

Capital Income Taxation and Resource Allocation

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Chapter 7: Taxation and International Capital Movements

Chapter 7

TAXATION AND INTERNATIONAL CAPITAL MOVEMENTS

International distortions in the structure of capital are just as important as *intersectoral* distortions. The international taxation problem is very similar to, but not identical with, the intersectoral problem. Questions regarding the principles by which border-crossing factor income flows are, or should be, taxed and others relating to the role of multinational corporations come up in this connection.

Today, international capital markets are more highly integrated than ever. Clever speculators and arbitragers exploit even the smallest interest margins, and the possibility of international tax differentials inducing huge capital movements, which significantly disturb the world economy and bring about lasting welfare repercussions, has to be reckoned with. Clearly, under such circumstances national taxation policy is no longer autonomous. No country can afford a tax policy that risks driving its capital abroad.

The problem has been clearly perceived in the political sphere, following the disturbances in the world capital market that were caused by the American tax reform of 1981, and governments of other countries have thought hard about introducing changes in their tax systems as countervailing measures. The West German Council of Economic Advisors even predicted a "competition of tax systems".¹ Theoretical studies of the problem, however, are rare. It is true that the role of taxation in directing international capital flows is occasionally addressed in the context of the pure theory of international trade. However, when this is done, the analysis does not look for a proper microfoundation for the influence of taxation, it concentrates instead on the distortions that arise if some particular in-

¹ See SVR (1985, p. 138).

fluence of taxation on the marginal condition of the firm's investment choice is postulated.

In particular, the literature disregards the diversity of capital movements; that is the fact that the foreign funds invested by a firm can come through various distinct channels connecting the national capital markets. At least three of these channels should be distinguished: (1) credit contracts with or without an exchange of tradable securities, (2) direct investment through injection of funds into foreign affiliates of domestic firms, and (3) direct investment through profit retentions within these affiliates. It will be shown that the tax systems affect these three channels in very different ways and that the view that they can be conflated into just one is highly misleading. As far as is known, no theory on the influence of taxation on international capital movements has so far been developed in which all three of the channels are simultaneously considered.

A further aspect that has received little attention in the literature is the role of tax bases in comparison to tax rates. The traditional view is that what matters for the distortion of international capital markets are the overall tax burdens imposed on the national industries, and "effective tax rates" are calculated to predict the direction and strength of capital movements. This view will not be confirmed. Instead it will be argued that, on theoretical grounds, changes in tax *bases*, effected through changing depreciation allowances, have much stronger effects on international capital movements than changes in tax *rates*. Under a number of circumstances the latter are neutral and it is even possible that they induce capital movements that are the opposite of what is commonly believed.

The discussion starts in Section 7.1 with an overview of the complicated institutional aspects of the taxation of international capital income flows. Section 7.2 begins the theoretical analysis by confronting two extreme opposing views on the international distortions brought about by capital income taxation. Section 7.3 tries to develop a detailed and perhaps more realistic picture of the way the various components of capital income taxation affect international capital movements. Finally, in Section 7.4, an attempt is made to use the theoretical results derived for examining the relationship between the Accelerated Cost Recovery System and the debt crisis that shook the world economy so strongly at the beginning of the eighties.

Formally, the considerations of this chapter will draw on the analysis of the Harberger problem where it is useful to do so. In particular, the separation of the basic model into different sectors between which capital, but not labor, movements are possible will be maintained.

7.1. International Taxation Principles

7.1.1. *The Taxation of International Interest Income Flows: Residence versus Source*

Because international capital flows freely between OECD countries and because standards of communication techniques are high, bond interest rates are closely connected internationally. In the absence of taxation there are strong forces that induce a uniform world interest rate. A fundamental prerequisite of the following analysis is to find out about how these forces link the national interest rates if interest income is taxed.

Two basic principles of taxing border-crossing interest income flows must be distinguished: the *source principle* and the *residence principle*.² As revealed by their names, the two principles differ with regard to the location of the tax authority. The former implies taxation in the country where the interest income is earned and the latter implies taxation in the country where it is received. The place of taxation is, however, less important than the fact that, with the residence principle, foreign interest income is included in the personal income tax base while the application of the source principle implies a tax on foreign interest income that is unrelated to the personal characteristics of the recipient. These differences have important implications for the international structure of interest rates.

Consider first the residence principle. Let θ_p^X and θ_p^Y be the interest income tax factors for an investor of Country X and an investor of Country Y, and r^X and r^Y the respective market rates of interest. Then an investor of Country X is indifferent between an investment at home and abroad if

$$\theta_p^X r^X = \theta_p^Y r^Y, \quad (7.1)$$

²These principles should not be confused with the *origin* and *destination* principles that refer to the taxation of border-crossing commodity flows. With regard to the value-added tax ($\tau_v \geq 0$) it will be assumed here, in line with reality, that the destination principle applies. This principle ensures that the ratio of the investment good price and the net-of-tax consumption good price is the same for all countries and that hence the value-added taxes are uniform taxes on the consumption of domestic residents. In the present model, only the destination principle is compatible with all countries simultaneously producing for both consumption and investment even in the case where the national value-added tax rates are different. In more complicated multi-good models, the destination principle has the virtue of being neutral with regard to the marginal conditions for efficient production and commodity trade. However, it is incompatible with the Pareto condition that the marginal rate of substitution between consumption goods and leisure be the same in all countries. See Sinn (1985a, pp. 166–169).

and an investor of Country Y is indifferent if

$$\theta_p^Y r^X = \theta_p^Y r^Y. \quad (7.2)$$

Thus, in a market equilibrium, the two market rates of interest will be equal if the residence principle is in operation:

$$r^X = r^Y. \quad (7.3)$$

The residence principle transforms the situation within a country to the international level. For the same reason that different personal income tax rates within a country do not imply different market rates of interest, interest differentials cannot persist in an international context provided there is perfect mobility of capital.³ If, however, the source principle is applied – that is, if the interest income tax which a household has to pay is determined according to the conditions of the country where the interest income originates – then there is a different situation. The condition for indifference of the investors of Countries X and Y , and hence the condition for an international capital market equilibrium, is now

$$\theta_p^X r^X = \theta_p^Y r^Y. \quad (7.4)$$

Thus, in general, taxation at source excludes an equality of the market rates of interest in the different countries. Instead, the net-of-tax market rates of interest are equalized.

In practice, interest income taxation at source is no longer important. Such taxation will only occur if there is no double taxation agreement between two countries and the interest income is not declared to the tax authority of the residence country. For, if there is no double taxation agreement, then a withholding tax applies in many cases, and the after-tax interest income is subject to personal income taxation by law, and sometimes only by law, in the residence country. However, if there is a double taxation agreement, and this is the rule between OECD countries, then, in effect, the residence principle is applied. It is true that according to the OECD Model Double Taxation Convention⁴ of 1977 the source country

³ Deviations between the interest rates are possible despite the operation of the residence principle if there are non-stationary expectations about the exchange rate. As the present model framework abstracts from inflationary and structural price changes, and since, moreover, internationally perfectly functioning markets with perfect mobility of commodity and capital flows are assumed, no exchange rate movements are possible in the long run. For this reason it is assumed that the expected future exchange rates are also constant. For an analysis of international capital movements in the context of inflation and historical cost accounting see Sinn (1987).

⁴ See OECD (1977, Article 11 and 23 A2). Cf. also the comment on p. 155 (§47).

has the right to impose a withholding tax of up to 10%. However, as a deduction of this tax from income tax in the residence country is allowed and as typically the personal marginal income tax rate is above 10%, this is meaningless for the properties of the international capital market equilibrium. Moreover, many double taxation agreements waive the withholding tax completely.⁵

A priori, it is very difficult to evaluate the rival principles from a welfare theoretic point of view. Because it equalizes the post-tax market rates of interest, taxation at source has the advantage of implying equality of the marginal rates of time preference of households at home and abroad and hence of satisfying an important condition for an intertemporal optimum in the exchange of credit contracts between households. The residence principle does not share this advantage, but perhaps it is more easily compatible with the conditions of an efficient international structure of capital. The circumstances under which this virtue can be expected are not obvious though, for, although the residence principle ensures that the market rates of interest are equal in the different countries, it does not by itself imply that the marginal products of capital are the same. Whether the residence principle equalizes the marginal products of capital will be extensively discussed in this chapter. Whether and under what circumstances the source principle is compatible with an efficient international structure of capital will be discussed in the context of the analysis of reform proposals in Chapter 11.4.7.

7.1.2. *International Aspects of Taxation of Capital and Profits*

After analyzing taxation of interest income the discussion now turns to the international aspects of taxing the capital stock and company profits. The latter is a particularly complex theme. Different taxation rules apply depending on whether there are retained profits, on whether dividends are distributed directly to shareholder households or indirectly via other firms, and on the percentage of the voting shares of the foreign corporation held.

In this subsection, no attempt is made to investigate the meaning of these rules for international capital movements; instead they are merely presented. For this purpose, a firm is considered that, partly or wholly, belongs

⁵This is the case, for example, for interest payments between West Germany on the one hand and France, Great Britain, and the United States on the other hand. See Korn and Debatin (1982, Vols. I, II, and III).

to foreign residents. The country where the firm is located is called the *host country* and the representative shareholders' country of residence is the *home country*. Realistically it is assumed that the firm is a corporation. For a description of the taxation of domestic firms owned by domestic residents the reader is referred to Chapter 3.

Little needs to be said on the direct taxation of retained profits and the taxation of the firm's capital stock. Since corporations are treated as separate legal entities, the residence principle coincides with the principle of taxing at source. It is true that retained profits and the capital employed by a firm belong to the shareholder of this firm from an economic point of view; however, from a purely legal perspective this is not so. For this reason only host-country taxes are relevant, and personal characteristics of shareholders are meaningless. From an economic point of view there is pure taxation at source⁶.

Retained profits may not only be taxed directly as corporate income, but also as capital gains. If there is a capital gains tax at all, capital gains, fully or in part, are included in the income tax base of the shareholder, where the shareholder may be a private household or a corporation. Thus the pure residence principle applies. In principle, a taxation of capital gains at both the corporate and the household levels is possible. However, as capital gains are seldom realized at the corporate level, this possibility is of minor importance.

The taxation of repatriated profits is a more complicated matter. Different combinations of the source and the residence principles are practised.⁷ Effectively, border-crossing profit distributions are usually taxed not just twice, but often three times.

First of all, there is a corporate tax in the host country. In countries that practise the classical system, and normally also in partial imputation countries, the full corporate income tax rate is applied.⁸ In exceptional cases, countries that apply the partial imputation system offer a tax credit not only for domestic, but also for foreign shareholders.⁹

In addition to the corporate tax, the host country usually levies a

⁶ Cf. OECD (1977, Articles 3 and 4).

⁷ A good overview of the institutional arrangements with particular emphasis on developing countries can be found in Adams and Whalley (1977). Cf. also Jacobs (1983) and, in particular, ITS (1985).

⁸ Cf. Chapter 3.1.

