tries to illustrate the kind of insights offered by game–theoretic analyses by means of a highly simplified model of the world economy. Because the model is so simple, the policy recommendations following from the analysis are rather self–evident, but the formal exercise may nevertheless be useful in illustrating the basic methodology of the game–theoretic approach. In the subsequent section II.5.3 we shall then survey some of the more recent and advanced contributions within this paradigm.

II.5.2. A simple illustration of the strategic aspects of international taxation

Hamada (1966) was one of the first economists to apply basic concepts of game theory to the study of international taxation. The following illustration of the game–theoretic approach is heavily inspired by his 1966–paper. Like Hamada, we employ the framework introduced by Kemp (1962) in which the world economy consists of a capital–exporting country and a capital–importing country. The total stock of capital in each country is fixed, but capital flows across borders until the after–tax returns from investment at home and abroad are equalized. Other factors of production are

inelastically supplied and are therefore ignored. The notation of the model is as follows:

Y = national income of the capital–exporting country
Y* = national income of the capital–importing country
K = stock of capital owned by the capital–exporting country
K* = stock of capital owned by the capital–importing country
E = stock of international investment
T = combined foreign and domestic tax rate on international investment income
t = capital income tax rate in the capital–exporting country
t* = tax rate on income from foreign–owned capital in the capital–importing country
θ = deductible fraction of foreign taxes allowed by the capital–exporting country

With these definitions the total tax on foreign investment will be given by

(22) $$T = t^* + t(1-\theta t^*)$$

Notice that this specification can encompass all of the tax regimes which we have previously discussed. If the deductible fraction of foreign taxes θ is unity, we have a standard deduction system where $T=t^*+t(1-t^*)$. Alternatively, if $\theta=1/t$ we have $T=t$ as would be the case under a pure credit system. Finally, an exemption system would be characterized by $\theta=1/t^*$, ensuring $T=t^*$.

The national income of the capital–exporting country is equal to

(23) $$Y = f(K-E) + (1-t^*)g'(K^*+E)E$$

where f() and g() are the production functions in the capital–exporting and capital–importing countries, respectively, K–E and K*+E are the amounts of capital invested in the two countries, and the marginal product g'() is the pre–tax return to investment in the capital–importing country. Equation (23) says that national income equals national product plus foreign investment income net of the taxes paid to the foreign Treasury. By analogy, the national income of the capital–importing country is

(24) $$Y^* = g(K^*+E) - (1-t^*)g'(K^*+E)E$$

To close the model we impose the capital market equilibrium condition that capital exporters obtain the same after–tax return on investment at home and abroad:

$$f'(K-E)(1-t) = g'(K^*+E)(1-T) \tag{25}$$

Given the tax instruments t, θ, and t*, equations (22) through (25) determine the four endogenous variables T, Y, Y* and E. To keep matters as simple as possible, we shall assume that the tax rate t is exogenously fixed by purely domestic policy considerations, whereas the instruments θ and t* can be freely chosen to bring about the desired level of international investment. The effects of θ and t* on national income and international investment are found from (22) through (25) to be

$$\partial E/\partial\theta = -g'tt^*/[f''(1-t)+g''(1-T)] \tag{26}$$

$$\partial E/\partial t^* = g'(1-\theta t)/[f''(1-t)+g''(1-T)] \tag{27}$$

$$\partial Y/\partial\theta = (\partial E/\partial\theta)[(1-t^*)(g'+Eg'')-f'] \tag{28}$$

$$\partial Y/\partial t^* = (\partial E/\partial t^*)[(1-t^*)(g'+Eg'')-f'] - Eg' \tag{29}$$

$$\partial Y^*/\partial t^* = (\partial E/\partial t^*)[g'-(1-t^*)(g'+Eg'')] + Eg' \tag{30}$$

$$\partial Y^*/\partial\theta = (\partial E/\partial\theta)[g'-(1-t^*)(g'+Eg'')] \tag{31}$$

Not surprisingly, we see from (26) that an increase in the deductible fraction of foreign taxes will stimulate international investment, provided tax rates are positive, and given the standard assumption that the marginal productivity of capital is diminishing, so that f'' and g'' are negative. We also see from (27) that a rise in the capital–importing country's tax rate on foreign–owned capital discourages international investment, as long as the capital–exporting country does not allow full credit for this tax, i.e. as long as θ is less than 1/t.

Suppose now that the two countries both strive to maximize their national income and that each sets its own tax instrument to achieve this goal. Because the level of international investment (and hence Y and Y*) will generally depend on both θ and t*, the optimal tax policy of one country will depend on the policy chosen by the other country, and this strategic interdependence means that policy making can be viewed as a game between the two governments. If there is no international cooperation, the

capital–exporting country will choose the value of θ which will maximize Y, given the value of t* set independently by the capital–importing country. By analogy, the latter country will choose t* so as to maximize Y*, given the value of θ. For both countries to be in an optimum at the same time, the following first–order conditions must be satisfied simultaneously:

$$(32) \qquad \partial Y/\partial\theta = 0 \;\Leftrightarrow\; f' = (1-t^*)(g'+Eg'')$$

$$(33) \qquad \partial Y^*/\partial t^* = 0 \;\Leftrightarrow\; (\partial E/\partial t^*)[g'-(1-t^*)(g'+Eg'')] + Eg' = 0$$

When supplemented by (25) and (27), equations (32) and (33) describe a Nash equilibrium in which the policy choice of each government is optimal, given the choice made by the other government. The right–hand side of equation (32) measures the capital–exporting country's marginal social return to foreign investment, considering that part of the pre–tax return goes to the foreign Treasury, and that any additional export of capital depresses the rate of return obtainable on previous foreign investments. In a national optimum, the marginal social return to foreign investment must equal the marginal social return to domestic investment, which is simply the pre–tax marginal product of capital in the domestic economy (f').

Equation (33) is the national optimum condition for the capital–importing country. It says that the country should keep on raising its tax rate on foreign–owned capital until the resulting increase in tax revenue from the existing stock of foreign capital (Eg') is just matched by the loss of national income stemming from the partial repatriation of foreign capital following the tax increase.

Inserting (25), (27), and (32) into (33) and rearranging, one finds that

$$(34) \qquad 1-\theta t \;=\; (f'-g')^{-1}E(1-t)[f'' + (f'/g')g'']$$

Equation (34) implicitly defines the equilibrium value of the deductible fraction of foreign taxes allowed by the capital–exporting country (θ). From (32) we see that $f'<g'$ for all positive values of t* (and even some negative ones). It then follows from (34) that θ must be less than $1/t$ which in turn implies that the capital–exporting country will provide less than full credit for taxes paid abroad. In fact, if the equilibrium value of t* is between zero and 100%, it can be shown that the equilibrium value of θ will be less than unity, i.e. the capital–exporting country will choose to provide less

than full deduction for taxes paid abroad (see Sorensen (1990)).

As Bond and Samuelson (1989) have recently pointed out, no Nash equilibrium with a positive level of international investment can exist under a pure credit system. Formally, this may be seen by noting from (27) that $\partial E/\partial t^*=0$ for $\theta=1/t$, implying that the Nash equilibrium condition (33) cannot be met for $E>0$. With an unlimited credit mechanism, the capital–importing country will in principle wish to choose an infinitely high level of t^*, since it can thereby soak revenue from the foreign treasury without deterring foreign capital. Obviously this scenario is incompatible with an international equilibrium.

The non–cooperative Nash equilibrium described by (32) and (33) is inefficient in the usual sense that the welfare (income) of one country could be raised without reducing the welfare (income) of the other country. One way of seeing this is to substitute (32) into (29) to find

$$(35) \qquad \partial Y/\partial t^* = -Eg' < 0$$

and to insert (26) and (32) into (31) to get

$$(36) \qquad \partial Y^*/\partial\theta = (f'-g')g'tt^*/[f''(1-t)+g''(1-T)] > 0 \quad \text{for } t>0 \text{ and } t^*>0$$

To a first–order approximation, a marginal decrease in t^* will have no effect on the welfare of the capital–importing country in a Nash–equilibrium (since $\partial Y^*/\partial t^*=0$), but according to (35) it will raise the welfare of the capital–exporting country. Similarly, a small increase in θ will have no (first–order) effect on the national income of the capital–exporting country, but according to (36) it will raise the income of the capital–importing country, since we have already seen that $f'<g'$ for $t^*>0$. Our analysis thus indicates that both countries could improve their welfare if they struck a bargain according to which the capital–exporting country would raise the deductible proportion of taxes paid abroad while the capital–importing country would simultaneously reduce its tax on foreign–owned capital.

