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Tax Incentives and International Capital Flows:
The Case of the United States and Japan

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Abstract

This paper explores how the tax treatment of investment and savings affects international capital flows as well as national and global welfare. Focusing on portfolio investment, it evaluates the international effects of capital income taxes in the United States and Japan. During the 1980s, these taxes encouraged capital flows to the United States both by favoring investment in that country and by harming the country's relative savings performance. The paper concludes that the internationalization of financial markets calls for a careful study of the international implications of domestic tax policies.

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Summary

In recent years, world financial markets have become more integrated as barriers to international capital movements have been removed. This raises important issues for the international transmission and coordination of tax policy. Tax rules, especially those regarding the taxation of capital income, can have powerful effects on the demand for capital and on savings-investment balances. Accordingly, in an integrated world financial market, they can set in motion large capital flows. These tax rules can, therefore, interact to affect worldwide resource allocation and welfare, with the strength of the effects depending on how other nontax factors intervene.

This paper examines how tax treatments of investment and savings affect international capital flows as well as national and global welfare. It adopts the concepts of the tax wedge and cost of capital and extends them to measure the incentive effects of capital income taxation on cross-border investments. The study then uses these concepts to examine how reforms of capital income taxes in the United States and Japan and their interaction with the macroeconomic environment have created incentives for international portfolio investments that may have contributed to bilateral capital flows during the 1980s.

The results reveal that the tax burden on assets located in Japan exceeded the tax burden on assets located in the United States during the 1980s. Taxes may therefore have encouraged capital flows to the United States during this period. Investment incentives in the United States, owing to a more favorable corporate tax treatment, rose between 1980 and 1984, but fell in 1987. The repeal of investment credits, less-favorable depreciation rules, and lower inflation rates contributed to the reduced incentives to invest in the United States in 1987.

As regards the taxation of savings, for assets located in both countries a U.S. saver faced a heavier tax burden than a Japanese saver. If higher after-tax returns lead to increased savings, the relative savings performance of the United States may therefore have suffered. Accordingly, large U.S. capital inflows may have been encouraged not only by investment incentives but also by disincentives to savings.

I. Introduction

The internationalization of financial markets has contributed to the growing interdependence of the world's economies. In particular, policy or other shocks that affect domestic savings-investment balances may set in motion large international capital flows. Accordingly, policymakers increasingly recognize that their macroeconomic policies may have important international ramifications.

Tax rules, especially those regarding the taxation of capital income, potentially have powerful effects on savings-investment balances and, therefore, on external current accounts and international capital flows. Moreover, the integration of financial markets has made tax rules more powerful in affecting the global allocation of investment and savings, thereby potentially distorting the worldwide allocation of resources. Thus, with the capital markets of the major industrial countries now much more integrated, changes in the structure of capital income taxes in one country can have major implications for other countries by affecting international capital flows and global efficiency. This raises important issues of surveillance and coordination in an international context (see Tanzi and Bovenberg (1988)). Nevertheless, with only a few recent exceptions, 1/ the international implications of domestic tax rules have received relatively little attention.

This study explores how tax incentives for investment and savings affect international capital flows as well as national and global welfare. It measures the incentive effects of capital income taxation by using the concept of the tax wedge, which has been developed in the academic literature (see, e.g., King and Fullerton (1984), Auerbach (1983), and Boadway (1985)). Most studies using this concept have applied it only to investments financed domestically. A major purpose of this study is to extend the methodology to analyze cross-border investments. This paper also presents some results on how the tax systems in Japan and the United States have interacted over the period 1980-87 in a manner that could affect bilateral capital flows and the efficiency with which resources are allocated between them.

The plan of the paper is as follows. Section II discusses the scope of the study. Section III introduces the concept of the tax wedge and describes how it can be used to measure the incentive effects of capital income taxation, both in closed and in open economies. Section IV develops a methodology for summarizing the effects of capital income taxation on international capital flows and welfare. Section V presents the information on tax parameters and the economic environment needed for the application of the methodology to Japan and the United States and briefly discusses the major tax reforms in recent years in the two countries. Section VI applies the methodology to Japanese and

1/ See Alworth and Fritz (1988); Fukao and Hanazaki (1987); Sinn (1987); Tanzi (1987); Sørensen (1987); and Boadway, Bruce, and Mintz (1984 and 1987).