⁹ Such an exception appears, for example, in the double taxation agreement between the United Kingdom and France. Cf. OECD (1977, p. 99). West Germany applies a corporate tax on dividends at the reduced rate of 36%. Domestic residents get a full refund for this tax but foreigners do not.

withholding tax on dividends. Sometimes this tax amounts to 25% or even 30% of the dividend net of corporate tax, but, following the OECD Model Double Taxation Convention of 1977, countries that have double taxation agreements frequently set tax rates between 5% and 15% only, depending on the percentage of voting shares the receiving company owns in the company paying out the dividends.¹⁰ Moreover, according to the OECD Convention, in the home country the withholding tax is deductible from corporate or personal income tax, provided this does not lead to a tax rebate.¹¹ The withholding taxes are therefore rather insignificant for (honest) private investors.

More important are the home country's corporate and personal taxes themselves. If the shareholder is a private household or a non-corporate firm, then the dividend net of the host country's corporate tax is subject to personal income tax in the home country. Thus there is double taxation of dividends that resembles the double taxation of dividends paid out to domestic shareholders in a country that employs the classical system of capital income taxation or a partial imputation system. The only difference is that, when the host country employs a partial imputation system, the total tax burden on repatriated dividends is often higher than the corresponding tax burden on internal dividend payments.¹²

Portfolio investment in bonds, including credit contracts, and direct investment are the dominant means of international capital movements. Portfolio investment in corporate stocks, however, is empirically negligible.¹³ Thus a more relevant case than profit repatriation directly to shareholder households is that where this repatriation is channelled through home country parent companies before it reaches the household level. In this case, an additional corporate tax liability can arise in the home country, and there is legal double taxation since the same kind of tax is applied twice. This is actually triple taxation of distributed profits from an economic point of view.

Many countries, including the United States, Japan, Great Britain,

¹⁰Cf. OECD (1977, Article 10). An exception is West Germany where, because of the comparatively low corporate tax on dividends (36%) a withholding tax of 15% is levied even in the case of qualified majority.

¹¹OECD (1977, Article 23 A2 in connection with Article 10).

¹²If the host country practises the classical system of capital income taxation, foreigners and domestic residents are subject to the same corporate tax burden. Van Den Tempel (1971) considered this aspect to be one of the major advantages of the classical system over partial imputation systems.

¹³In 1984, only 4% of U.S. private assets invested abroad belonged to this category. See Scholl (1984, p. 27).

France, and West Germany provide double taxation relief in their corporate tax laws. Normally, the parent company enjoys a tax credit for the corporate and withholding taxes paid by its foreign subsidiary on the dividends transferred and sometimes, for example in West Germany, the home country even exempts the dividends from domestic taxation (international affiliation privilege). The double taxation relief is not always granted though. First, it is not granted by all countries. When the OECD Model Double Taxation Convention was being discussed, the tax credit was considered as a general requirement for all countries. However, the preparation committee that consisted of representatives of the OECD countries was unable to agree on this point.¹⁴ Obviously, some countries did not want to give up a lucrative tax source. Second, even in countries that do grant a tax credit, the double taxation relief is usually confined to corporations that hold a qualified majority. Third, with the tax credit the deductibility of the corporate and withholding taxes is typically limited to that amount of corporate income tax that would have accrued if the tax law of the home country alone had applied. Thus, distributed profits are effectively taxed at a rate that equals the higher of two possible rates. All these limitations imply that double taxation of repatriated profits has not been fully lifted. As before, border-crossing profit distributions are in many cases subject to heavier tax burdens than internal profit distributions.

A priori, it can hardly be expected that the muddle of the existing tax laws is compatible with an efficient allocation of capital. Many authors fear that these laws bring about a substantial misallocation of capital and that there are huge welfare losses. The subsequent chapters try to find out to what extent these fears are justified. They show that there may indeed be distortions. But some of these distortions do not go the direction that would usually be expected and, in some important cases, there is no distortion at all.

7.2. Two Extreme Views: Heavy Distortions or Perfect Neutrality?

The discussion of the tax-induced distortions begins in this section by confronting two extreme, contradictory views on the nature of an international capital market equilibrium in a world with capital income taxes. Neither of these views can claim full generality, but together they limit the

¹⁴See OECD (1977, p. 156, §50-52).

spectrum of possible cases and as such are useful at least for didactic purposes. A more subtle analysis that concentrates on what are perhaps more realistic intermediate cases follows in Section 7.3.

7.2.1. The Traditional View

Consider the simple two-sector model of Chapter 6.2.1 and reinterpret this model as a two-country model where X is the domestic and Y is the foreign country. Traditionally, it is argued in models of foreign trade that do allow for capital movements¹⁵ that a capital market equilibrium is characterized by

$$\left(\frac{\partial f(K^X, L^X)}{\partial K^X} - \delta \right) \theta^X = \left(\frac{\partial f(K^Y, L^Y)}{\partial K^Y} - \delta \right) \theta^Y, \quad (7.5)$$

where $\theta^X = 1 - \tau^X$ and $\theta^Y = 1 - \tau^Y$ are tax factors for repatriated earnings imposed by the source countries and the terms in brackets are the respective marginal products of capital. Implicitly this formula refers to a household that wants to invest personal funds in a domestic or a foreign firm and plans to collect all returns as dividends. For this household to be indifferent between the two alternatives and hence for an equilibrium to exist, it is necessary that the post-tax marginal rates of return to capital be equal in the two countries. As the source principle is assumed, this equality will generally preclude the possibility of equality in the pre-tax rates of return. Thus, a distortion in the structure of the world capital stock seems inevitable.

An equation like (7.5) inspired many authors, including Hamada (1966, pp. 368–370) or Sato and Bird (1975, pp. 406–417), to recommend applying the residence principle to taxing repatriated earnings. They argued that an efficient international allocation of capital could only be achieved if, for the capital exporting country, profits earned at home and abroad were taxed at the same rate, for only then would there be what they called *capital export neutrality*. Indeed, other things being equal, this view is correct. For each single investor, there would be the same θ on each side of (7.5) and, as with the equilization of interest rates discussed above [see (7.1)–(7.3)], there

¹⁵ Cf. MacDougall (1960), Kemp (1961; 1964, Chapters 13 and 14), Jones (1967), Hamada (1966), and others. This early literature was path-breaking in that it did allow for capital movements. It did not study the role of taxation in the firm's investment decision, but concentrated on the general equilibrium repercussions of certain model taxes.

would be an equilibrium with equality in the marginal pre-tax returns to capital. This in turn would ensure an allocation of capital that maximizes the world production level.

There are two problems with this recommendation though. First, it rests on the assumption that direct investment is the only form of international capital movement. Second, it implies that direct investment is only financed through new issues of shares. As in the Harberger model, an equilibrium condition like (7.5) necessarily requires that new issues of shares are the only marginal source of finance.¹⁶ Neither retained profits as a source of direct investment nor international capital movements through portfolio investment are allowed. Because of the double and triple taxation of profits distributed to domestic and foreign shareholders, new issues of shares are by far the least attractive source of finance particularly in those countries that employ the classical or closely related partial imputation systems. Only the absurd assumption that firms want to *maximize* their cost of capital could legitimate an equilibrium condition like (7.5).

Not only theoretical, but also empirical reservations about the traditional view seem appropriate. On the one hand, direct investment accounts for only part of international investment flows. In the short and medium run, international net capital flows nearly exclusively involve portfolio investment, and only if these flows are netted out over long periods of time, does direct investment attain a significant empirical role. A look at foreign trade statistics clearly suggests that, although significant stocks of assets that have been directly invested abroad exist, portfolio investment is the predominant channel through which marginal reallocations of the world capital stock are brought about.¹⁷ On the other hand, retained profits have long been an important source of direct investment. As early as the mid-fifties Barlow and Wender (1955, Chapter 11) and Penrose (1956, pp. 227–229) observed the phenomenon of internal growth of foreign affiliates of U.S. corporations. Typically, the subsidiaries received an injection of funds from the parents when they were founded, but thereafter they grew primarily through retaining profits and borrowing in the local credit markets. This observation has since been confirmed in a number of studies including the extensive work by Robbins and Stobaugh (1973). A detailed empirical analysis of the components of U.S. direct investment in 1979, carried out by Wichard (1980), revealed that only 7% of the increase in equity capital of

¹⁶Cf. Chapters 5.4.2 and 6.2.2–6.2.3.

¹⁷Cf. e.g. *Survey of Current Business* 65, 1985, pp. 38–39, Table 1.

incorporated foreign affiliates of U.S. parent companies was financed through new issues of shares.¹⁸

Clearly, these observations call for an alternative theory of taxation and international capital movements – one that, in addition to direct investment through new issues of shares, allows for capital movements through portfolio investment and for direct investment via retentions. Concerning direct investment, various attempts to allow for a richer set of financial instruments available to foreign affiliates have been made in the literature. Using effective tax rates that were weighted averages of the domestic and foreign corporate tax rates, where the weights depended on the dividend-payout ratio, Horst (1977) implicitly tried to allow for retentions and new issues of shares as marginal sources of finance of foreign affiliates. Hartman (1980) assumed that debt and new issues of shares are chosen in fixed proportions, and in a stimulating paper Hartman (1985) discussed alternately the cases that subsidiaries use new issues of shares or retentions as the only source of finance. However, little or no attention seems to have been paid to the role of taxation in affecting international capital movements through portfolio investment – empirically the most important channel of all. The fundamental portfolio equilibrium conditions (7.1)–(7.3) are simply not popular in the literature on tax-induced distortions in the international structure of real capital.

The following sections present a model of taxation and international capital movements that includes both portfolio investment and direct investment. Moreover, rather than implicitly imposing a particular financial behavior upon the firms, the model allows them to optimize their decisions as analyzed in Chapter 4. Much emphasis will be placed on the interactions between the real and the financial distortions caused by the tax system.

¹⁸ In connection with data provided in the Survey of Current Business (p. 33, lines 48–50, same issue as Wichard's article), Wichard's (1980, p. 18) findings imply that U.S. foreign direct investment in 1979 was composed as follows:

outflows to unincorporated affiliates (debt and equity)	\$ 3.4 billion
equity outflows to incorporated affiliates (new issues of shares)	\$ 1.4 billion
intercompany account transactions (loans from parents to incorporated affiliates)	\$ 1.2 billion
retained profits by incorporated affiliates	\$18.4 billion
	\$24.4 billion

7.2.2. The Formal Condition for an International Capital Market Equilibrium

The analysis of the tax influence that will be given in the subsequent sections is strictly based on the model of financial and investment behavior developed in Chapters 3–5. As far as possible, it follows the treatment of the Harberger problem in Chapter 6.

It is assumed that only the effective interest cost is tax-deductible ($\alpha_2 = \alpha_3 = 0$). Corporate taxes on retained profits (τ_r), corporate taxes on distributed profits (τ_d), personal income taxes that apply to interest income and dividends (τ_p), capital gains taxes (τ_c), consumption taxes (τ_v), and taxes on the stocks of capital employed by the firms (τ_k) are allowed as well as tax depreciation rules that deviate from true economic depreciation ($\alpha_1 \geq 0$). There are two countries, X and Y , and the respective factor endowments and the tax parameters determined by the authorities of these countries are labelled accordingly. As in the Harberger case, and for a similar reason, labor is considered immobile, while capital is perfectly mobile. Both countries produce the same commodity.

It is assumed that the destination principle is applied to the consumption taxes so that there is the same producer price in both countries. Without loss of generality this price is fixed at the level of unity. Moreover, it can be assumed that, because of (7.3), the residence principle implies a uniform interest rate in international financial markets:

$$r = r^X = r^Y. \quad (7.6)$$

In order to examine the central issues it will suffice to distinguish two types of firm for each country.