If cooperation between the two countries were perfect, they would jointly maximize a weighted average $W=\lambda Y+(1-\lambda)Y^*$ of their incomes $(0<\lambda<1)$, implying the first–order conditions

(37) $\lambda(\partial Y/\partial\theta) + (1-\lambda)(\partial Y^*/\partial\theta) = 0$

(38) $\lambda(\partial Y/\partial t^*) + (1-\lambda)(\partial Y^*/\partial t^*) = 0$

When λ is between zero and unity, it is easily seen that (37) and (38) can be satisfied only when a marginal change in a tax instrument has opposite effects on the welfare of the two countries. Fulfilment of (37) and (38) thus implies that tax policies have been coordinated in a Pareto–optimal way. The two equations also provide an alternative illustration of the inefficiency of the Nash–equilibrium, since in such an equilibrium we have $\partial Y/\partial\theta=0$ and $\partial Y^*/\partial t^*=0$ which is inconsistent with (37) and (38), given (35) and (36) and the assumption $0<\lambda<1$.

It is interesting to note that the cooperative solution to the tax policy game will not necessarily imply adoption of a pure credit system, which according to the conventional analysis in section II.4.4 would be necessary to achieve "world efficiency" in the presence of inelastic capital supply. To demonstrate this point, recall that under the credit system $\theta=1/t$. Inserting this along with (26) through (31) into (37) and (38), one finds that the cooperative equilibrium conditions take the form

(39) $(1-2\lambda)[g'-(1-t^*)(g'+Eg'')] = 0$

(40) $(1-2\lambda)g'E = 0$

Obviously (39) and (40) can be met only if $\lambda=0.5$. In other words, adoption of a pure credit system will be consistent with a cooperative equilibrium only if the two countries agree to put equal weights on their national incomes in the joint maximization of welfare. Because of its simple political appeal, both countries might in fact accept such a rule. However, since the choice of the parameter λ will determine the distribution of the gains from cooperation, it will generally depend on the relative bargaining strength of the two countries, which in turn is likely to depend on the relative income levels obtainable by each country in the non–cooperative equilibrium. There is therefore no reason to assume that λ will always be set at 0.5, thereby leading to adoption of the credit system. The game–theoretic approach thus reveals that the policy regime which would have been chosen by some hypothetical benevolent "world government" may not be attainable in practice, even under the strong assumption that national governments are willing and able to engage in perfect coordination of their policies.

II.5.3. Some recent contributions to the game–theoretic approach

As already noted, scholars have only recently started to apply game theoretic tools to the study of international tax coordination. However, during the 1980s a number of writers have used the concept of a Nash–equilibrium to describe the outcome of a process of tax competition between local governments within a nation state. Contributions to this strand of literature include Beck (1983), Bucovetsky (1986), Wilson (1986), Zodrow and Mieszkowski (1986), and Wildasin (1988), and much of it is nicely surveyed in Wildasin (1986). A typical assumption in these articles is that local governments have to finance at least part of their expenditure by a source–based tax on an interjurisdictionally mobile factor of production such as capital. In the absence of coordination, this usually leads to an inefficiently low supply of local public goods, since local governments are reluctant to raise their tax rates for fear of expelling capital to other jurisdictions.

Much of this literature on local government tax competition could surely illuminate the costs of non–coordination in an international context. In fact, the inefficiency result so often arrived at in these contributions may be more relevant in the international sphere, for as McLure (1986) has argued, local governments could escape the constraints imposed by tax competition by levying all of their taxes on immobile factors such as residential property or land. By contrast, most national governments would have to tax income from internationally mobile capital, because it is politically less acceptable to exclude capital income from the tax base at the national than at the local level.

The papers by Hamada (1985) and Sorensen (1989) can be seen as an attempt to transfer some of the insights obtained in the literature on local government tax competition to the international scene. Both papers set up a two–country model of a world economy with perfect capital mobility, where each country is described by the neoclassical overlapping generations growth model developed by Diamond (1965). In Hamada's model a government transfer to the old (retired) generation is assumed to be financed either by lump–sum taxes on the young (working) generation or by temporary government debt issues. In the case of tax finance Hamada shows that a Nash–equilibrium in which each government strives to maximize the welfare of its own consumers, given the fiscal policy pursued by the other government, will typically involve an inefficiently high level of government expenditure in both countries relative to a cooperative equilibrium. Apparently the reason is that public expenditure in each country implies a redistribution from savers (the young) to dissavers (the old) which

tends to drive up the world interest rate and reduce the capital intensity of production. For reasonable specifications of tastes and technology this can be shown to reduce consumer welfare in both countries, so the inefficiency stems from the fact that each government in the Nash equilibrium fails to account for the negative impact of its tax and expenditure policies on consumer welfare in the other country.

Hamada's conclusion contradicts most of the literature on local government tax competition in which taxation and government spending is typically inefficiently low. However, the paper by Sorensen (op.cit.) reveals that Hamada's result is rather sensitive to his assumption that taxes take the form of a non–distortionary lump sum levy on the young generation. Thus Sorensen shows that if marginal government expenditure is financed by a source–based capital income tax, the level of taxation and government spending in a Nash equilibrium will almost certainly be too low. Moreover, he demonstrates that if marginal government expenditure is financed by a source–based comprehensive income tax, then the Nash–equilibrium will in fact be efficient, if consumer preferences are homothetic (as assumed by Hamada) and the elasticity of substitution in production is unity (as would be the case under a Cobb–Douglas technology). The explanation for the latter result is that whereas the tax on capital income will tend to expel capital from the home country to the benefit of consumers abroad, the tax on wage income will reduce domestic savings, and the resulting reduction of the supply of capital in the home country will just match the fall in that country's demand for capital, given a homothetic utility function and a Cobb–Douglas production function. Hence the level of taxation and government spending will have no impact on the world capital market, so a fiscal policy maximizing national advantage in one country will not have any detrimental effect on the welfare of the other country.

As a final alternative, Sorensen shows that if marginal public expenditure is financed by a residence–based capital income tax, it is likely to be inefficiently high in an international Nash equilibrium, in accordance with Hamada's conclusion. Under such a tax regime, a reduction in the capital income tax rate in one country would tend to stimulate that country's savings, and part of the resulting increase in capital supply would be exported to the benefit of foreign consumers. Thus the main message of the Sorensen paper is that one cannot prescribe the direction in which cooperating governments should change their tax and spending policies, unless one has knowledge of the specific marginal source of finance of public expenditure. In addition, the Sorensen paper highlights the potential intergenerational conflicts involved in the formulation of optimal coordinated policies. For instance, he shows that while in the

long run consumers in both countries are likely to gain from a coordinated reduction of capital income taxes under the residence principle, the first generation in each country would unequivocally gain from a coordinated increase in capital income tax rates. The optimal coordinated policy package will thus depend on the relative weights placed on the welfare of present and future generations.

The game–theoretic literature referred to above has mainly focused on the determination of equilibrium rates of tax, whereas it has taken the tax regime – i.e. the type of tax to be used – to be exogenously given. However, some recent contributions also attempt to endogenize the choice of tax regime. Thus Mintz and Tulkens (1988) consider a two stage game in which two interdependent countries initially choose a (positive or negative) rate of credit for foreign taxes and subsequently set their corporate tax rates, given the credit rates already chosen. The set–up in which these policy choices are made is one in which each country has resident multinational corporations that invest at home and abroad, so there is cross–hauling of direct international investment. Governments pursue non–cooperative Nash strategies, i.e. they try to maximize the welfare of their own residents, given the policy of the other country. The main point of the analysis is to show that capital exporters can use their credit rates as a retaliatory weapon against capital importers. By choosing a lower rate of credit for foreign taxes a capital exporter can thus elicit a reduction of the foreign tax on its capital exports, because the foreign country would otherwise face an undesirably large reduction of its capital imports.[5] In this way the absence of full crediting could in fact improve efficiency in all the countries involved by calling forth a world–wide reduction in distortionary corporate income tax rates.