U.S. data for the years 1980, 1984, and 1987, in order to highlight the major tax reforms and interprets the results. Finally, the concluding section relates the results to the observed movements in savings and investment balances in Japan and the United States and briefly examines the case for coordinating tax policy internationally.

II. The Scope of the Study

This study focuses on portfolio rather than direct investment for two reasons. First, portfolio investment can be expected to be more sensitive to after-tax rates of return than direct investment; the latter investments are undertaken for reasons other than temporary higher rates of return, such as avoiding protectionist barriers or entering a market. Second, the share of portfolio investment in private capital flows has increased in recent years, in particular, during the 1980s. Tables 1 and 2 show the composition of private capital flows from and to the United States during the period 1980-87. In Japan, developments in long-term capital flows are almost entirely determined by movements in portfolio investment (Figure 1).

This study does not explicitly consider the role of intermediaries, although Tables 1-3 reveal their importance. Japanese savers in particular show a marked preference for saving through intermediaries (Table 3). Nevertheless, some of the study's results will continue to hold, even if funds are channeled through intermediaries, if these institutions are competitive, earning no monopoly profits at the margin. An explicit analysis of the role of intermediaries would require a separate study.

This study examines corporate investments that relate to machinery. Because tax treatments of investments in structures or noncorporate residential assets, especially housing, differ from those of corporate investments in machinery, some modification would be necessary to apply the formulas developed in the study to these investments.

Finally, Table 1 reveals that part of portfolio investments were in government securities. Although we do not explicitly consider investments in government securities, our calculations can be readily used to infer the impact of taxes on after-tax rates of return to savers as indicated in Section VII.1

III. Capital Income Taxation in Closed and Open Economies

After introducing the concept of the tax wedge, this section analyzes how capital income taxes influence capital accumulation and welfare in a closed economy. It then turns to an open economy that is integrated in world financial markets. While the initial discussion considers the small open economy, which is conceptually the easiest to

Table 1. The United States: Private Capital Flows, 1980-87

(In millions of U.S. dollars)

	1980	1981	1982	1983	1984	1985	1986	1987
U.S. private investment abroad <u>1/</u>	83,382	104,516	95,304	44,265	15,643	43,203	113,891	100,234
Direct investments abroad	27,517	12,973	-20,596	-549	4,277	18,770	29,312	49,318
Foreign securities	5,853	720	12,100	8,353	5,301	23,706	20,385	13,530
Bonds	1,521	2,330	10,890	972	4,134	11,181	8,782	9,240
Corporate stocks	4,332	-1,610	1,210	7,381	1,167	12,525	11,603	4,290
U.S. claims on unaffiliated foreigners reported by U.S. nonbanking concerns	3,175	1,181	-7,270	6,534	-5,061	-1,005	4,219	-3,145
U.S. claims reported by U.S. banks, not included elsewhere	46,794	89,622	111,070	29,927	11,126	1,732	59,975	40,530
Foreign private investment in the United States <u>2/</u>	68,514	73,503	100,672	91,042	103,268	165,106	240,564	153,985
Direct investments in the United States	28,584	25,668	15,963	12,384	27,522	20,032	35,799	41,513
U.S. securities	17,430	3,363	25,156	28,911	37,810	104,322	110,482	22,482
Bonds	1,179	3,541	13,268	8,833	39,619	75,196	67,503	15,761
U.S. Treasury securities	1,903	2,392	7,253	8,088	24,349	25,441	7,862	-13,108
Corporate and other bonds	-724	1,149	6,015	745	15,270	49,755	59,641	28,869
Corporate stocks	16,251	-178	11,888	20,078	-1,809	29,126	42,979	6,721
U.S. liabilities to unaffiliated foreigners reported by U.S. nonbanking concerns	11,757	180	-3,074	-595	4,087	-1,566	-2,833	2,212
U.S. liabilities reported by U.S. banks, not included elsewhere	10,743	44,292	62,627	50,342	33,849	42,318	97,116	87,778

Source: U.S. Department of Commerce, Survey of Current Business.

1/ Changes (including valuation changes) in the year-end balance of U.S. private assets abroad.2/ Changes (including valuation changes) in the year-end balance of foreign nonofficial assets in the United States.