Type 1: The representative shareholder is a domestic resident. There may be foreigners among the shareholders but they are unable to affect the vote of the general meeting.

Type 2: The representative shareholder is a foreign parent company that in turn represents the interest of a foreign shareholder household. The parent transfers the dividends of its domestic subsidiary to this household and (potentially) sells newly issued shares to it in order to raise funds for the subsidiary.^{19,20}

¹⁹It is admissible that the parent is itself a producer of commodities, but analytically we separate out that part which acts as a holding company for the subsidiary. This procedure implicitly excludes the possibility that international profit transfers can be carried out via commodity trade at false prices. Cf. Itagaki (1979) and Nachtkamp and Schneider (1980).

²⁰For the sake of brevity, this chapter abstracts from differences in the tax treatment of corporate and non-corporate firms. It is a straightforward matter, however, to extend the results presented below by considering further marginal conditions of type (7.7).

For both types of firm, the decision problem is, in principle, the same as that described in Chapter 3.2. Only the tax rates or tax factors, respectively, require a suitable interpretation. Thus, the employment of capital by a firm of Type i located in Country Z is determined by (5.65):

$$r = \frac{\frac{\partial f(K^{Zi}, L^{Zi})}{\partial K^{Zi}} - \delta - \tau_k^Z}{P_K^{Zi}}; \quad Z = X, Y; \quad i = 1, 2; \quad (7.7)$$

where

$$P_K^{Zi} = \frac{\theta_p^{Zi}(1 - \sigma^{*Zi} - \alpha_1^Z \tau_r^Z)}{\max(\theta_d^{*Zi}, \theta_r^{*Zi})} + \sigma^{*Zi} \quad (7.8)$$

is the general formula for the effective price of capital as given in (5.52). The following sections will simultaneously discuss these formulas for the case where σ^* is exogenously given and the case where it is endogeneously determined such that, in the case of accelerated depreciation, firms just avoid violating their loss-offset constraints. For the latter case it follows from (5.19)–(5.21) that

$$\begin{cases} \sigma^{*Zi} = 1 - \alpha_1^Z \tau_r^Z - \varepsilon^{*Zi}, \\ \varepsilon^{*Zi} = \alpha_1^Z W^{Zi} \max(\theta_d^{*Zi}, \theta_r^{*Zi}), \\ W^{Zi} = \lim_{t \rightarrow \infty} \left(\frac{\hat{K}^{Zi}(t)}{\theta_p^{Zi} r(t)} \right) \end{cases} \quad (\text{if } \sigma^* \text{ is endogenous}). \quad (7.9)$$

If these expressions are inserted into (7.8),

$$P_K^{Zi} = 1 - \alpha_1^Z \left\{ \tau_r^Z - \lim_{t \rightarrow \infty} \left(\frac{\hat{K}^{Zi}(t)}{r(t)} \right) \left(1 - \frac{\max(\theta_d^{*Zi}, \theta_r^{*Zi})}{\theta_p^{Zi}} \right) \right\} \quad (\text{if } \sigma^* \text{ is endogenous}) \quad (7.10)$$

results. For simplicity it is assumed that the planned long-run growth rates of all firms are constants $[\lim_{t \rightarrow \infty} \hat{K}^{Zi}(t) = \text{constant } \forall Z, i]$. It can be left open whether the expected long-run interest rate $[\lim_{t \rightarrow \infty} r(t)]$ is constant or whether it equals the current equilibrium interest rate that clears the capital market. None of the results to be derived depends on this.

An implicit assumption underlying (7.7)–(7.10) is that, within a country, both types of firm pay the same tax on the stock of capital and on retained profits and that the same tax depreciation rules apply. Thus $\tau_k^{Z1} = \tau_k^{Z2} = \tau_k^Z$, $\tau_r^{Z1} = \tau_r^{Z2} = \tau_r^Z$ and $\alpha_1^{Z1} = \alpha_1^{Z2} = \alpha_1^Z$. The parameters with

superscripts Z and i are country and firm-specific. Let θ_d^{ZZ} denote the corporate tax factor for profits distributed from Country Z to Country $\bar{Z}$, θ_d^Z the corporate tax factor for profits distributed within Country Z , and θ_r^Z the corporate tax factor for retained profits in Country Z . Then it holds for the firms of Type 1 and 2 that

$$\theta_d^{*Z1} = \theta_d^Z \theta_p^{Z1}, \quad \theta_d^{*Z2} = \theta_d^{ZZ} \theta_p^{Z2} \quad (7.11)$$

and

$$\theta_r^{*Z1} = \theta_r^Z \theta_c^{Z1}, \quad \theta_r^{*Z2} = \theta_r^Z \theta_c^{Z2}, \quad (7.12)$$

where $Z = X, Y$ and $\bar{Z} = \{Y\}$ when $Z = \{X\}$. Note that, for subsidiaries (Type 2), the combined tax factors for distributed (θ_d^{*Z2}) and retained profits (θ_r^{*Z2}) are affected by taxes levied in both countries. This aspect will be needed in the analysis of tax distortions.

It is also useful to recall that, according to the discussion of Section 7.1.2, it will generally be true that

$$\theta_d^{ZZ} \leq \min(\theta_d^Z, \theta_d^{\bar{Z}}). \quad (7.13)$$

Moreover, of course, the basic assumption $\theta_p \geq \max(\theta_d^*, \theta_r^*)$ from (3.14) and (3.15) must hold for each type of firm in order to ensure the existence of a solution to this firm's decision problem.

For each point in time, Equations (7.7) and (7.8) or (7.7) and (7.10), respectively, implicitly define sets of well behaved, downward sloping demand functions.²¹ Given these demand functions, the market rate of interest is assumed to adjust in such a way that the available world stock of capital is exhausted through the factor demands:

$$K^{X1} + K^{X2} + K^{Y1} + K^{Y2} = K. \quad (7.14)$$

²¹ A sufficient condition for downward sloping demand functions is $\partial^2 f / \partial K^2 < 0$ and $d(rP_K)/dr > 0$. The former is a general assumption throughout this book. The latter is trivially satisfied if $\sigma^* = \text{constant}$ in (7.8) or $\lim_{t \rightarrow \infty} r(t) = \text{constant}$ in (7.10) for then $P_K = \text{constant}$. If $\lim_{t \rightarrow \infty} r(t) = r$ where r is the current market rate of interest appearing in (7.7) and if (7.10) applies, then

$$\begin{aligned} d(rP_K)/dr &= P_K + (dP_K/dr)r \\ &= P_K - \alpha_1 \lim_{t \rightarrow \infty} \dot{K}(t) [1 - \max(\theta_d^*, \theta_r^*)/\theta_p]/r \\ &= 1 - \alpha_1 \tau_r > 0, \end{aligned}$$

where the inequality sign holds as $0 \leq \alpha \leq 1$ and $0 \leq \tau_r < 1$ by assumption.

A maximum of the world production level is achieved if (7.14) is satisfied and (7.7) reduces to the laissez-faire condition $r = \partial f / \partial K^{Zi} - \delta$ for all i and all Z . It would be impossible in such a situation to raise aggregate output through a marginal reallocation of capital. Whether there is any hope for such an optimistic outcome will be discussed next.

7.2.3. *Perfect Neutrality under Full Financial Flexibility and True Economic Depreciation*

No financial flexibility and a choice of the most expensive source of finance are the assumptions that underly the traditional approach to the influence of taxation on international capital movements. This section considers the opposite case. There is full financial flexibility within the legal constraints ($\sigma^* = 1 - \alpha_1 \tau_r$) and the firm chooses the cheapest source of finance so as to maximize the wealth of its shareholders. As with the traditional approach, it is assumed that tax depreciation coincides with true economic depreciation ($\alpha_1 = 0$) and that there are no taxes on the capital stock ($\tau_k = 0$).

In this case, despite taxation, $P_K^{Zi} = 1$ from (7.8) or (7.10), and (7.7) reduces to:

$$r = (\partial f / \partial K^{Zi}) - \delta; \quad Z = X, Y; i = 1, 2. \quad (7.15)$$

With this expression, the complex edifice of national and international capital income taxation disappears into thin air. Instead of a complicated equilibrium condition that incorporates the tax rates τ_d , τ_c , τ_r , and τ_p , differentiated with regard to countries and types of firm, the simple equilibrium condition of the laissez-faire model, which is also the efficiency condition for an internationally optimal structure of capital, appears. It is admissible that the tax laws of the two countries impose different burdens on interest income, capital gains, retained profits, and distributed profits. Profit distributions to domestic residents may be subject to full or reduced double taxation with the personal income tax and the corporate tax. Distributions to foreigners may, depending on whether or not a tax credit is provided, be subject to a double or triple tax burden. All these properties are irrelevant for the allocation of the existing capital stock to the different countries and sectors. In any case, the allocation is such that the aggregate level of production is maximized.

The reason for this neutrality result is again the general investment neutrality of capital income taxation that was derived in Chapter 5.3.3 and,

of course, it depends on the same assumptions.²² Additional prerequisites are, however, that international commodity flows are taxed according to the destination principle and international interest income flows according to the residence principle. (Compare footnote 2 and Section 7.1.1.).

Why it is only the tax treatment of interest income flows and not the treatment of other flows of capital income that is important can best be understood by considering the process of allocating savings internationally. The flow of savings of the inhabitants of a country is formed out of income earned in this country or in other countries. It can be made available to the investors of the different countries by agreeing to a policy of retaining profits, by purchasing newly issued shares, or by buying bonds issued by private companies. Moreover, the savings can be channelled directly to the investors or indirectly via multinational firms. Which of these channels is chosen by market forces and how much savings flow through it depends crucially on the relative tax burdens on these channels. If all kinds of capital income of a single household are subjected to the same tax burden, independently of their origin, then all channels are available for a distribution of savings and the total amount of savings of all households is allocated to the different countries so as to make the marginal products of all stocks of capital equal. If, however, certain channels are discriminated against by the tax law relative to others then these channels are excluded from the distribution of savings provided that more favorable channels remain which provide access to the real investment opportunities of a country. Thus, for example, the stream of new shares issued to foreigners runs dry when there is multiple taxation of the profits distributed to them.²³ It must also be expected that firms controlled by foreigners tend to replace retained profits with debt financing since retained profits are subject to a higher tax burden than the interest income of the representative shareholder. However, discrimination against certain financial instruments does not mean that the distribution of savings to the countries themselves will change. Under the ideal assumptions considered, this case would only arise if *all* channels through which savings can flow into a particular country are discriminated against in comparison to the *least* discriminated against channels through which they can flow into other countries. The analysis of Chapter 4 has shown that, provided a solution of the planning problem of the firm exists, debt financing can neither be inferior to new issues of shares nor to

²²Basically, these assumptions are: financial optimization within the legal constraints; true economic depreciation; satisfaction of the existence requirements (3.14) and (3.15): $\theta_d^*, \theta_r^* \leq \theta_p$; absence of taxes on the capital stock.

²³Cf. the financial preferences depicted in Figure 4.2.

retentions. For this very reason, it is crucial for an efficient distribution of savings to the different countries that the tax systems do not disturb the distribution of funds available for debt financing. The application of the residence principle with the taxation of interest income ensures that this is the case.