An alternative view of the credit system is offered in the contribution by Bond and Samuelson (1989). As we noted in the previous section, a Nash equilibrium with positive international investment does not exist under a pure credit system. According to the two authors, the fact that non–cooperative behavior can thus be expected to lead to a complete break–down of mutually beneficial trade in capital means that the credit system may be better suited to support an efficient cooperative equilibrium than other methods of double tax relief. This may be one reason why countries choose to adhere to the credit system even though such a system seems quite unattractive in a purely non–cooperative environment.

In section II.6.1 we found it to be a weakness of the traditional approach to the study of international tax coordination that it often fails to explain why sovereign

self–interested national governments should wish to adopt a coordinated policy package which allegedly improves "world welfare". Taking this line of criticism to its logical conclusion, a scholar inspired by the Public Choice paradigm might ask why national governments should necessarily wish to maximize the welfare of their citizens, as they are frequently assumed to do in the game–theoretic framework. If politicians and bureaucrats are self–interested, they may have other goals than the noble one of maximizing the utility of the "representative consumer". In response to such potential criticism, it is worth pointing out that the methodology of the game–theoretic approach can of course also be used for descriptive ("positive") purposes, even if policy makers pursue their own narrow interests. For instance, a "Leviathan–type" government might be expected to maximize tax revenue rather than national income or consumer welfare, but it would be straightforward to substitute the former criterion function for the latter ones in a game–theoretic model, as Bond and Samuelson (op.cit.,pp. 16–28) actually do in part of their paper. However, it must be admitted that the normative implications of such models become somewhat unclear, since it is not obvious that international policy coordination for the benefit of the self–interested policy makers involved should be considered desirable.

III. COORDINATION OF COMMODITY TAXES

III.1. Defining the issues

Having dealt with taxes on income, it is time now to turn to the problem of international coordination of taxes on commodities. These indirect taxes can take the form of a general tax on all goods and services such as a value–added tax, or they may be selective excise taxes such as those on alcohol, tobacco, gasoline etc.

Indirect taxes are said to be levied according to the origin principle when they are imposed by the country in which the production of the commodity takes place. By contrast, indirect taxation is said to follow the destination principle when the tax is collected by the country where consumption takes place. When the taxed commodity is not traded, this distinction is of course irrelevant. However, when goods and services are traded internationally, the two tax principles do have different implications, as we shall see below.

Today most commodity taxes in western countries follow the destination principle, but the origin principle has had some historical importance, and in much of the literature on commodity tax coordination the main issue is whether indirect taxation should be origin– or destination–based. As usual, the question can be addressed both from an equity and from an efficiency perspective. Because indirect taxes are by definition impersonal taxes which cannot be differentiated according to the specific circumstances of the consumer, they are obviously inferior to direct taxes as a means of ensuring equity among individual taxpayers. As a consequence, scholars have not found it worthwhile to try to derive guidelines for commodity tax coordination with the aim of promoting taxpayer equity. Yet, the problem of internation equity retains its relevance in the context of commodity taxes, since the choice between the origin and the residence principles determines the cross–country division of tax revenues. In the next section we shall briefly address the equity issues involved in international commodity taxation.

Intellectually, the more challenging issues arise in the discussion of the efficiency effects of alternative commodity tax regimes. The basic problem is how the commodity tax system should be designed so as to avoid distortions of the international pattern of production and trade? This question is dealt with in section III.3. Finally, section III.4 reviews some recent analyses of the welfare effects of international commodity tax competition and of cross–country harmonization of commodity tax rates; topics which are becoming increasingly relevant in the light of the plans of the EC countries to engage in such harmonization in the 1990s.

III.2. Equity issues in international commodity taxation

As we have already suggested, indirect taxes are not well suited to further the twin goals of horizontal and vertical taxpayer equity. Horizontal equity calls for identical tax rates on all commodities to ensure that two consumers with the same total consumption expenditure pay the same amount of tax on that expenditure even if their preferences and consumption patterns differ. On the other hand, considerations of vertical equity would seem to call for higher tax rates on those commodities which weigh more heavily in the budgets of high–income consumers.

As far as the taxation of internationally traded commodities is concerned, horizontal equity would likewise seem to require a tax system ensuring the same effective tax rate on imported and domestic products, to avoid discrimination between consumers with

differing preferences for imported and domestically produced goods. By contrast, if imports tend to be "luxury" (necessity) goods which are mostly consumed by the rich (poor), a desire for vertical equity would imply higher (lower) tax rates on imports than on domestic products. Thus the goals of horizontal and vertical equity appear to be incompatible in the context of indirect taxation.

However, it does make sense to ask whether inter–nation equity is better served under the origin principle or under the destination principle? In answering this question, we shall focus on selective commodity taxes which are reflected in relative consumer prices, since a uniform tax on all goods and services (including investment goods) will work like an income tax. It is useful to distinguish two polar cases: Suppose first that all commodity taxes serve to finance public services which reduce the costs of production in the country levying the taxes, and suppose further that taxes on each product are set to reflect as accurately as possible the value of the public services received by the producer. If the destination principle were applied, domestic commodity taxes would not be imposed on exports. The foreign consumers of the exported products would thus benefit from the lower commodity prices resulting from the cost–reducing public services provided by the exporting country, without contributing any tax revenue to that country. In short, the destination principle would imply a transfer of resources from exporting to importing countries, and this would violate the principle of internation equity. On the other hand, if the origin principle were adopted, exported products would be taxed by the exporting country, and in so far as the product tax reflects the value of the input of public services supplied by the government of that country, there would be no international resource transfer. Hence, as Richard Musgrave noted (1969, ch. 10), internation equity requires adherence to the origin principle when commodity taxes finance cost–reducing government service inputs to firms.

Consider next the alternative benchmark case in which all commodity taxes finance public services supplied directly to consumers. It is then clear that the destination principle is necessary for internation equity, for under the origin principle the revenue from commodity taxes on exports would involve a transfer, via the domestic government, from foreign consumers to domestic consumers.

In practice, it seems that only a minor part of government expenditure in western countries represents cost–reducing public services to business firms, whereas the greater part of expenditure reflects services provided to consumers. From an internation equity perspective it therefore appears that ordinary commodity taxes

should be levied according to the destination principle, and that public service inputs to the business sector should be financed by special user–charges which should not be refundable when the final products are exported.

III.3. Efficiency aspects of product tax coordination: The origin principle versus the destination principle

A long–standing issue in the literature has been whether indirect taxation should be origin–based or destination–based in order to avoid distortions of the international pattern of production and trade?

Without further reflection, one would perhaps think that an origin tax would tend to reduce the competitiveness of domestic producers and would therefore disturb the trade pattern, because it is levied on exports as well as domestic sales but does not apply to imports. Yet, under certain idealized conditions the origin principle will in fact be consistent with an efficient pattern of trade, provided the product tax is levied at the same uniform rate on all goods and services. This was pointed out long ago by Richard Musgrave (1969, pp. 274–75), and was later proved formally by Whalley (1979) within a simple international trade model. Whalley assumed perfect competition and fixed factor supplies within each country, implying the absence of factor movements across borders. In such a setting equilibrium requires balanced trade among countries. Suppose now that, starting from an initial situation with zero taxes and a Pareto–optimal allocation of resources, the government of country 1 introduces a general origin–based commodity tax at the rate of, say, 10% and redistributes the revenue as a lump sum transfer to the private sector. The original (optimal) volume of production and international trade could then be maintained if all producer and factor prices within country 1 fell by 10%, since in that case all relative prices (including the relative prices of domestic and foreign goods) would be the same, and since households would end up with the same disposable income, because their lower factor incomes would be compensated by the transfers from the government. Alternatively, if some kind of market imperfection prevented producer prices in country 1 from falling, the original trade equilibrium could still be maintained if the country devalued its currency by 10% and allowed the money supply to expand to accommodate the higher domestic consumer price level. Thus, with flexible prices and/or exchange rates and inelastic factor supplies, a general indirect tax based on the origin principle will not change the "real" equilibrium of the world economy and hence will be undistortionary. Even if prices are "sticky" in a downward direction, the trade effects of the origin tax can still

be neutralized by an appropriate exchange rate adjustment.