Table 2. The United States: Private Capital Flows, 1980-87

(In percent)

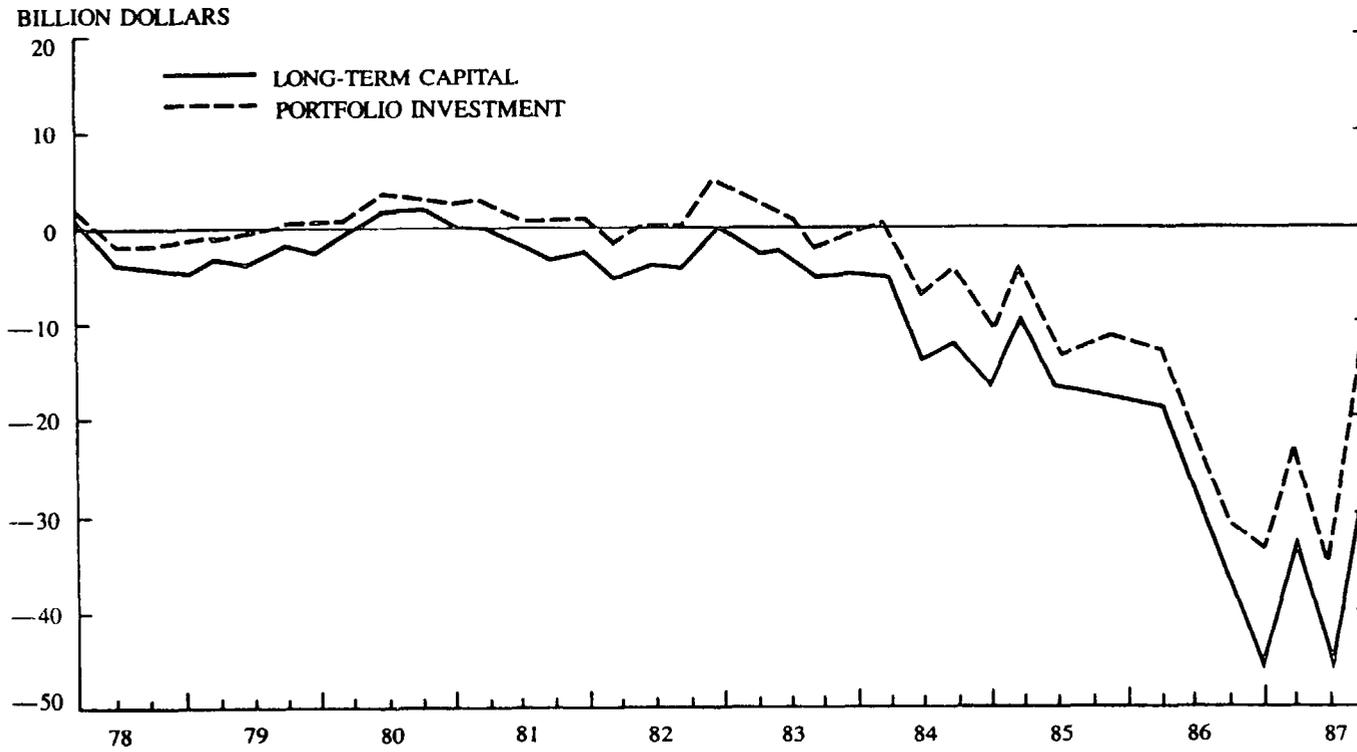
	1980	1981	1982	1983	1984	1985	1986	1987	1980-87 Average
U.S. private investment abroad <u>1/</u>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Direct investments abroad	33.0	12.4	-21.6	-1.2	27.3	43.4	25.7	49.2	21.0
Foreign securities	7.0	0.7	12.7	18.9	33.9	54.9	17.9	13.5	19.9
Bonds	1.8	2.2	11.4	2.2	26.4	25.9	7.7	9.2	10.9
Corporate stocks	5.2	-1.5	1.3	16.7	7.5	29.0	10.2	4.3	9.1
U.S. claims on unaffiliated foreigners reported by U.S. nonbanking concerns	3.8	1.1	-7.6	14.8	-32.4	-2.3	3.7	-3.1	-2.8
U.S. claims reported by U.S. banks, not included elsewhere	56.1	85.7	116.5	67.6	71.1	4.0	52.7	40.4	61.8
Foreign private investment in the United States <u>2/</u>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Direct investments in the United States	41.7	34.9	15.9	13.6	26.7	12.1	14.9	27.0	23.3
U.S. securities	25.4	4.6	25.0	31.8	36.6	63.2	45.9	14.6	30.9
Bonds	1.7	4.8	13.2	9.7	38.4	45.5	28.1	10.2	19.0
U.S. Treasury securities	2.8	3.3	7.2	8.9	23.6	15.4	3.3	-8.5	7.0
Corporate and other bonds	-1.1	1.6	6.0	0.8	14.8	30.1	24.8	18.7	12.0
Corporate stocks	23.7	-0.2	11.8	22.1	-1.8	17.6	17.9	4.4	11.9
U.S. liabilities to unaffiliated foreigners reported by U.S. nonbanking concerns	17.2	0.2	-3.1	-0.7	4.0	-0.9	-1.2	1.4	2.1
U.S. liabilities reported by U.S. banks, not included elsewhere	15.7	60.3	62.2	55.3	32.8	25.6	40.4	57.0	43.7