This result contradicts strongly the traditional theory of taxation and international capital movements that predicts heavy distortions. That it is also in contradiction to the empirical evidence is likely, but not trivial. It is true that according to the figures reported in Section 7.2.1, retained profits are an important source of finance in addition to debt, and at first sight the mere observation of this fact could be interpreted as counterevidence. Note, however, that the neutrality result derived in this section does not require that debt is really the marginal source of finance. It merely requires that the marginal cost of capital equals the cost of debt financing. Suppose, for example, that the Miller mechanism is operative and hence that there are large numbers of firms of either type in all countries for which the overall tax burden on retained profits is approximately the same as the tax burden on the interest income of their respective representative shareholder households. Some of these firms may choose retentions as the only marginal source of finance but this would not mean that the marginal cost of finance is no longer the cost of debt financing and it would not invalidate the decisive role of the residence principle for taxation of interest income in keeping the international channels for capital transfers intact.

From an empirical point of view, the true problems with the neutrality result lie elsewhere. The most important reason why this result cannot be expected to characterize the current situation in the world economy may be the phenomenon of accelerated depreciation; this is so obvious in the Anglo-Saxon countries that one can hardly abstract from it. With accelerated depreciation there is no investment neutrality from the point of view of the single firm and hence an efficient international allocation of capital cannot be expected. A second potential reason is that, in the absence of a Miller equilibrium,²⁴ firms might choose equity finance at the margin *although* the tax rate structure discriminates against both kinds of equity capital. As discussed in Chapter 5.2, accelerated depreciation in itself can be one of the causes of this behavior. A variety of other reasons that are exogenous to the model are also conceivable, however. The next section reduces the level of abstraction of the analysis and discusses the possibility of tax distortions under more realistic assumptions.

²⁴Cf. Chapter 4.3.4.

7.3. An Analysis of International Tax Distortions: Accelerated Depreciation and Imperfect Financial Flexibility

Equations (7.7)–(7.14) are now interpreted for the less ideal case. Accelerated depreciation is allowed (but not required) in one country or both ($\alpha_1 \geq 0$) and it is assumed that, perhaps because of accelerated depreciation, at least some given fraction ε^* of marginal net investment must be financed with equity capital ($\varepsilon^* = 1 - \sigma^* - \alpha_1 \tau_r > 0$). Debt financing may be strictly favored by the tax system [$\theta_p \geq \max(\theta_d^*, \theta_r^*)$]. There may be country specific taxes on the stocks of capital employed by the firms ($\tau_k \geq 0$).

The analysis is a comparative static investigation into the effect of tax reforms on the international structure of capital. All economic reactions are measured in terms of the world economic situation that would have prevailed in the future if the tax reform had not occurred. In a growing world economy, structural changes typically do not involve shrinking domestic economies, but are accomplished through diverging national growth rates. Realistically, it will take a decade or more before the world economy has settled down to the kind of equilibrium analyzed in this chapter.

7.3.1. Taxing the Capital Stock

For didactic purposes – and not because of its empirical importance – the analysis starts with a tax on the capital stock. As explained, taxes on the capital stock are independent of the personal aspects of the shareholders of a firm and are levied in the source country. Since the firms cannot avoid these taxes through changing their financial decisions, international distortions can be expected for the case where the tax rates are different.

Looking at (7.7) confirms this expectation. Obviously the employment of capital in a country is lower the higher this country's tax rate on capital. The result is illustrated in Figure 7.1. For each of the four sectors ($X1, X2, Y1, Y2$) the outer diagrams of this figure illustrate the capital demand curves with regard to the market rate of interest that are implicitly defined by (7.7). The two lefthand diagrams show the two types of firm operating in the domestic country and the two righthand diagrams, which are mirror images of the lefthand ones, refer to the two types of firm that operate abroad. For example, the diagram directly right of center which is denoted with $Y2$ indicates the capital demand of subsidiaries of domestic parent companies

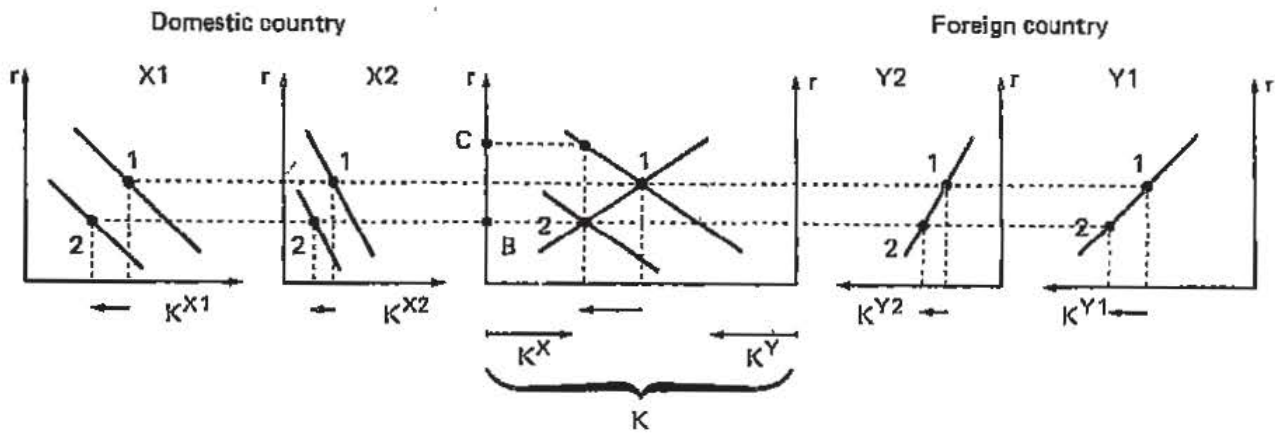


Figure 7.1. Capital exports after taxing the domestic stock of capital.

that operate abroad. Analogously, the farthest left diagram $X1$ depicts the capital demand of a domestic firm that is controlled by domestic residents. The middle diagram contains aggregate capital demand curves for both the domestic and the foreign country. In the case without taxation or in the ideal case considered in the previous section, these demand curves coincide with the marginal product curves of Kemp's diagram but in general they have a different position. Since the distance between the two verticals of the middle diagram measures the existing world capital stock K , the intersection of the two aggregate demand curves in this diagram determines the equilibrium rate of interest in the world capital market. Given this equilibrium level of interest, the amount of capital employed in the single sectors and countries can easily be seen from the diagrams.

Suppose now, starting from a situation that in the diagram is characterized by the number 1, the domestic country (X) introduces a tax on the stock of capital or raises the rate of an existing tax. In this case the demand curves in the two lefthand diagrams and hence the corresponding aggregate curve in the middle diagram shift downward where the magnitude of this shift (CB) equals the increase in the tax rate on capital when other taxes are absent. A new equilibrium emerges that is characterized by the number 2 in the diagrams. The market rate of interest is lower than before and both foreign sectors employ more capital at the expense of both domestic sectors.

Internationally, taxes on the *stock* of capital are by far less important

²⁵ Most countries do not have the former, but, simply because of this, it may cause more distortions than is commonly expected. Cf. IFA (1986). Until 1984, a tax on the capital stock of firms (Gewerbekapitalsteuer) was quite important in West Germany. In 1984 this tax was modified by allowing a deduction of half of the stock of debt of the firm.

than taxes on capital income.²⁵ Nevertheless they are theoretically quite interesting since they operate independently of tax depreciation rules and independently of the firms' financial decisions. This can be seen from (7.7). Even in the case $P_K^{Zi} = 1$, perhaps because the ideal conditions discussed in the previous section prevail, the imposition of country specific taxes on the capital stock would induce the distortions reported in Figure 7.1.

7.3.2. Taxes on Corporate Distributions

The neutrality result derived in Section 7.2.3 left no room for the traditional conjecture that the taxation of international dividend flows creates heavy distortions in the allocation of capital. The question to be considered now is how much of this result can be attributed to the assumption of perfect financial flexibility including the *possibility* of using debt as the only marginal source of finance. Can it be expected that a change in the degree of integration between personal and corporate taxation will affect the international allocation of capital when firms must use equity finance at the margin?

7.3.2.1: Conditions for an Irrelevance of Double Taxation

Consider first a world of countries that operate under the classical or closely related systems of capital income taxation where double taxation of dividends is sufficiently high or the tax burden on retained profits sufficiently low to insure that new issues of shares are inferior to debt for all sectors: $\theta_d^{*Zi} < \theta_r^{*Zi}$ for all i and all Z . For this world, the term $\max(\theta_d^{*Zi}, \theta_r^{*Zi})$ reduces to θ_r^{*Zi} in (7.8) and (7.10), and obviously there is no way for a marginal change in the tax burden on dividends or "repatriated earnings" to affect the international allocation of capital. This result holds completely independently of the value of the maximum marginal debt-asset ratio σ^* ; that is, it holds even when equity capital must be used at the margin. What was perhaps the most striking aspect of the neutrality result derived above, the irrelevance of double and triple taxation on border-crossing dividend flows, does not rely on the possibility of debt financing!

Neither does the result depend on the implicit assumption that the high taxation of dividends causes firms never to distribute dividends and hence pay no dividend taxes. The conjecture that dividend taxation reduces dividend payments is extremely plausible at first sight and was held by

many authors who wrote on the problem of taxation and international capital flows – including P.B. Musgrave (1969, p. 82) and Kopits (1972) for example. But this conjecture relies on the assumption that there is a loophole in the tax system and that it would be possible some day to pay out dividends circumventing the dividend taxes. If the overall dividend tax rate $(1 - \theta_d^*)$ is constant for all future points in time and is applied to all corporate distributions and if, moreover, the firm has access to a perfect capital market where it can borrow and lend at a given rate of interest, then the magnitude of this tax rate is irrelevant for the firm's dividend policy. This policy instead depends on the relative magnitudes of the tax rate on interest income of the shareholder household $(1 - \theta_p)$ and the overall marginal tax burden on retained profits $(1 - \theta_r^*)$. As already shown in Chapter 4.3.3, there is no lock-in effect. Dividend taxation is neutral even though firms are actually paying dividend taxes!

The true reason for the neutrality of double taxation is the implicit partnership in the enterprises taxed which the government imposes through dividend taxation. There is no point in repeating the argument here. The reader is referred to Chapters 5.4.2 and 6.2.3–6.2.5 for details.

The irrelevance of dividend taxation sheds new light on the economic significance of double taxation agreements that reduce the corporate tax burden on border-crossing dividend flows. The advantage of these agreements is not primarily that they avoid distortions in the international allocation of capital.²⁶ Their true advantage is that they remove the tax discrimination against one of three potential channels of international capital movements – the injection of new funds into subsidiaries as opposed to retentions within the subsidiaries or transfers via the bond market – and, if this is any advantage, that they make the owners of multinational corporations richer.