Unfortunately this conclusion ceases to hold if capital is internationally mobile so that countries have non–zero net foreign asset positions in equilibrium. To see this, note that long–run equilibrium in the presence of international lending and borrowing requires the current account to balance, since the country's net wealth would otherwise be changing over time. In other words, we have the equilibrium condition

$$P_x(1+t_x)X + reA = eP_m(1+t_m)M \tag{41}$$

where X is the volume of exports, P_x is the producer price of exports in domestic currency, t_x is the origin–based general commodity tax levied by the domestic country, e is the exchange rate (units of domestic currency per unit of foreign currency), P_m is the foreign–currency price of imports before tax, M is the volume of imports, t_m is the origin tax imposed by the foreign country, r is the world interest rate, and A is the domestic stock of net foreign assets measured in foreign currency. Thus (41) simply says that expenditure on imports must be matched by export earnings and net interest income from abroad. If, say, t_m is raised from an initial value of zero to some positive value, an offsetting adjustment of P_m by a factor $1/(1+t_m)$ would leave relative prices and trade volumes unaffected and hence would not disturb the equality in (41). However, if commodity prices were sticky, the adjustment would have to fall on the exchange rate, and it is immediately clear that a change in e by a factor $1/(1+t_m)$ would not preserve the current account balance in (41) if net foreign assets A were non–zero. As a consequence, the origin–based commodity tax would have to influence relative prices and trade volumes for current account balance to be restored.

Of course, if net interest payments from abroad were numerically small relative to trade flows, it is likely that the real effects of the origin tax could still be approximately neutralized by changes in exchange rates. However, in practice the changes in floating exchange rates tend to be dominated by transactions on the capital account of the balance of payments in the short and medium run. Therefore there could be significant trade effects of a change in the origin tax over an extended adjustment period.

Under realistic conditions of limited price flexibility and substantial international capital movements it would thus seem that a general indirect tax on all goods and services will be neutral only if it is levied in accordance with the destination principle, i.e. only if exports are tax–exempt and imports are taxed at the same rate as domestic products. Moreover, even if the destination principle were applied, a general commodity tax

would not leave the economy's real equlibrium and trade position unchanged if factor supplies are elastic. The reason is that a truly general commodity tax is equivalent to an income tax which may discourage savings and labor supply.

III.4. Efficiency under the restricted origin principle

One administrative advantage of the origin principle is that it does not require any border controls, because imports are not subject to domestic tax, and domestic taxes on exports do not have to be rebated. Following the pioneering work of Shibata (1967), several scholars have therefore considered the trade effects of a socalled "restricted origin principle", under which a group of countries form a tax union and apply the origin principle in intra–union trade with the purpose of abolishing frontier controls within the union, while maintaining the destination principle in their trade with countries outside the union.

As Berglas (1981) has demonstrated, the restricted origin principle will generally be neutral with respect to production and trade only if the countries adopting this tax regime apply the same commodity tax rates. To demonstrate this, Berglas considered a simple world economy consisting of three countries A, B, and C, which all produce three traded commodities 1, 2, and 3, having different net trade positions in each commodity. Before taxes are introduced, the three commodities sell at the common world prices p_1, p_2, and p_3 in all countries. Suppose now that A and B form a tax union and introduce general commodity taxes on a restricted origin basis, with A adopting a tax rate t_a and B applying the rate t_b. Suppose further that A is a net exporter of, say, commodity 2 to both B and C, and assume for simplicity that the tax union countries are too small to be able to affect consumer prices in the rest of the world. Producers of commodity 2 in country A will then still obtain a net price of p_2 on their exports to C, since the destination principle applies in trade with this non–union country, and since that principle implies that exports go untaxed. Because country A's producers are the marginal suppliers of commodity 2 in the other union country B, the consumer price in that country will have to rise to $p_2(1+t_a)$. Otherwise A's producers would prefer to sell commodity 2 in country C, rather than supplying it on an origin tax basis to B. The local producers of commodity 2 in country B will then obtain a net price of $p_2(1+t_a)/(1+t_b)$, because their sales will be subject to country B's tax rate t_b. It follows that relative producer prices will be unaffected only if $t_a=t_b$, since this is the only case in which producer prices in all countries would remain equal to p_2.

III.5. Selective commodity taxes

So far our discussion of the origin versus the destination principle has focused on a general uniform tax on all goods and services, but in practice almost all existing VAT systems are of the so–called consumption type, exempting investment goods from tax. As Sinn (1989) has pointed out, this means that the allocative effects of cross–country differences in origin–based VAT taxes cannot be neutralized by appropriate exchange rate adjustments. Moreover, even if policy–makers wanted to impose a truly general tax with no exemptions, it would in practice be very difficult, if not impossible, to subject all kinds of activities to tax. Thus any real world commodity tax is likely to be more or less selective, thereby affecting relative prices within the country imposing the tax.

Of course, such relative price effects will be even more pronounced in the case of excise taxes which are by their very nature selective. If a selective commodity tax is levied on an origin basis, the percentage change in the exchange rate or in the general price level needed to maintain overall trade balance will be less than the percentage rate of tax, and hence the international competitiveness of the taxed sector will deteriorate, whereas the competitiveness of the untaxed sectors will improve. Consequently the structure of foreign trade will be distorted. By contrast, under the destination principle domestic and foreign producers will be subject to the same tax rate, and the pattern of trade will be affected only in so far as the imposition of a selective commodity has general equilibrium effects on relative prices.

III.6. Administrative aspects of alternative commodity tax regimes

The discussion above clearly indicates that the destination principle is preferable to the origin principle from the point of view of economic efficiency. In one respect, however, the origin principle still seems superior: As already noted, the administration of the destination principle has so far required the maintenance of "fiscal frontiers", i.e. customs procedures at borders to ensure that imported goods are taxed and that goods for which tax exemption is claimed are in fact exported. In many respects the delays and extra paper work involved in adhering to these customs procedures work essentially like an increase in transport costs, reducing the volume of international trade and the efficiency gains from such trade. Yet, in recent years scholars like Cnossen (1983) and Cnossen and Shoup (1987) have pointed out that fiscal frontiers are not really

necessary to operate a destination–based commodity tax system. One alternative to fiscal frontiers is the socalled Deferred Payment Scheme applied in the Benelux countries. Under this system the imposition of import VAT in intra–firm trade is shifted from the border to the first taxable firm in the importing country, and eligibility for the export tax rebate is proven on the basis of documentary evidence (bills of lading etc.) from exporting firms. Another alternative is the clearing house mechanism proposed by Cnossen (1983) and included in the EC Commission's plans for commodity tax harmonization in the EEC. Under this scheme firms would charge their domestic rate of VAT on exports as well as domestic sales, and importers would deduct the foreign VAT on their imports from the VAT on their sales, so that consumer prices would be unaltered relative to the present destination system. The redistribution of VAT revenue across countries would be offset by a central Clearing House which would clear the difference between payments of import VAT and receipts of export VAT among countries (see, e.g. Lee, Pearson and Smith (1988) for further description and discussion). The administrative argument for the origin principle has thus been considerably weakened in recent years.

III.7. Commodity tax competition and commodity tax harmonization

The contributions reviewed above discuss the proper choice of the base for commodity taxation. Another strand of literature focuses on the choice of commodity tax rates in an open economy, given that a choice between the origin and the destination basis has been made.

Some of these studies confine themselves to an analysis of optimal commodity tax rates from a national perspective, without incorporating international coordination. For instance, Friedlander and Vandenthorpe (1968) analyse how an open economy with some ability to influence world markets can engage in "tax exporting" by imposing destination–based commodity taxes which reduce import prices of the taxed commodities. In a national optimum the marginal gain from improved terms of trade is just offset by the marginal deadweight loss from the tax[6].

From an international perspective such tax exporting is clearly a fiscal externality which needs to be corrected through international tax coordination. The scope for such coordination in a world of interdependent jurisdictions is analysed further in the sophisticated contributions by Mintz and Tulkens (1986), Rose (1987), and de

Crombrugghe and Tulkens (1987). These papers are game–theoretic in spirit. They start out studying a Nash equilibrium in which each jurisdiction optimizes its own commodity tax rates, taking the foreign tax rates as given, and they then proceed to analyse how each jurisdiction should change its tax rates to support a move to a Pareto improving cooperative equilibrium. The model of Mintz and Tulkens (op.cit.) describes a two–region economy where an origin–based commodity tax is levied by each region on a private good to finance a local public good and where consumers can purchase their private commodities either at home or in the other jurisdiction, if they are willing to incur some transportation costs. The level of taxation and public expenditure in a non–cooperative Nash equilibrium is generally inefficient, because the origin tax imposed by one jurisdiction imparts two sorts of fiscal externalities on the other jurisdiction: On the one hand, a rise in the tax rate imposed in jurisdiction 1 induces more purchases of private goods in jurisdiction 2, thereby enabling the latter region to expand its supply of public goods without increasing its tax rate. This is of course a positive externality. On the other hand, the increased demand for commodities produced in jurisdiction 2 drives up equilibrium prices and thereby reduces the welfare of consumers in that jurisdiction. Clearly this is a negative spillover of the higher tax rate in jurisdiction 1. Proceeding to the cooperative case, Mintz and Tulkens are able to show that Pareto improving tax changes are always tax increases for the region with net purchases of private goods from the other region but are ambiguous for the region with net sales out of its jurisdiction.