Source: U.S. Department of Commerce, Survey of Current Business.

1/ Changes (including valuation changes) in the year-end balance of U.S. private assets abroad.2/ Changes (including valuation changes) in the year-end balance of foreign nonofficial assets in the United States.

FIGURE 1

JAPAN: LONG-TERM CAPITAL AND PORTFOLIO INVESTMENT¹



Source: Fukao and Okima (1988)

¹Shows changes in the long-term capital balance and in the portfolio investment balance.

Table 3. Financial Assets of Households

(In percent)

	Japan 1984	United States 1983
Currency and sight deposit	11.0	5.8
Time deposit	59.7	31.7
Insurance and pension	15.7	25.5
Securities (stocks and bonds)	13.1	35.1
Stocks	(1.5)	(22.6)
Total	<u>100</u>	<u>100</u>

Source: Tachibanaki (1988), p. 23.

handle, the methodology of the paper is developed for the larger open economy, whose policies may influence world market conditions.

1. The tax wedge concept

An investment project involves a saver sacrificing consumption today by transferring resources to the project. At some point in the future, the saver earns a return on the investment. If taxes are absent, the saver's return coincides with the rate of return earned on the investment. Capital income taxes, however, constitute a wedge between the pre-tax return on investment and the after-tax return on savings.

The concept of the tax wedge can be explained ^{1/} by defining three rates of return: the required before-tax return on investment p , the market return r , and the after-tax return on savings s . All these returns are measured in real terms.

The market return r represents the price of funds on capital markets and provides the link between the firm carrying out the investment and the saver providing the financing. It is the return that the firm pays to the saver after it has paid corporate tax but before the saver has met personal tax liabilities. The funds may be in the form of either debt or equity. In the case of debt finance, the market return corresponds to the real interest rate. For equity financing, it amounts to the real return on equity (including retained earnings) before personal taxes.

The minimum rate of return that the firm must earn before taxes in order to be able to pay any taxes due and a market rate of return r is denoted by p . This required before-tax rate of return is the conventional user cost of capital measured net of depreciation. The relationship between p and r depends both on macroeconomic variables, such as the inflation rate, and on tax provisions, for example, regarding depreciation allowances, investment grants, and the deductibility of interest expenses. The cost of capital function, which links p to r , summarizes these various factors:

$$c(r) = p \tag{1}$$

The cost of capital function generally depends on the type of asset and industry as well as on the form of financing because the tax system typically discriminates between different assets, industries, and types of financing.

The after-tax return function formalizes the relationship between the market rate and the after-tax return received by the saver:

^{1/} Auerbach (1983) and Boadway (1985) provide excellent surveys of the literature in this area.

$$d(r) = s \quad (2)$$

This relationship is typically affected by the inflation rate and the personal tax treatment of the saver. Furthermore, it generally depends on whether the saver provides funds directly or through an intermediary, such as a bank, pension fund, or life insurance company, and on whether the funds are in the form of debt or equity.