7.3.2.2. *International Repercussions of Dividend Taxation in Partial Imputation Systems*

Consider now the case where for at least one of the four sectors, retentions are dominated by new issues of shares as the marginal source of equity finance; that is, the case where the overall tax burden on retained profits with corporate and capital gains taxes is higher than the overall tax burden on dividends with corporate and personal income taxes $(\theta_r^* < \theta_d^*)$. In this

²⁶See Adams and Whalley (1977, Chapter 6B) for an opposite view.

case, the effective price of capital for the respective sector becomes $P_K = [(1 - \sigma^* - \alpha_1 \tau_r)/\theta_d] + \sigma^*$ or, when σ^* is endogenous, $P_K = 1 - \alpha_1(\tau_r - W\theta_p\tau_d)$. It is obvious from these two equations that a change in the dividend tax burden will affect the international capital market through Condition (7.7) provided that, because of $W > 0$ or because of other reasons, a certain minimum of equity finance is required at the margin ($\varepsilon^* = 1 - \sigma^* - \alpha_1 \tau_r > 0$).

A single country can affect up to three of the four sectors by changing the corporate tax burden on distributed profits. In principle, it can change the tax burden on dividends of all firms located in its boundaries – those with domestic shareholders and those with foreign shareholders alike – and of subsidiaries of domestic parent companies located abroad. The different possibilities will not be discussed here. To illustrate the point, it will be enough to consider a simple case that could have approximated, for example, the capital movements between the United Kingdom (X) and the United States (Y) before the 1986 tax reform. It is assumed that the domestic country employs the partial imputation and the foreign country the classical system of corporate income taxation, and that the taxation of border-crossing dividend flows is sufficiently high to induce all subsidiaries to prefer retentions to new issues of shares ($\theta_r^{*Z2} > \theta_d^{*Z2}$, $Z = X, Y$). Only “genuine” domestic firms of Country X prefer new issues to retentions ($\theta_r^{*X1} < \theta_d^{*X1}$) as they benefit from the low domestic dividend tax rate.

Consider the case where Country X (Britain) increases the corporate tax burden on distributed profits through a change in the imputation system. Then it follows from (7.7) and (7.8) or (7.7) and (7.10) that the capital demand curve in the first diagram of Figure 7.2, and hence the corresponding aggregate demand curve in the middle diagram, shifts to the

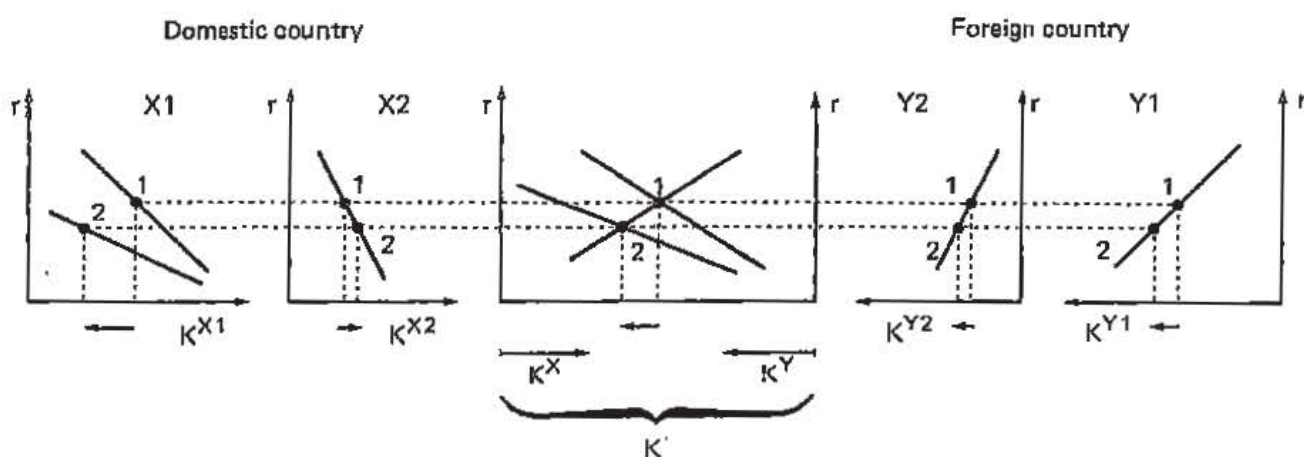


Figure 7.2. Capital outflows through an increased taxation of dividends (partial imputation system).

left. The world interest rate falls as a reaction to this tax increase and despite the interest-induced increase in employment of capital by foreign subsidiaries located in Country X, capital is exported to Country Y until the new equilibrium, characterized by the points labelled 2, is reached.

The result is worth noting in so far as it may help to shed the right light on an empirical investigation on the influence of taxation on the investment behavior of British firms that was published by Poterba and Summers (1983). In this investigation, it was found that the frequent changes in the corporate tax on dividends that occurred in the United Kingdom in the post-war period did have a significant influence on private investment behavior. The authors interpret their result as evidence for the traditional view discussed above that dividend taxes do enter the cost of capital and hence induce international distortions.

While this is not the place to discuss the empirical result, the preceding analysis does suggest objections to its theoretical interpretation. The result could only be taken as supporting the traditional view if there were reasons for believing that the phenomenon observed in the United Kingdom is generally valid and applies to all countries. However, it does not seem that this is the case. On the contrary, it can be expected that a variation of dividend taxes will affect the investment behavior particularly in the special case of the U.K. where accelerated tax depreciation has called forth a significant proportion of equity finance and where the corporate tax burden on distributed profits has been very low. With other constellations, in particular a high financial flexibility or a high tax burden on dividends, this result would not have shown up. It is even doubtful whether the result could be expected for the United States where traditionally, and also because of accelerated depreciation, a high portion of investment is financed with equity capital. Because of the full double taxation of dividends, new issues of shares are clearly inferior to retentions there and hence a marginal variation of dividend taxes would not bring about real economic effects. In order to induce a significant change in investment, it would be necessary to reduce the dividend taxes more than marginally, sufficiently far to make new issues of shares superior to retained profits ($\theta_d^* > \theta_r^*$).

7.3.3. Capital Gains Taxation

It follows from (7.8) and (7.10) that the conditions under which capital gains taxation affects the firm's investment decision are those where the double taxation of dividends is neutral, and vice versa. Consider, therefore, the case

of a country (X) that employs the classical or a closely related system of capital income taxation so that the domestic and foreign firms controlled by the residents of this country ($X1, Y2$) prefer retentions to new issues of shares ($\theta_r^* > \theta_d^*$). If this country increases the tax burden on capital gains while equity finance is required at the margin ($\epsilon^*, W > 0$), it increases the effective price of capital for both types of firm and hence reduces their capital demand. This follows straightforwardly from (7.7)–(7.9).

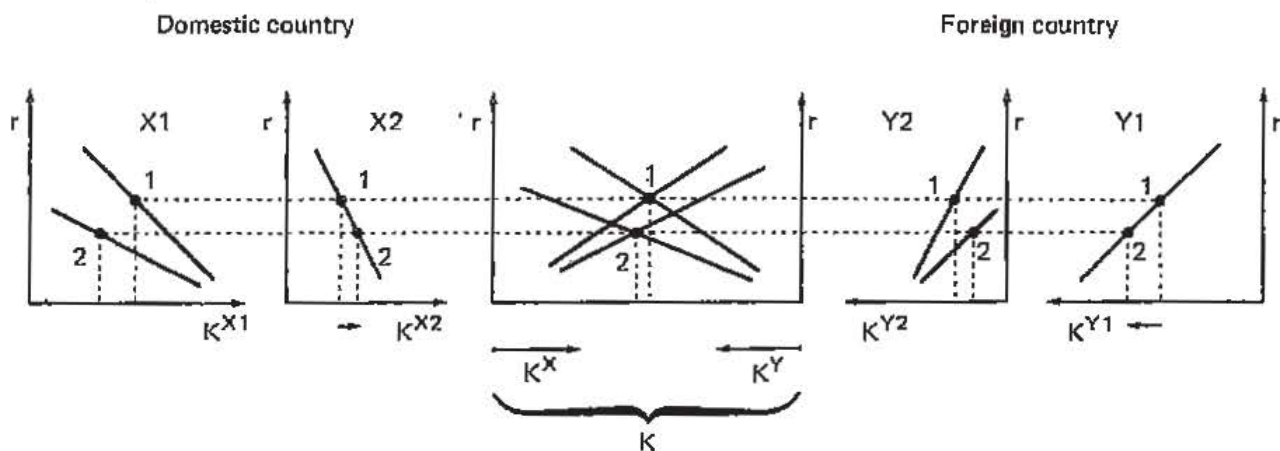


Figure 7.3. The effects of an increase in the capital gains tax rate or a fall in the personal income tax rate (classical and closely related systems).

The result is illustrated in Figure 7.3. The increase in P_K reduces the capital demands of both Sectors $X1$ and $Y2$. Thus, the aggregate capital demand curves of the two countries shift outward, and the world market rate of interest falls. Because of the reduced capital demand by Country X 's foreign subsidiaries, it is theoretically unclear whether there will be a capital export or a capital import. However, realistically, it can be assumed that the foreign subsidiaries are very small compared to the domestic economy, so the demand reduction of domestic firms controlled by domestic residents must dominate: there will be a net capital export. Figure 7.3 depicts this case.

This result fully confirms what was said in Chapter 6.2.4 in connection with the Harberger problem. With the classical and closely related systems of capital income taxation, it is the double taxation of retained rather than that of distributed profits that scares the capital away.

7.3.4. The Corporate Tax Rate

Consider now the effects of a change in the corporate tax rate; that is, of a

simultaneous and proportional change of τ_r and τ_d . In a sense, this change combines the economic effects of a change in the extent of double taxation of dividends and of a change in capital gains taxation. It also introduces a new element though in that, with accelerated depreciation, it alters the degree to which government implicitly subsidizes the investment cost.

7.3.4.1. The Case of True Economic Depreciation

Suppose first that the tax laws require true economic depreciation but that, for reasons exogenous to the model, firms nevertheless wish to finance part of their net investment with equity capital ($\varepsilon^* > 0$). Assume that all countries employ the classical system of capital income taxation and that Country X lowers its corporate tax rate. The reduction in the corporate tax rate means a reduction in the tax rate on retained profits for all domestic firms including those that are foreign-owned. In addition, it means a fall in the dividend tax rate faced by genuine domestic firms ($X1$) and potentially a fall in the dividend tax rate faced by foreign-owned domestic firms ($X2$) and domestically owned foreign firms ($Y2$); this, however, is irrelevant with the classical system.

According to (7.8) and (7.10), the reduction in the corporate tax rate on retained profits lowers the effective price of capital and, as revealed by (7.7), the capital demand curves of both domestic sectors will shift to the right. As a result, the world market rate of interest rises and a capital import from Country Y into Country X is necessary to reach a new equilibrium. Figure 7.4 illustrates this.