The contribution by Rose (1987) is inspired by the plans for commodity tax coordination in the EC. Thus he derives formulae for optimal non–coordinated and coordinated commodity tax structures in a model capturing some of the institutional features of the EC. One of his intuitively appealing results is that uncoordinated tax rates on food products will tend to be inefficiently high within the present institutional framework. The reason is that the EC's Common Agricultural Policy guarantees minimum food prices which are typically above the market–clearing level. If a country raises its tax rate on food products, the costs of absorbing the resulting increase in excess supply will fall on the CAP authorities – and hence mainly on the other EC countries – but in an uncoordinated equilibrium each individual country will neglect this fiscal externality.

The plans for EC tax harmonization has also led writers like Hatta (1986) and Keen (1987) to investigate the welfare effects of simply reducing the cross–country differentials in commodity tax rates. For this purpose Keen sets up a two–country general equilibrium model with destination–based commodity taxation and with a

single representative consumer in each country. Inspired by the EC proposals, he then assumes that the two countries adopt a harmonization program involving a uniform proportionate convergence of all commodity tax rates towards a common weighted average of the prevailing rates in each country. It turns out that such a tax reform generates a potential Pareto improvement, i.e. if accompanied by appropriate international transfers, it can improve the welfare of consumers in both countries. The intuition behind this result is that, because excess burden tends to increase more than proportionately with the tax rate, the welfare gain from the reduction of the relatively high tax rates outweighs the welfare loss from the increase in the relatively low tax rates. Thus Keen's analysis provides some welfare–theoretic rationale for the EC tax harmonization program. In the light of Keen's study, it is interesting to note that the EC plans for the Internal Market of 1992 also involve increased transfers to the poorer southern European countries. Since these countries would typically have to raise their tax rates to concord with the tax harmonization program, and since their consumers could therefore be expected to suffer a welfare loss, the EC transfer scheme could be interpreted as a means to ensure that the potential Pareto improvement generated by tax harmonization is transformed into an actual Pareto improvement.

IV. SUMMARY

The main conclusions of this lengthy review of issues in the theory of international tax coordination can be summarized as follows:

1. The distinction between the source principle and the residence principle is a basic one in international income taxation. Under the source principle income is taxed in the country where it is generated, whereas under the residence principle it is taxed in the country where the income recipient is resident.

2. Most countries levy income taxes according to the source principle as well as the residence principle. A problem of international double taxation therefore arises. Much of the theory of international tax coordination discusses how such double taxation can be alleviated so as to meet certain standards of equity and efficiency.

3. It is almost universally accepted that the source country has a prior right to tax income orirginating within its borders. The residence country can then choose among the following three methods of double taxation relief: (a) Under the tax credit system taxes paid abroad are credited against the domestic tax liability on foreign–source income. (b) Under the exemption system foreign–source income is simply exempt from domestic tax. (c) Finally, the home government can allow taxes paid abroad to be deducted from income taxable at home. This deduction system is rarely used in practice, however.

4. The problem of internation equity is the problem of ensuring a fair international division of the income generated by international economic transactions. A solution to this problem involves the delineation of territorial tax bases and the setting of appropriate source–country tax rates.

5. Delineating the source of the income of multinational corporations is particularly difficult. Traditionally, the division of total income among jurisdictions has been based on separate accounts for the various entities of the multinational group. Yet, an objective norm for the allocation of common overhead costs and the setting of appropriate "arm's length" prices on intra–group transactions is often missing. The multinational may therefore try to shift profits from high–tax to low–tax jurisdictions by means of socalled transfer–pricing.

6. As a response to the problems of transfer–pricing and overhead cost allocation, it has been suggested that the worldwide profits of multinational corporations should be divided among countries according to an apportionment formula. For instance, such a formula could allocate profits in proportion to the amount of capital and labor invested in the various jurisdictions. However, the use of apportionment in the presence of cross–country differences in tax rates would distort international resource allocation. To avoid distortions, effective tax rates would have to be equalized across countries.

7. Traditionally a "fair" source–country tax rate has been derived from the principle of non–discrimination according to which foreign–owned factors of production should be taxed at the same effective rate as domestically–owned factors. This principle is difficult to implement when countries have different degrees of corporate–personal tax integration. Therefore an alternative criterion of "effective reciprocity" has been suggested. By this criterion, the total effective tax rate on foreign–owned capital should be the same in all source countries.

8. In addition to the problem of internation equity there is a problem of taxpayer equity, i.e. a problem of ensuring a fair tax treatment of individual taxpayers. According to the internationalist view of taxpayer equity, two individuals with the same worldwide income should pay the same amount of tax. This calls for double taxation relief by means of the tax credit system. By contrast, the nationalistic view considers taxes paid abroad as a cost of doing business abroad. Under this view two persons with the same worldwide income net of foreign taxes should pay the same amount of domestic tax, and double taxation relief should thus be granted by means of the deduction system.

9. The international tax system may also be evaluated by an efficiency criterion. According to this criterion, a "good" international tax system is one which does not interfere with an efficient allocation of resources across national boundaries.

10. From the national viewpoint of a small open economy the system of capital income taxation is efficient when it guarantees equality between the domestic social opportunity cost of capital and the return on foreign investment after foreign taxes. In general the optimal overall tax rate on foreign investment income will lie somewhere in between the rates implied by the systems of exemption and deduction. In a large open economy, the nationally optimal overall tax rate on foreign investment will tend to be higher than the corresponding rate in the small economy.

11. From an international point of view, an efficient system of capital income taxation is achieved when the social opportunity cost of capital is the same in all countries. If capital supply is very elastic relative to capital demand, this condition will be approximately met when double taxation relief is granted by means of exemption. On the other hand, if capital demand is very elastic relative to capital supply, international efficiency requires double taxation relief by means of the credit system.

12. Traditionally capital supply has been assumed to be inelastic with respect to the net rate of return. In that case the tax credit system will ensure not only efficiency but also taxpayer equity from an international point of view. By contrast, from a national point of view one must adopt a deduction system to ensure both taxpaer equity and efficiency, when capital supply is inelastic and the economy is too small to affect the foreign rate of return.

13. Under a pure credit system the tax system provides no incentive to invest in one country rather than another, and "capital export neutrality" is said to prevail. A regime of capital export neutrality has traditionally been considered desirable, but to implement it, residence countries would have to grant unlimited foreign tax credits, which would involve serious incentive problems, and they would have to give up the practice of deferring domestic taxation of foreign profits until the time of repatriation, which would meet with several practical obstacles.

14. A partial harmonization of capital income tax rates across all countries in the world is likely to enhance efficiency from an international point of view. However, harmonization of tax rates within a subgroup of countries forming a tax union will not necessarily improve resource allocation from a global point of view.

15. Multinational corporations generally have more alternative financing opportunities than firms with only domestic operations. A foreign subsidiary of a multinational can finance its investment by issuing debt instruments in the local capital market, by retaining its profits, or by issuing shares to local minority shareholders. Alternatively, it can rely on finance from the parent company which in turn can raise funds by incurring new debt, by retaining profits, or by new share issues. This leaves at least nine different sources of finance for foreign direct investment.

16. The incentive effects of the international tax system on foreign direct investment can vary significantly, depending on the mode of finance used by subsidiaries of

multinational companies. The system of international double taxation relief for corporate equity income can be shown to be immaterial for the subsidiary's cost of capital when its investment is financed by loans from the parent. Further, a system of credit with deferral is equivalent to an exemption system when the subsidiary does not rely on finance from the parent company.