The total tax wedge t is defined as the difference between the required pre-tax rate of return and the post-tax return received by the saver

$$t = p - s \quad (3)$$

One can interpret the tax wedge as the equivalent of a wealth tax rate because it is the difference between two rates of return on an asset. ^{1/}

2. The closed economy

The extensive literature on the effects of capital income taxation in a closed economy summarizes the disincentive effects of capital income taxation by the total tax wedge t . King and Fullerton (1984), for example, calculated these tax wedges for 81 different hypothetical investment projects in each of the following four countries: the United States, the United Kingdom, the Federal Republic of Germany, and Sweden. The 81 projects combine three types of assets (machinery, buildings, and inventories), three types of industries (manufacturing, commerce, and other), three types of financing (debt, retained earnings, and new share issues), and three types of owners (households, tax-exempt institutions, and insurance companies). The study did not consider international capital flows. Accordingly, firms are assumed to finance their investments by raising funds from savers who reside domestically.

a. Savings and investment

Figure 2 illustrates how the total tax wedge t affects the capital market equilibrium in a closed economy setting. The investment schedule relates the flow of investment to p . According to the neoclassical theory of investment behavior, which we shall assume here, firms carry out investments until the before-tax return (i.e., the internal rate of return) equals the required rate of return p . Accordingly, in the absence of externalities, the investment schedule represents the marginal product of investment at different levels of investment. Its

^{1/} Alternatively, the effective marginal tax rate, found by dividing the tax wedge by the before-tax rate of return p , can describe the effects of capital income taxation.

downward slope reflects diminishing marginal returns on investment. ^{1/} The slope of the investment curve is inversely related to the elasticity of investment with respect to the required return p .

The savings schedule relates the flow of savings to the after-tax return s . The sign of the relationship between savings and s is ambiguous, both empirically and theoretically. The upward slope of the savings schedule reflects the assumption that a higher after-tax return stimulates savings. The smaller the slope is, the larger the savings elasticity becomes.

If taxes are absent and intermediation costs are ignored, both the before- and after-tax returns coincide with the market return

$$r = s = p \quad (4)$$

and equilibrium in Figure 2 is found at the point A where the savings and investment schedules intersect.

Taxes drive a wedge between the before- and after-tax returns. Given the investment and savings elasticities, the total tax wedge t contains enough information to find the effects of capital income taxes on savings and investment. To illustrate, in Figure 2 the tax wedge is given by the distance BC. Thus, in this particular case, the wedge is positive and the required before-tax return on investment exceeds the after-tax return received by the saver. ^{2/} This positive wedge reduces both investment and savings by the distance $I(0)I(1)$. The more elastic savings and investment are, the flatter the curves become, and the more powerful a given tax wedge is in affecting savings and investment.

b. Welfare

Once the effects of the tax wedge on savings and investment are determined, the welfare effects in a closed economy can more easily be determined. On the savings side, households are assumed to equate the after-tax return on their marginal savings s to the opportunity cost of delaying consumption, which measures the social costs of financing the

^{1/} Thus, the investment demand curve is in flow terms rather than in stock terms because this section focuses on the short-term equilibrium. These flow demands are derived from a model with adjustment costs, which prevent instantaneous stock adjustment. Alternatively, one could model the long-term capital market equilibrium in stock terms. In that case, a lower p would raise the stock demand for capital. This would imply a higher rate of net investment during the transition, assuming rising short-run adjustment costs.

^{2/} Results below indicate that in some cases the tax wedge is negative. In that case, the government subsidizes marginal investments.