The same kinds of capital movement result when the reforming country,

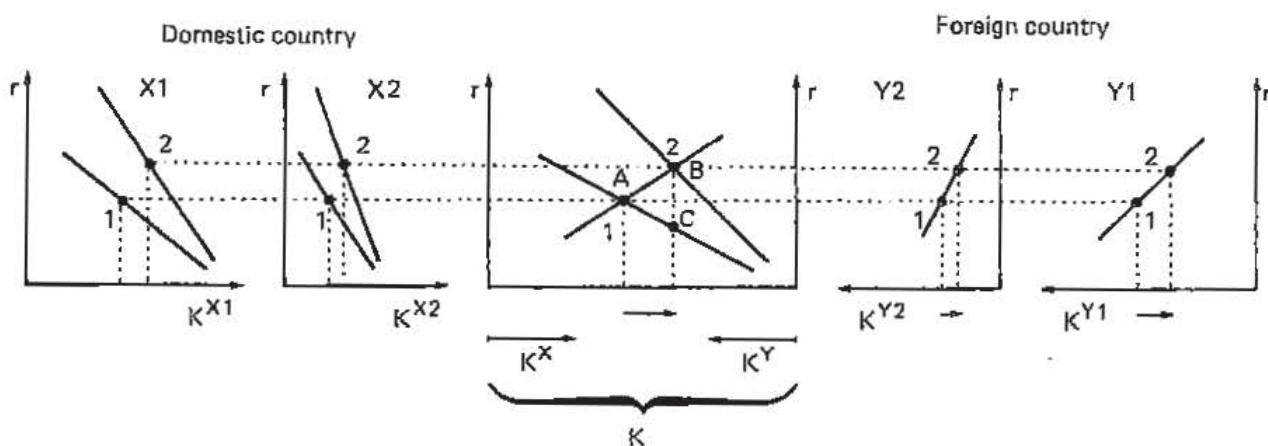


Figure 7.4. Capital imports through a change in the corporate tax rate or an acceleration of tax depreciation.

X , employs a generous partial imputation system such that $\theta_d^* > \theta_r^*$ for firms of Type $X1$ and perhaps even for firms of Type $X2$. New issues of shares rather than retentions are now chosen as the source of finance but since, given the degree of imputation, the corporate tax rate on dividends falls proportionately with that on retained profits, the effective price of capital still falls, causing the same reactions as before.

A slight modification of the result depicted in Figure 7.4 can arise when Country Y has a partial imputation system and if the constellation $\theta_d^* > \theta_r^*$ holds even for the subsidiaries of Country X that are operating in Country Y (Type $Y2$). In this case, a reduction in Country X 's corporate tax rate implies a reduction of the effective price of capital for Sector $Y2$ and hence the demand curve in the diagram right of the center shifts leftward. This counteracts the capital import by Country X , but – due to the relatively small size of Sector $Y2$ – it is unlikely to reverse the direction of aggregate capital movements.

7.3.4.2. *Adverse Capital Movements with Accelerated Depreciation: The Role of the Taxation Paradox*

Return now to the case where the foreign subsidiaries of Country X (Type $Y2$) prefer retentions to new issues of shares ($\theta_r^{*Y2} > \theta_d^{*Y2}$) so that their investment policy is independent of Country X 's corporate tax rate. Retain the assumption that Country X employs the classical system and assume that it allows both types of firm operating within its boundaries ($X1$ and $X2$) to use accelerated depreciation methods in calculating the corporate tax base. According to the results of Chapter 5.4.3, this will not necessarily alter the firms' reactions to a reduction of the corporate tax rate. With a sufficiently high requirement to use equity finance at the margin, the effective price of capital will still fall for both types of firm and the allocation depicted in Figure 7.3 will result.

However, when the minimum marginal equity–asset ratio is endogenously explained by the attempt to avoid exhausting the corporate loss-offset possibilities, so that the effective price of capital is given by (7.10), then a reversal of the result can be expected. As shown with (5.63), a reduction of the corporate tax rate raises the effective price of capital with any given rate of interest regardless of the system of capital income taxation. Thus both domestic sectors will *reduce* their capital demands and, instead of capital being imported, it will be exported.²⁷ The increase in

domestic capital demand and the corresponding capital import which are depicted in Figure 7.3 would now result, not from a reduction, but from an *increase* in the corporate tax rate!

These findings resemble the inverted Harberger model presented in the previous chapter, and again their cause is the taxation paradox discussed at length in Chapter 5. The taxation paradox results from the fact that, with accelerated depreciation, marginal assets are subsidized by an increase in the corporate tax rate while intramarginal assets are taxed. It does not imply that the corporate tax base will become negative and it is compatible even with a marginal equity-asset ratio that is large enough to ensure that the corporate tax base grows in strict proportion with other aggregates of the model.

The public is typically very interested in international comparisons of tax burdens, and often such comparisons are used to recommend tax cuts by alluding to the risk of capital flight abroad. The above results cast serious doubts on the validity of such recommendations. If generous depreciation rules are employed, the level of the corporate tax rate could have effects that are the reverse of what is commonly believed. Under certain conditions, increasing the corporate tax rate rather than reducing it may be the appropriate policy measure to protect the economy from capital flight. If the increase in the corporate tax rate induces a flight of capital then it may well be a "flight" *into* the country that raised this tax rate. With accelerated depreciation, with the residence principle for the taxation of interest income flows, and with sufficient financial flexibility, a capital import is the means by which profit maximizing firms and interest arbitragers try to escape an increased corporate tax burden. Again, as with the Harberger problem, attack is the best form of defense.

7.3.5. *Personal Income Taxation: Another Paradox?*

Not only a change in corporate taxation, but also a change in personal income taxation seems very likely to produce capital movements that stand a common opinion on its head. This section will discuss the possibility.

²⁷The result summarized in (5.63) was derived under the condition that the corporate tax rate on distributed profits varies proportionately with that on retained profits [see (5.54)]. It is obvious from (7.10) though that the rise in the effective price of capital will a fortiori occur if the dividend tax rate varies less than proportionately with the corporate tax rate on retentions or is even constant.

A change in the personal tax rate will not affect the firm's investment behavior if new issues of shares are the marginal source of equity finance since both dividends and interest income earned in the capital market are subject to this tax. This is obvious from (7.8) and (7.10). Whether σ^* is exogenously given or whether it is endogenously determined through (7.9): as $\theta_d^* \equiv \theta_d \theta_p$, θ_p disappears from both of these equations when $\theta_d^* > \theta_r^*$. Thus, when Country X employs a partial or full imputation system where the degree of double taxation of dividends is sufficiently low to ensure that both sectors of firms, whose owners are domestic residents ($X1, Y2$), prefer new issues of shares to retentions ($\theta_d^* > \theta_r^*$), this country will be unable to affect the international structure of capital by changing its personal income tax rate.

Consider, however, the case where Country X employs the classical or a closely related system of capital income taxation so that new issues of shares are dominated by retained profits as marginal source of equity finance ($\theta_r^* > \theta_d^*$) for both, Sectors $X1$ and $Y2$. In this case the corporate tax on retained profits and the capital gains tax replace the corporate and personal taxes on dividends in the formulas for the effective price of capital and hence the personal tax rate is no longer neutral. Both (7.8) and (7.10), imply that P_K falls when τ_p is rising, and vice versa. As accrued capital gains are not fully included in the personal tax base this would be true even if the capital gains tax rate rose proportionately with the personal income tax rate. What matters in (7.8) and (7.10) is that θ_r^*/θ_p rises with an increase in τ_p , and, as $\theta_r^* = \theta_r \theta_c$, this is obviously the case if $\tau_p/\tau_c = \text{constant} > 1$. Thus Sectors $X1$ and $Y2$ increase their capital demands for any given rate of interest when Country X raises the personal income tax rate, and vice versa.

When we assume that Country X lowers the personal income tax rate, the result is obviously the same as that which was found above for an isolated rise in the capital gains tax rate. Thus Figure 7.3 also illustrates the international capital movements that result from a fall in Country X 's personal income tax rate. Again, the small size of Sector $Y2$ relative to $X1$ will imply that the reactions of domestic investors dominate and that a capital export results.

That a reduction in the personal income tax rate induces a capital export, and a rise induces a capital import, may seem paradoxical at first sight. In fact, however, this result is a very natural implication of the residence principle for taxing border-crossing interest income flows and of the firms' attempt to minimize their cost of equity finance. The former implies that an increase in the personal income tax rate applies equally to foreign and domestic interest income and hence does not induce domestic wealth

owners to substitute foreign for domestic bonds. The latter implies that the tax increase lowers the opportunity cost of real investment within domestic corporations. Thus fewer dividends are being paid out by these corporations and fewer funds are being offered by shareholders in the capital market, so the market rate of interest rises. The rising rate of interest reduces domestic and foreign credit demand until the shareholders' reduced supply is balanced. When a new equilibrium is found, part of the real capital that formerly was employed by the foreign country (or that otherwise would have been employed there) is now working in the domestic country.

An important assumption underlying the result is that firms use equity finance at the margin. The more they use the stronger the effect, but when only debt is used at the margin, the structure of the world capital stock will stay unaffected. This aspect merits being contrasted with the financial assumptions underlying the taxation paradox under accelerated depreciation. That paradox was shown to be strong when firms use little equity finance at the margin, and with a minimum marginal equity-asset ratio beyond a certain critical value it disappears. Thus, with accelerated depreciation and the classical system of capital income taxation, a capital import into the domestic country will either be induced through a rise in the corporate tax rate or through a rise in the personal income tax rate. At least one of these seemingly paradoxical results must be true, and the weaker the forces producing one of them the stronger are those producing the other. As can be confirmed by looking at (7.8) and (7.10), this suggests quite robust implications of a general tax cut. Regardless of the degree of financial flexibility enjoyed by the firms, a simultaneous reduction of both the corporate and the personal tax rates that does not greatly affect the ratio θ_p/θ_r^* induces capital to fly abroad when retentions dominate new issues of shares as the marginal source of equity finance and accelerated tax depreciation is allowed.

7.3.6. Depreciation Rules, Tax Rates, and the 1986 American Tax Reform

Consider finally the role of a change in depreciation rules. Suppose Country X introduces accelerated tax depreciation rules or allows for more generous acceleration than before. In this case, the value of the parameter α_1^X in (7.8) and (7.10) rises and, according to (7.7), both Sectors X1 and X2 increase their capital demands at each given rate of interest.

The result is the same as that illustrated in Figure 7.4 for a change in the

corporate tax rate. The rise in α_1^X shifts the demand curves in the two lefthand diagrams to the right and with them the aggregate demand curve of Country X in the middle diagram. Hence there is an increase in the world market rate of interest and a capital import into Country X . Unlike the above results on the role of tax rate changes, this result is quite robust. It does not depend on the firms' financial flexibility, on the relative sizes of the sectors of domestic and foreign-controlled firms, or on the degree of integration between personal and corporate taxation. Under a large variety of circumstances the implementation of generous depreciation rules will be rewarded by capital imports.

Sometimes the importance of depreciation allowances for international capital movements is downplayed with the remark that a change in depreciation allowances *only* means a postponement of the tax burden, not a reduction of this burden. This view neglects the great influence which the postponement may have on the marginal investment decision of the firm. Suppose, for example, Country Y requires true economic depreciation for tax purposes ($\alpha_1 = 0$) and Country X allows an immediate write-off ($\alpha_1 = 1$) while there are no taxes on the capital stock ($\tau_k = 0$). Assume $\theta_p^{Zi} = \theta_r^{*Zi}$ for all i and all Z such that debt and equity are equivalent sources of finance. Then it follows from (7.7) and (7.8) that

$$\frac{\partial f}{\partial K^X} - \delta = r(1 - \tau_r^X) = \left(\frac{\partial f}{\partial K^Y} - \delta \right) (1 - \tau_r^X),$$

with

$$\partial f / \partial K^{Z1} = \partial f / \partial K^{Z2} = \partial f / \partial K^Z, \quad Z = X, Y.$$

With a corporate tax rate of $\tau_r^X = 0.5$ this means that the marginal product of capital in the country with the more generous depreciation rules is 50% below that of the country that requires true economic depreciation and hence 50% below the world market rate of interest. The possibility of an immediate write-off has the same effect as when the government subsidizes marginal investment projects at a rate of 50% (in general: at a rate of $\tau_r^X 100\%$). This information should clarify how important the depreciation problem may be for international capital movements.