17. International coordination of taxes on labor income is less urgent than coordination of capital income taxes because labor is less mobile across borders than capital. For "frontier workers" with no special preferences for working on the domestic side of the border an efficient allocation of labor is achieved when there are no source–based payroll taxes, when transport costs are fully tax–deductible, and when the residence country allows unlimited credit for personal income taxes paid abroad. For other types of workers with a special preference for living and working in their home country it is very difficult to achieve efficiency, because the tax system cannot provide exemption for the "psychic costs" of working abroad.

18. In recent years a game–theoretic approach to the study of international tax coordination has emerged. This approach investigates the nature of the world equilibrium which will emerge in the absence of coordination; it identifies the Pareto–inefficiencies which typically characterize such non–cooperative equilibria, and it is often able to describe a coordinated policy package which would improve the welfare of all the countries involved.

19. Contributions within the game–theoretic paradigm suggest that countries will not generally wish to adopt a credit system of double taxation relief even in a fully cooperative equilibrium of a static policy game. However, in a dynamic setting of a repeated policy game countries may nevertheless wish to stick to a credit system because this system may be better suited to support cooperative behavior. Other contributions indicate that, in the absence of policy coordination, source–based capital income taxes will be set at an inefficiently low level, whereas residence–based capital income taxes will be inefficiently high.

21. The theory of international commodity tax coordination distinguishes between the origin principle and the destination principle. Under the origin principle commodities are taxed in the country of production. Under the destination principle they are taxed in the country of consumption. Most commodity taxes in the western countries follow the destination principle, but the origin principle has had some historical importance and is still advocated by some economists.

22. Commodity taxes cannot serve the goal of taxpayer equity, but they still raise a question of internation equity. If selective commodity taxes are used to finance cost–reducing government service inputs to business firms, internation equity calls for adherence to the origin principle. By contrast, if commodity taxes finance government services to resident consumers, the destination principle is required for internation equity. In practice, the latter case is the most relevant one.

23. Commodity taxes based on the destination principle have no direct distortionary effect on international trade since they are levied at identical rates on domestic and foreign products. Under the origin principle selective commodity taxes imposed at unequal rates in different countries will inevitably distort the trade pattern, but a uniform origin–based tax on all goods and services will be nondistortionary, if prices and/or exchange rates are flexible, and if there are no international factor movements. However, in the presence of substantial international capital flows and price rigidities, even a uniform origin–based commodity tax will not be trade neutral.

24. Under the restricted origin principle of commodity taxation a group of countries form a tax union and apply the origin principle in intra–union trade with the purpose of abolishing frontier controls within the union, while maintaining the destination principle in their trade with countries outside the union. The restricted origin principle will generally be neutral with respect to production and trade only if the countries adopting this tax regime apply the same commodity tax rates.

25. Traditionally the origin principle has been considered superior to the destination principle from an administrative point of view, because the origin principle does not require the maintenance of "fiscal frontiers" to undertake border tax adjustments. However, in recent years various methods of operating the destination principle without border controls have been suggested, so the administrative argument for the origin principle has been weakened.

26. A number of recent contributions analyze the potential gains from international commodity tax coordination in a game–theoretic setting. They typically find that the uncooperative (Nash) equilibrium equilibrium will be inefficient, because countries have some ability to export part of the burden of commodity taxation to the consumers of other countries.

27. Other recent studies have found that international harmonization of commodity tax

rates around a common weighted average of the prevailing rates in each country will generate a potential Pareto improvement for the countries involved. The reason is that, because excess burden tends to increase more than proportionately with the tax rate, the welfare gain from the reduction of the relatively high tax rates outweighs the welfare loss from the increase in the relatively low tax rates.

FOOTNOTES

1) A strong plea for socalled "unitary taxation" of multinational corporations based on apportionment is offered by Bird (1988). McLure (1984) proposes criteria for determining when a group of companies should be treated as a single "unitary" business, and P. Musgrave (1984) discusses the design of rational apportionment formulae.

2) Notice, however, that if debt were the marginal source of finance everywhere, and if all countries allowed (real) interest deductibility and true economic depreciation for tax purposes, we know from the theory of taxation that firms would invest up to the point where the marginal pre–tax rate of return equals the interest rate. If capital mobility and residence–based interest income taxation ensured equalization of pre–tax interest rates around the world, the gross marginal return to capital would then also be identical in all countries, despite cross–country differences in capital income tax rates. In the next section we shall elaborate on the importance of the mode of finance for the incentive effects of the tax system.

3) The conditions for full investment neutrality in an international setting are spelled out in detail by Alworth (1988, pp. 142–144).

4) The discussion in the remainder of this section is heavily inspired by R. Musgrave (1969, pp. 258–260).

5) Within a rather different framework, Feldstein and Hartman (1979, pp. 620–629) also found that a less favorable tax treatment of foreign investment by capital exporters will induce capital importers to lower their tax on foreign–owned capital. This result was derived from a model of a large capital–exporting country facing a number of small capital–importing countries which adjust their tax rates optimally to a change in the tax policy of the capital exporter.

6) The analysis is thus very similar to the conventional theory of "the optimal tariff". Friedlander and Vandenthorpe assume that, for political reasons, the domestic authorities cannot discriminate openly against foreign products by imposing tariffs and that they therefore have to resort to less transparent forms of discrimination through the tax system.

Appendix on

THE COST OF CAPITAL IN FOREIGN DIRECT INVESTMENT

I. Notation

This appendix derives the general formulae which were used to compute the required rates of return on foreign direct investment presented in table 3 of section II.4.6. We consider a multinational corporation consisting of a parent company, located in the "home country", which controls a subsidiary located in a foreign "host country". It is assumed that residence countries grant full credit for any withholding taxes which source countries might levy on interest income accruing to foreign investors. This is indeed the practice in most countries, and — given effective tax enforcement — it implies that investors in any given country are faced with the same effective tax rate on domestic and foreign interest receipts. Perfect capital mobility will then tend to equalize the pre–tax rates of interest across countries, and this is why the analysis below refers to a common "world" rate of interest.

For simplicity, we shall abstract from inflation, thereby avoiding the need to distinguish between nominal and real rates of return. In addition, we shall assume fixed exchange rates between the host country and the home country. The complications introduced by inflation and exchange rate changes are left for future research.

Our notation will be as follows:

a = rate of discount of subsidiary
D = present value of depreciation allowances for tax purposes
i = rate of interest before tax in world capital market
i' = rate of interest on loan from parent company to subsidiary
m_p = marginal personal income tax rate of shareholders in home country
m_s = marginal personal income tax rate of minority shareholders in host country
p = required rate of return before tax on the subsidiary's physical investment
t_p = corporate income tax rate in home country of parent company

t_s = corporate income tax rate in host country of subsidiary

z = effective personal tax rate on accrued capital gains to parent company shareholders

α = withholding tax rate on dividends from subsidiary to parent

δ = exponential rate of true economic depreciation

θ_p = opportunity cost of retentions in parent company in terms of dividends received by shareholders

θ_s = opportunity cost of retentions in subsidiary in terms of dividends received by minority shareholders in host country

II. The cost of capital

The required real rate of return on the subsidiary's physical investment is given by the general formula for the cost of capital derived by King and Fullerton (1984, pp. 14–18). In the absence of inflation this formula reads

$$p = (1-D)(1-t)^{-1}(a+\delta) - \delta \tag{A.1}$$

where t is the relevant corporate tax rate. As we shall see, this corporate tax rate will be either t_s or t_p, depending on the method of international double taxation relief. If depreciation allowances for tax purposes coincide with true economic depreciation, and if there are no special investment grants and the like, the present value of depreciation allowances will be equal to

$$D = \int_0^\infty t\delta e^{-(\delta+a)v} dv = t\delta/(\delta+a) \tag{A.2}$$

and insertion of (A.2) into (A.1) then yields

$$p = a/(1-t) \tag{A.3}$$

To derive the required rate of return p, we thus have to specify the subsidiary's discount rate a, sometimes also referred to as the "cost of finance".

III. The cost of finance

The relevant discount rate for the subsidiary is the one which will guarantee the shareholders of the parent company an after–tax rate of return on the subsidiary's investment which is at least as high as the net rate of return they might have obtained on passive financial investment.