A related view that is clearly incorrect but nevertheless enjoys some popularity is that the effects of introducing accelerated depreciation schemes will only be transitory. It is true that, in a stationary economy, the tax revenue will fall only temporarily. After a while, the low depreciation on old assets will compensate for the high depreciation on new assets, and the

tax revenue will gradually recover. In the long run, the flow of taxes paid by the firm will be the same as with true economic depreciation. This, however, by no means implies that the incentive to employ a high stock of capital will vanish. Clearly, none of the formal expressions derived depends on the time that has passed since the tax reform. The introduction of a more generous depreciation scheme operates like a permanent subsidy on domestic capital and the distortion in the international structure of capital will persist forever. The economic reason for this aspect is simply that, if firms were to react to the recovering tax revenue by investing less, they would waive the tax advantages on new assets and pay even more taxes than before the reform or than they would otherwise have had to pay.

The persistence of a stimulus to investment despite the recovery of the tax revenue confirms the old public finance saw that it is not the size of the tax burden that affects the allocation of resources but rather the way this size can be altered through the tax payers' actions. And it once again invalidates the usefulness of international comparisons of "effective" capital income tax rates for predicting the direction of capital movements. When the "effective tax rates" are simply the ratios of capital income tax revenues and capital incomes or company tax revenues and profits, such comparisons are useless and misleading. They may be good weapons for tax cut fights in the political sphere, but they cannot be accepted as serious tools for efficient policy making.

This can be seen even more pointedly if the tax *base* effect studied in this section is confronted with the tax *rate* effects analyzed in the previous sections. Consider the 1986 American tax reform. Basic elements of this reform are drastic cuts in corporate and personal tax rates and a broadening of the tax bases, including the return from very generous accelerated depreciation rules to slightly more conservative ones.²⁸ Perhaps the reform will raise the tax revenue. Suppose, however, that the tax rate cuts and the base broadenings just offset one another so that the revenue from capital income taxation relative to the true size of capital incomes stays constant. Believers in effective tax rates will then predict that the reform is neutral with regard to international capital movements. But, in fact, this is not so. As was shown, both a cut in corporate and personal tax rates, given the accelerated depreciation scheme, and a return to more conservative depreciation rules, given the tax rates, bring about a new international capital market equilibrium where a higher proportion of capital is being invested abroad. Capital flight and domestic recession

²⁸See Chapter 3.1.3.

therefore might result from the 1986 U.S. tax reform even when this reform does not raise the revenue from capital income taxation.²⁹

An analogy to a common physical example may help the intuitive understanding of this result. Consider a steam engine. The fire under the boiler creates pressure for the steam just as capital income taxation creates pressure for wealth owners. Accelerated depreciation provides wealth owners with the possibility of reducing this pressure by directing more funds into domestic real investment. It is like opening the valve of the engine: the pressure will only be released when the engine moves. The U.S. policy of cutting taxes and removing accelerated depreciation is equivalent to dampening the fire and throttling back on the valve. Wealth owners might not care, but the engine slows down.

It goes without saying that there are limitations to this analogy. A domestic reduction of capital income tax rates increases the net-of-tax market rate of interest for any given level of the gross market rate of interest and hence stimulates domestic savings: reducing tax rates not only dampens the fire, it also releases the brakes. (Chapters 8–11 will analyze such effects.) But the increase in domestic savings will not be exclusively channelled into domestic investment. Instead, part of it will move abroad, and, for an even stronger reason, capital will be exported. What the above analogy illustrates is how wealth owners restructure their portfolios as a reaction to a policy of tax-cut-cum-base-broadening, not how they augment the size of their portfolios through a tax-induced increase in the flow of savings. In the short and medium run, the size of the savings effect seems unlikely to be comparable to that of the portfolio effect but, of course, it can be substantial in the very long run.

7.4. The Accelerated Cost Recovery System and the International Debt Crisis: A Theoretical Interpretation

The first half of the eighties was characterized by enormous capital imports into the United States accompanied by a strong dollar and a high world

²⁹Note that, according to the analysis of Section 7.3.3, this result becomes even stronger if the rise in the effective capital gains tax rate (from about 0.1 to 0.17) which the U.S. tax reform brought about is taken into account. Using the stylized facts reported in Chapter 3 it follows that, for the period after the reform, $\theta_p/\theta_r^* = 0.72/(0.83 \cdot 0.66) = 1.31$, while for the period before the reform $\theta_p/\theta_r^* = 0.6/(0.9 \cdot 0.54) = 1.23$. It is obvious from (7.8) and (7.10) that, with $\varepsilon^* > 0$, these values imply that a capital export takes place even when all of the effects of accelerated depreciation are neglected. Additional support results from the fact that the U.S. also abolished a number of further investment incentives of which the investment tax credit is the most important. The model neglects these as it focusses on those aspects of the tax system that are of general significance for the OECD countries.

interest rate level. Most countries suffered from this situation. Europe was driven into the worst recession of the post-war period, and the developing countries were shaken by one debt crisis after another. A number of countries were unable to meet their interest obligations, and a collapse of the world banking system was avoided only by strenuous efforts. The United States alone seemed to have benefited: despite the high interest rate it enjoyed a significant consumption and investment boom.

Most observers made the tight monetary policy or the large government budget deficit in the United States responsible for this development.³⁰ However, while these elements probably contributed to an explanation of some of the facts, they are hardly compatible with the investment boom. A potential explanation of the development of the world economy that fits all of the facts mentioned could be the Accelerated Cost Recovery System (ACRS) introduced by the Reagan Administration in 1981.³¹ This system meant a dramatic shortening of depreciation periods for firms operating in the United States and, as shown in the previous section, its introduction could have indeed been expected to raise the world interest rate, induce capital imports into the United States, stimulate U.S. investment, and increase U.S. output.

The introduction of ACRS was not a marginal reform.³² Official agencies predicted that this reform would wipe out most of the corporate income tax in the short and medium run and, in fact, this prediction came quite close to what really happened. The partial removal of accelerated depreciation allowances through the 1986 tax reform is a reaction to this development.³³ In reports published by the U.S. Department of the Treasury, it was argued that the joint subsidy effect implicit in ACRS and other tax incentives might well have been equal to, or more favorable than, an immediate write-off.³⁴ Given the fact that the U.S. economy accounts for nearly 40% of the whole OECD output and given the theoretical results reported in the last section there cannot be much doubt that ACRS caused one of the most severe disturbances of the world economy ever induced by a tax reform.³⁵

³⁰ See Blanchard and Dornbusch (1984) and Blanchard and Summers (1984).

³¹ Cf. Sinn (1984b, 1985b).

³² Cf. Chapter 3.1.3.

³³ While the average depreciation period for industrial assets was reduced from about 10 to 5 years with ACRS, the 1986 reform increased this period to about 7 years. As argued in Chapter 3.1.3, the introduction of ACRS can be seen as an increase in α_1 from 0 to 0.5, and the 1986 reform as a decline in this parameter from 0.5 to 0.3.

³⁴ U.S. Department of the Treasury (1984, pp. 106, 107 and 112; and 1985, p. 135). Cf. Fn. 29.

³⁵ It was estimated in Sinn (1984b, 1985b) that ACRS in itself would cause an accumulated long-run capital import into the United States in the order of magnitude of \$1 trillion. By the end of 1986, about 40% of this value will have been accomplished.

The reform not only created stability problems for the Western world; it also brought about significant distortions in the world-wide structure of capital and had important welfare repercussions. First intimations of the benefits and losses from this policy can be seen by observing the diverse developments of the levels of economic activity in the United States and elsewhere, but this is only one side of the story. A more thorough analysis has to take into account the change in foreign capital income earned by U.S. residents. Since World War II, the United States has been a major source of capital for Europe and the developing countries, either through direct investment or through extensive lending operations. The enormous U.S. trade deficit that occurred after the introduction of ACRS repatriated part or all of this capital. The base of interest income earned abroad was being reduced through this process, but the remaining capital, if there was any, was able to earn a higher rate of return. Did the United States benefit from this?

To get a first idea of the potential welfare effects abstract from the complications arising from a disaggregation of the national industries and assume that firms enjoy sufficient financial flexibility to optimize within the financial constraints. Given this assumption, it can be assumed, without any further loss in generality, that they pay out their profits and that marginal variations in the employment of capital are debt financed. Assume moreover that, before the introduction of ACRS, all countries required true economic depreciation. Under these assumptions, the welfare effects of the reform can be illustrated in Figure 7.5 which shows Kemp's diagram with X as the United States and Y as the rest of the world (ROW).

The two heavy lines are the respective net-of-depreciation marginal product curves which do not necessarily coincide with the demand curves considered in the previous sections. The world endowment of capital is $K = IN$. The portion $K_e^X = IM$ of this endowment belongs to U.S. residents or is backing claims of U.S. residents on foreigners. The remainder (MN) belongs to foreign residents. Because of (7.7) and (7.8), the above assumptions imply that the pre-ACRS allocation of capital is characterized by point A. Thus IJ is the amount of capital employed in the U.S. and JN the amount employed in the ROW. The world production level net of depreciation is the area under the two curves. Given K , it is at its maximum level.

Consider now the effects of the reform. According to (7.7), (7.8), and the discussion of the previous section, a wedge of size $\alpha_1^X \tau_r^X$ will be driven between the marginal product of capital in the ROW and in the U.S. The world interest rate which always equals the net-of-depreciation marginal product of capital in the ROW, rises from r_0 to r_1 , and capital of amount

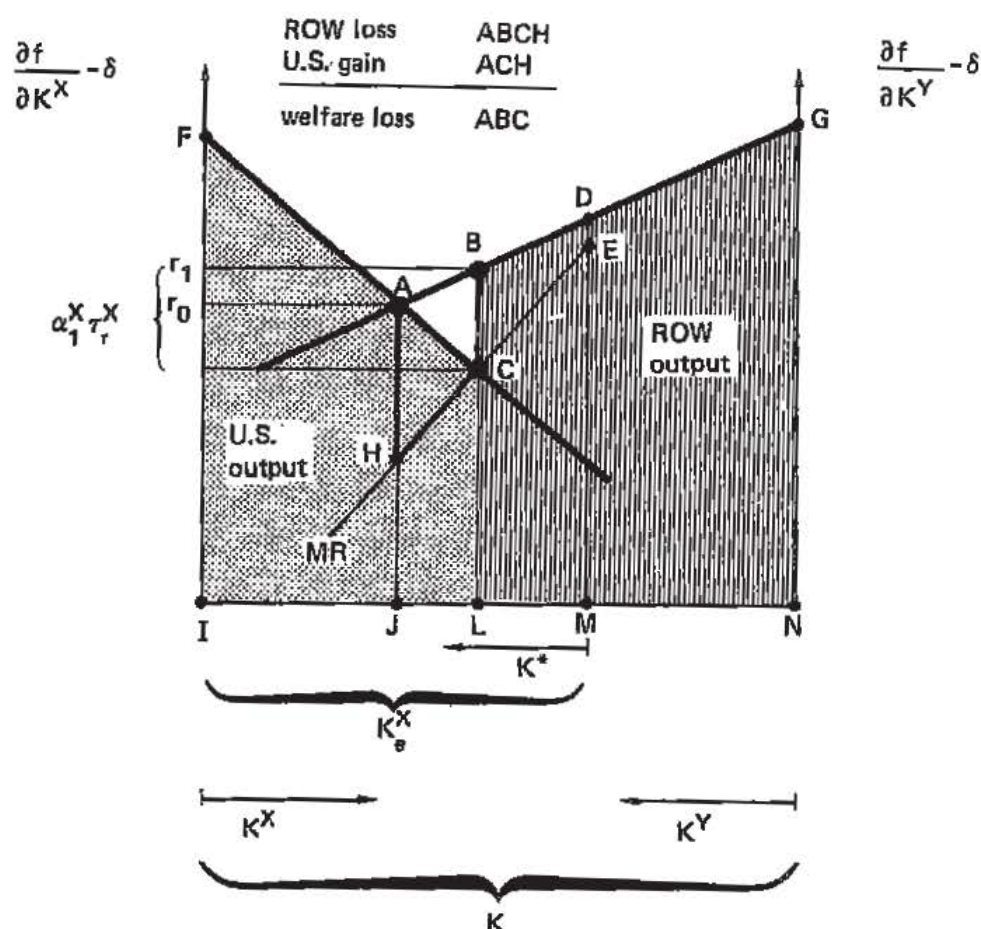


Figure 7.5. ACRS, World Welfare, and National Advantage.