In section II.4.6 of the main text we saw that there are at least nine different ways in which the subsidiary's investment may be financed. Since the tax consequences of the different modes of finance are generally different, the subsidiary's discount rate will also differ across modes of finance. In addition, the cost of finance may vary with the method of international double taxation relief applied. As we have already mentioned, we assume that the home country always grants full credit for any possible withholding taxes on interest payments from the subidiary to the parent, since this is normal practice in most countries. We shall also assume that the authorities of the subsidiary's host country do not grant any credit or other form of alleviation of the double taxation of dividends to foreign shareholders. Such discrimination against foreign investors is likewise a common practice.

As far as equity income stemming from the subsidiary's investment activity is concerned, we shall distinguish among the systems of exemption, credit with deferral, and credit without deferral.

III.a. The exemption system

Consider first the case where the home country exempts all equity income earned by the parent on investments made by the subsidiary. The corporate tax rate to be inserted in the cost–of–capital formula (A.3) will then be the host country tax rate t_s, and the subsidiary's discount rate will be given by the following arbitrage conditions (to be explained below) under the nine alternative modes of investment finance:

Borrowing in the host country:

(A.4) $$a = i(1-t_s)$$

Retention by subsidiary:

(A.5) $$a(1-z) = i(1-m_p)$$

Share issues to minority shareholders in host country:

(A.6) $a\theta_s(1-m_s) = i(1-m_s)$

Borrowing by parent and lending to subsidiary:

(A.7) $a = i'(1-t_s), \qquad i'(1-t_p) = i(1-t_p)$

Retention by parent and lending to subsidiary:

(A.8) $a = i'(1-t_s), \qquad i'(1-t_p)(1-z) = i(1-m_p)$

Share issues by parent and lending to subsidiary:

(A.9) $a = i'(1-t_s), \qquad i'(1-t_p)\theta_p(1-m_p) = i(1-m_p)$

Borrowing by parent and purchase of shares from subsidiary:

(A.10) $a(1-\alpha) = i(1-t_p)$

Retention by parent and purchase of shares from subsidiary:

(A.11) $a(1-\alpha)(1-z) = i(1-m_p)$

Share issues by parent and purchase of shares from subsidiary:

(A.12) $a(1-\alpha)\theta_p(1-m_p) = i(1-m_p)$

Equations (A.4) through (A.6) represent the cases where the subsidiary raises its funds in the host country without relying on the parent for supply of finance. If the subsidiary borrows in the local capital market, it will score a net profit (which will accrue to the shareholders of the parent company in one way or another) as long as the rate of return on its investment after payment of local corporate income tax exceeds the after–tax cost of borrowing. The relevant discount rate is therefore equal to the after–tax interest rate, as stated in (A.4).

If the subsidiary finances its investment by retaining its own profits, the return to parent company shareholders will accrue in the form of capital gains on their shares, which will be taxed at the effective rate z. The shareholders' net return on the subsidiary's marginal investment will thus be equal to $a(1-z)$[1]. For the investment to be profitable, this net return must be at least as high as the after–tax rate of interest $i(1-m_p)$ which the parent company shareholders might have earned on passive financial investment. This explains the arbitrage condition (A.5).

Alternatively, the subsidiary may obtain finance by issuing new shares to minority shareholders in the host country. These shareholders will then earn an after–tax dividend of $a\theta_s(1-m_s)$ on the marginal investment, since they receive an amount of dividend θ_s before personal tax for every dollar of profits distributed by the subsidiary (under a classical corporate tax system θ_s is simply unity, but if there is partial or full alleviation of the double taxation of dividends, θ_s will exceed unity). Again, this net return on shares must at least be able to match the net interest rate on bonds, as indicated in (A.6).

The arbitrage conditions (A.7) through (A.9) apply when the subsidiary raises its funds by borrowing from the parent company. The parent may in turn obtain funding by borrowing, by retaining its own profits, or by issuing new shares. The interest rate on the intra–company loan is assumed to be set such that the shareholders in the parent corporation will earn a net return at least as high as their opportunity cost of investment $i(1-m_p)$, when the subsidiary's after–tax profits are just sufficient to cover its interest payments to the parent, i.e. when $a=i'(1-t_s)$.

If the parent borrows, the corporate tax rate t_p against which it will be able to deduct its interest expense will of course equal the rate at which its interest earnings from the subsidiary will be taxed. The parent will therefore be willing to extend credit to the subsidiary at the going market rate of interest, and it will allow the subsidiary to invest as long as the return on such investment after payment of local corporate tax exceeds the interest rate after local corporate tax. These profitability conditions are stated in (A.7).

The loan to the subsidiary may also be financed by the retained profits of the parent company. The home country stock market will then capitalize the parent's expected future after–tax interest income $i'(1-t_p)$ from the subsidiary, and this capital gain will be taxed at the effective rate z, leaving a net return of $i'(1-t_p)(1-z)$ to parent company shareholders. This reasoning explains the arbitrage conditions in (A.8).

Finally, the credit extended to the subsidiary may be funded by the revenue from new share issues by the parent corporation. The net–of–corporate–tax interest receipts from the subsidiary will then be paid out as dividends to home–country shareholders who will be left with net dividends of $i'(1-t_p)\theta_p(1-m_p)$ after payment of corporate as well as personal taxes. When this net return is equated to the shareholders' opportunity cost of investment, we get the arbitrage condition (A.9).

The remaining equations (A.10) through (A.12) represent the case where the subsidiary finances investment by issuing new shares to the parent corporation which may once again finance these share purchases in three different ways. When the subsidiary applies the discount rate a, and the host country levies a dividend withholding tax at rate α, the parent's after–tax dividend income stemming from the subsidiary's marginal investment will be $a(1-\alpha)$, since the home country does not levy any corporate tax on foreign–source dividend income under the exemption system. If the parent finances its share purchases by debt, the after–tax dividend from the subsidiary must be at least as high as the parent's after–tax cost of borrowing $i(1-t_p)$ for the subsidiary's investment to be profitable. This condition is stated in (A.10). When the parent finances the share purchase by retentions, its outstanding shares will appreciate, and the resulting capital gain will be subject to personal tax, leaving a net return of $a(1-\alpha)(1-z)$ to parent company shareholders. Alternatively, the parent may raise funds by issuing new shares in the home country. The net dividends that can be paid on these shares on the basis of the subsidiary's investment will be $a(1-\alpha)\theta_p(1-m_p)$ after payment of personal income tax. In both cases the shareholders' net return must of course be at least as high as their opportunity cost of investment $i(1-m_p)$, as (A.11) and (A.12) make clear.

III.b. Credit with deferral

We now assume that relief of international double taxation of equity income from foreign direct investment is granted by means of the system of credit with deferral. In other words, we assume that equity income from foreign subsidiaries is taxed by the parent's home country only when it is repatriated in the form of dividends, while interest income is still taxed according to the residence principle. Such a system implies the same tax treatment of foreign investment as the exemption system, when the subsidiary does not rely on finance from the parent company, or when finance is supplied in the form of an intra–company loan from the parent. The arbitrage conditions (A.4) through (A.9) will thus continue to apply under the system of credit with deferral, and the corporate tax rate to be inserted in the cost–of–capital formula (A.3) will still be t_s.

The difference between the systems of exemption and credit with deferral arises when the parent purchases shares from the subsidiary. The parent's return will then take the

form of dividends from the subsidiary which will be taxed at the home country corporate tax rate. More precisely, the home country tax authorities will "gross up" the dividend payment a by the amount of corporate tax paid to the host country. The resulting amount $a/(1-t_s)$ will then be taxed at the home country corporate tax rate t_p, and the foreign corporate tax plus any dividend withholding tax paid abroad will subsequently be deducted to arrive at the net tax liability payable to the domestic Treasury. This procedure will ensure that the subsidiary's gross dividend payment of a will leave the parent company with a net dividend income of $a(1-t_p)/(1-t_s)$. Depending on the parent's mode of financing the share purchase, the discount rate a to be applied by the subsidiary will therefore be given by the following arbitrage conditions:

Borrowing by parent and purchase of shares from subsidiary:

(A.13) $$a(1-t_p)/(1-t_s) = i(1-t_p)$$

Retention by parent and purchase of shares from subsidiary:

(A.14) $$a(1-t_p)(1-z)/(1-t_s) = i(1-m_p)$$

Share issues by parent and purchase of shares from subsidiary:

(A.15) $$a(1-t_p)\theta_p(1-m_p)/(1-t_s) = i(1-m_p)$$

Fulfilment of (A.13) ensures that the net dividend received by the parent can cover the net interest payment on its debt, while fulfilment of (A.14) and (A.15) guarantee that parent company shareholders obtain a net return on the parent's foreign investment equal to the net return on passive financial investment.