JL is repatriated from the ROW to the U.S. While the proprietorships in the world capital stock are still indicated by IM and MN respectively, the employment of capital in the U.S. is now IL and the employment of capital in the ROW is LN. Because of the reform, U.S. output net of depreciation rises by the area ACLJ and ROW output net of depreciation falls by the area ABLJ. Thus, the world production level, before and after depreciation, shrinks by the triangle ABC. This triangle is the same as that indicated in Figure 7.4 above.

To find out whether the United States could have benefited from the reform it is useful to study the properties of an optimal reform. An optimal reform is one that determines the depreciation parameter α_1^X such that national income Y^X , defined as U.S. output net of depreciation plus foreign-earned capital income net of foreign withholding taxes, is maximized. Because of Euler's theorem and the fact that the above assumptions imply $\partial f / \partial K^Y - \delta = r$, U.S. capital income earned abroad, including all withholding taxes, is $K^*[\partial f(K^Y, L^Y) / \partial K^Y - \delta]$ where K^* is the accumulated stock of capital exported by the U.S. The withholding taxes

are taxes on dividends and, perhaps, interest income.³⁶ As, by assumption, a variation in K^* is accomplished through an exchange of debt instruments, the volume T of these taxes is a well-defined function of K^* : $T(K^*)$, $T'(K^*) \geq 0$. Thus

$$Y^X \equiv \int_0^{K^X} \left(\frac{\partial f(u, L^X)}{\partial u} - \delta \right) du + K^* \left(\frac{\partial f(K^Y, L^Y)}{\partial K^Y} - \delta \right) - T(K^*), \quad (7.16)$$

and an optimal policy in the interest of national advantage requires:

$$\begin{aligned} & \max_{\alpha_1^X} Y^X \\ & \text{s.t. } K^X + K^Y = K, \quad K^* = K_e^X - K^X, \\ & \alpha_1^X \tau_r^X = \frac{\partial f(K^Y, L^Y)}{\partial K^Y} - \frac{\partial f(K^X, L^X)}{\partial K^X}. \end{aligned} \quad (7.17)$$

A necessary condition for a solution of this optimization problem is

$$(\partial f / \partial K^X) - \delta = MR(K^*), \quad (7.18)$$

where

$$MR(K^*) \equiv \frac{\partial f}{\partial K^Y} - \delta + K^* \frac{\partial^2 f}{(\partial K^Y)^2} - T'(K^*) \quad (7.19)$$

is the marginal revenue, net of foreign withholding taxes, from lending U.S. capital abroad. Because of the constraints of the optimization problem, an equivalent version of the optimality condition (7.18) is

$$\alpha_1^X \tau_r^X = \left(T'(K^*) - K^* \frac{\partial^2 f}{(\partial K^Y)^2} \right). \quad (7.20)$$

Condition (7.18) says that an optimal reform requires a repatriation of capital into the United States up to the point where the net-of-depreciation marginal product of capital in the U.S. equals the marginal loss in capital income net of foreign withholding taxes earned abroad. Condition (7.20) reveals that this point will be reached through market forces if the wedge between the world market rate of interest and the U.S. net-of-depreciation marginal product of capital equals the marginal reduction in withholding taxes plus the *increase* in capital income that the marginal rise in the world market rate of interest, resulting from the repatriation of capital, would by *itself* bring about. Clearly, as $T' \geq 0$, $\partial^2 f / (\partial K^Y)^2 < 0$, and, from (7.18) and

³⁶ Cf. Sections 7.1.1 and 7.1.2.

(7.19), $K^* > 0$, it holds that $\alpha_1^x \tau_r^x > 0$ in the optimum. Thus, in principle, ACRS could have been a reform that increased the U.S. advantage from international capital trade.

The optimality condition (7.18) is related to formulas that were derived in the earlier literature on the taxation of international capital income flows including the contributions of MacDougall (1960), Kemp (1961; 1964, Chapters 13 and 14; 1966), Jones (1967), and P.B. Musgrave (1969).³⁷ However, there is an important difference with regard to the means by which the optimizing country is assumed to satisfy (7.18). Without exception, the authors mentioned assume that the market equilibrium is characterized by an equation like (7.5). Hence they conjecture that an appropriate choice of the tax rate on repatriated earnings would be able to drive the market into an equilibrium that satisfies (7.18). In Section 7.3.2 it was shown that this view is fallacious since it neglects the neutrality properties of dividend taxation. Here it is assumed that (7.18) is achieved through Condition (7.20); that is, through subsidizing domestic investment via accelerated tax depreciation. As shown in the previous section, this is an efficient measure for reallocating the world capital stock.

Other differences refer to the terms $K^* \partial^2 f / (\partial K^Y)^2$ and $-T'(K^*)$ in (7.19). Most of the authors mentioned neglect the latter, some the former. P.B. Musgrave, for example, argues that the welfare of the capital exporting country is maximized when the pre-tax return in the capital exporting country equals the post-tax return in the capital importing country; i.e. when $\partial f / \partial K^X - \delta = (\partial f / \partial K^Y - \delta)(1 - \tau^Y)$ where τ^Y is the foreign withholding tax rate. This view is correct when there is a uniform withholding tax rate for dividends and interest income and when the capital exporting country is too small to affect the world market rate of interest, a condition that is clearly not satisfied for the United States. For the United States, the term $K^* \partial^2 f / (\partial K^Y)^2$ that measures the change in revenue resulting from the change in the world interest rate does not seem negligible.

The "optimal" reform of depreciation rules as defined by (7.18)–(7.20) is illustrated in Figure 7.5. The marginal revenue from lending capital to the

³⁷ Cf. also Pitchford (1970), Nadel (1971), Bade (1973), and Gandenberger (1985) and, in particular, the very comprehensive study of Gehrels (1971). Related analyses that allow for optimizing behavior of both countries include Feldstein and Hartman (1979) and Mintz (1986). The above formulas do not explicitly allow for strategic behavior of other countries, but the foreign-tax function $T(K^*)$ can easily be interpreted as incorporating a Nash–Cournot type reaction by foreign countries which the optimizing country knows and anticipates in its own decisions. This country would then have the role of a Stackelberg leader and the others would act as followers. Concerning the role of the United States in the world capital market this does not seem to be a bad idealization.

ROW is represented by the curve leading through points E, C, and H. By construction, the area under this curve between the point that characterizes the allocation of capital to the two regions and the endowment point M measures the U.S. capital income net of foreign withholding taxes earned abroad. Thus, in the situation before the reform, the foreign-earned U.S. income is represented by the area EMJH. This area plus the area FAJI is the U.S. national income (Y^X) before the reform. Analogously, DGNM plus ADEH is the pre-reform income earned by the ROW. The portion ADEH of this income is the ROW's rent from employing capital that was imported from the United States.

Through the introduction of an optimally designed ACRS and the resulting repatriation of capital to the U.S., the rent enjoyed by the ROW falls by the amount ABCH which is the difference between the decline in net-of-depreciation output ABLJ and the decline in U.S. foreign-earned capital income HCLJ. The United States on the other hand, gains by the triangle ACH which is the difference between the increase in U.S. net-of-depreciation output ACLJ and the reduction in foreign-earned capital income HCLJ. Obviously the U.S. gains less than the ROW loses. The welfare loss for both parties taken together is the triangle ABC, the reduction in aggregate output. This triangle can be interpreted as the social cost of the capital exporting country's attempt to participate in the rent it generates abroad.

It should be stressed that the figure illustrates the case where an "optimal" depreciation system is introduced. There is no evidence that ACRS was such an optimal system. On purely theoretical grounds it cannot be ruled out that the reform was over or undershooting the appropriate degree of acceleration in depreciation allowances. Published data on the U.S. net foreign position suggest the former. According to these data, the net foreign position turned negative in 1985, and so it seems that far more capital was repatriated into the United States than would have been optimal under the aspect of national advantage.³⁸

³⁸ See *Survey of Current Business* 65, June 1985, Table 2. Unfortunately, the data are not very reliable since they include directly invested assets being evaluated at nominal historical book values. Most of U.S. direct investment abroad results from the post-war period where significant parts of European industry were bought under exceptionally favorable conditions. An attempt was made to adjust the data for this distortion through weighting the annual gross direct investment flows between the United States and the rest of the world since 1948 with growth factors that were derived from American and European stock market indexes. The result is a jump of the 1984 U.S. foreign net position from the value of \$28 billion, published in the statistics, to \$405 billion. Given the huge magnitudes of current U.S. trade deficits (\$144b and \$134b in 1985 and 1986, respectively) it will not take long, however, until even this value will have melted away. -

The 1986 U.S. tax reform can be seen as a policy of correcting this overshooting. As argued above, both the cut in tax rates, given ACRS, and the prolongation of depreciation periods, given the tax rates, works in the direction of lower interest rates and capital exports from the United States into the rest of the world. It may therefore well be possible that the final result of ACRS and the 1986 tax reform taken together will be a combination of the world interest rate and the net foreign position that approximates a policy which maximizes national advantage better than ACRS alone.

This should not be taken to mean that the two tax reforms were *consciously* designed to exploit a U.S. monopoly position in the world capital market, and that the world debt crisis was deliberately produced. To hunt for the gains illustrated in Figure 7.5, if they are going to occur at all, may not have been the motivation of the deciding political agents. But does this mean anything? Economists are no moralizers. They do not condemn optimization, and they are hardly ever interested in whether the agents they model are "really" maximizing in a conscious manner. Even if there is no conscious optimization, economic decisions can often be interpreted quite well *as if* they were the solutions to maximization problems. Only in this limited sense might it be possible to explain ACRS, the world debt crisis, and the 1986 U.S. tax reform as an attempt to maximize the U.S. advantage from lending its capital abroad.