As we have mentioned in the main text, residence countries in practice do not grant credits in excess of the amount of domestic tax on the pre–tax foreign–source income. If the sum of the foreign corporate tax and the dividend withholding tax exceeds the amount of domestic tax on the gross foreign income, the effective tax rate on this income will then be given by the sum of the foreign tax rates, and the relevant arbitrage conditions will become equal to the conditions (A.10) through (A.12) applying under the exemption system. In short, there will be no difference whatsoever between the systems of exemption and credit with deferral, when the limitation on the foreign tax credit is effective.

III.c. Credit without deferral

Under a pure credit system without deferral the subsidiary and the parent are in effect subject to joint taxation according to the home country tax rules. Foreign tax rules have no effect on investment incentives, since they can be fully and immediately credited against the home country tax liability, whether the foreign–source income is repatriated or retained abroad. Host country tax rules only serve to determine the inter–nation division of tax revenue without affecting foreign investment.
Since the effective tax rate is always determined by home country tax rules, the cost of capital (A.3) will now be $p=a/(1-t_p)$ and, except in the case where the subsidiary raises its funds from minority shareholders in the host country, only home country tax rates will appear in the arbitrage conditions determining the subsidiary's discount rate. Applying the same type of reasoning as before, we find these arbitrage conditions to be:

Borrowing in the host country:

(A.16) $a = i(1-t_p)$

Retention by subsidiary:

(A.17) $a(1-z) = i(1-m_p)$

Share issues to minority shareholders in host country:

(A.18) $a\theta_s(1-m_s) = i(1-m_s)$

Borrowing by parent and lending to subsidiary:

(A.19) $a = i'(1-t_p), \qquad i'(1-t_p) = i(1-t_p)$

Retention by parent and lending to subsidiary:

(A.20) $a = i'(1-t_p), \qquad i'(1-t_p)(1-z) = i(1-m_p)$

Share issues by parent and lending to subsidiary:

(A.21) $a = i'(1-t_p), \qquad i'(1-t_p)\theta_p(1-m_p) = i(1-m_p)$

Borrowing by parent and purchase of shares from subsidiary:

(A.22) $a = i(1-t_p)$

Retention by parent and purchase of shares from subsidiary:

(A.23) $a(1-z) = i(1-m_p)$

Share issues by parent and purchase of shares from subsidiary:

(A.24) $a\theta_p(1-m_p) = i(1-m_p)$

While a comparison of (A.13) through (A.15) with (A.22) through (A.24) might suggest that the two credit systems have different tax implications when the subsidiary issues shares to the parent, this is in fact not so. Under the system of credit with deferral we specified the cost of capital as $p=a/(1-t_s)$, whereas the cost of capital is $p=a/(1-t_p)$ under the system of credit without deferral where the parent and the subsidiary are effectively jointly taxed according to home country tax rules. When these differences in the cost–of–capital formula are allowed for, the reader may easily check that the required rates of return are exactly the same under the two credit systems in the case of share issues from subsididiary to parent. This is of course as it should be, since the deferral provision will not be operative when the subsidiary's profits are repatriated as dividends.

IV. Restrictions on interest rates on intra–company loans

In the cases where the subsidiary's investment is financed by loans from the parent, we assumed above that the parent can freely set the interest rate on such loans. From (A.7) and (A.19) we see that the interest on the intra–company loan will in fact equal the market rate of interest when the parent raises its funds by borrowing in the international capital market. However, a closer inspection of (A.8), (A.9), (A.20) and (A.21) reveals that – because of asymmetric tax rules – the intra–company interest rate will generally deviate from the market rate when the parent finances the loan by retaining profits or by issuing new shares. Indeed, the economic double taxation of corporate equity income, i.e. the combination of the corporate income tax and the personal tax on dividends and capital gains, implies that the interest rate on intra–company loans will normally have to exceed the market interest rate if shareholders are to receive a net return equal to the net return obtainable on passive financial investment.

If the deviation from the market rate of interest becomes "too" large, the tax code in many countries enables the authorities to intervene and dictate that the parent charge an "ordinary" rate of interest on the loan to the subsidiary. This is a consequence of the general principle that the tax code usually prescribes the application of "arm's

length" prices in the intra–company transactions of multinationals (see Saunders (1989) for a description of the measures taken by a number of western countries against transfer–pricing in multinational corporations). When applying the formulae above, one should therefore be careful to check how much the interest rate on intra–company loans deviates from the assumed rate of interest in the open market. If the deviation is substantial, it is likely to be declared illegal.

In such cases one must use a different set of arbitrage conditions involving the charge of a market interest rate on the credit extended from the parent to the subsidiary. For example, consider the exemption system and suppose that the use of formula (A.9) would imply an excessively high intra–company interest rate i'. Instead the parent must then charge the market interest rate i, but this means that the subsidiary will have to apply a discount rate in excess of $i(1-t_s)$ to ensure that the parent company shareholders earn a net rate of return equal to their opportunity cost of investment. Suppose that the subsidiary applies the discount rate

$$a = i(1-t_s) + \hat{a} \tag{A.25}$$

where â is some positive number. Suppose further that the "excess" return (â) over the rate of interest is repatriated in the form of a dividend from the subsidiary to the parent. When the parent company raises its funds by issuing new shares, the shareholders will then "break even" when the arbitrage condition

$$[i(1-t_p) + \hat{a}(1-\alpha)]\theta_p(1-m_p) = i(1-m_p) \tag{A.26}$$

is met. The term in the square bracket on the l.h.s. is of course the net interest and dividend receipts of the parent corporation after payment of domestic corporate tax on the interest income and after payment of foreign withholding tax on the dividend. Equation (A.26) determines the required "excess return" â, and when this magnitude is known, the discount rate to be applied by the subsidiary may be found from (A.25).

Applying similar reasoning, one may derive the required excess return when the parent finances the loan to the subsidiary by retentions. Under the exemption system, the shareholders' arbitrage condition will then be

$$[i(1-t_p) + \hat{a}(1-\alpha)](1-z) = i(1-m_p) \tag{A.27}$$

when the return on the subsidiary's investment is repatriated partly as interest and

partly as dividends. The subsidiary's discount rate may now be found by combining (A.27) and (A.25).

The discount rates to be used under the system of credit with deferral in the presence of restrictions on intra–company interest rates can be derived along similar lines. When the return in excess of the market interest rate is repatriated as dividends, and when the parent issues new shares to finance the loan to the subsidiary, the arbitrage condition to be applied along with (A.25) becomes

$$[i + \hat{a}(1-t_s)^{-1}](1-t_p)\theta_p(1-m_p) = i(1-m_p) \tag{A.28}$$

where the left–hand side is the after–tax dividend received by parent company shareholders on the basis of the subsidiary's marginal investment. If instead the parent finances the loan by retaining its profits, the arbitrage condition changes to

$$[i + \hat{a}(1-t_s)^{-1}](1-t_p)(1-z) = i(1-m_p) \tag{A.29}$$

Finally, the system of credit without deferral – where the subsidiary and the parent are subject to joint taxation at the rate t_p – implies that the cost of capital and the discount rate are given by

$$p = a/(1-t_p), \qquad a = i(1-t_p) + \hat{a} \tag{A.30}$$

where the "excess" rate of return is determined either by

$$[i(1-t_p) + \hat{a}]\theta_p(1-m_p) = i(1-m_p) \tag{A.31}$$

which applies when the mode of finance used by the parent is new share issues, or by

$$[i(1-t_p) + \hat{a}](1-z) = i(1-m_p) \tag{A.32}$$

which is valid when the parent finances the loan by retained profits.

NOTE

1. According to the socalled "capitalization hypothesis", the economic double taxation

of dividends implies that the expected increase in future earnings following from an increase in retained profits will not be fully capitalized in the market value of outstanding shares. Thus, if one dollar of retained earnings leads to an expected increase in dividends of 1+a one year from now, share values may appreciate by only (1–k)(1+a), where $0<k<1$. However, since the double taxation of dividends has also reduced the purchase price of shares by the factor k, it will not affect the shareholder's percentage capital gain, i.e. it will leave the percentage rate of return on investment financed by retained earnings unaffected.

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