FIGURE 2

TAX WEDGE AND WELFARE COSTS: THE CLOSED ECONOMY CASE

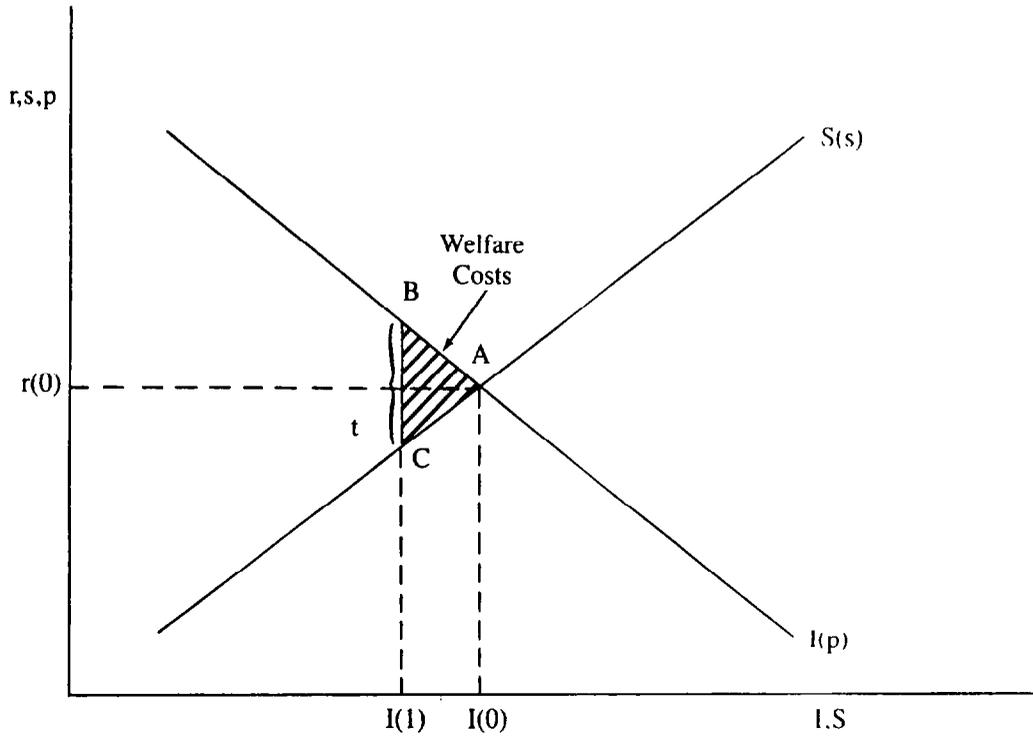
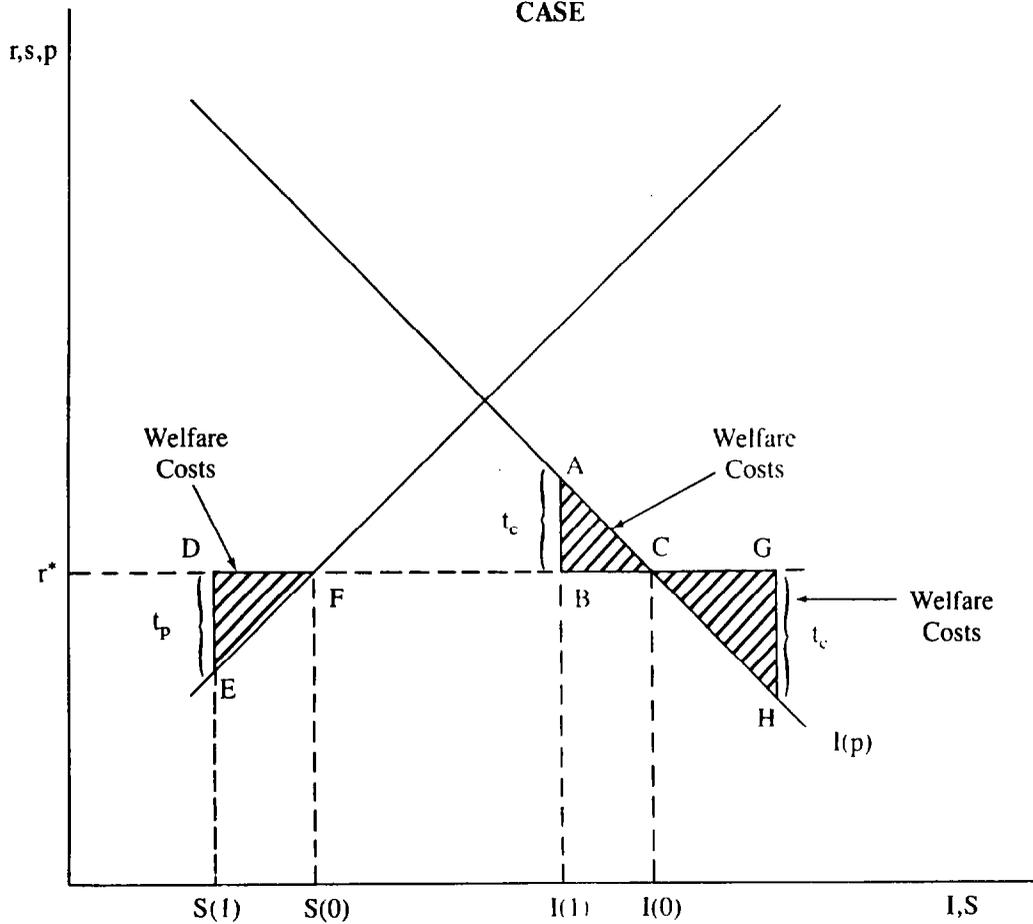


FIGURE 3.

TAX WEDGE AND WELFARE COSTS: THE SMALL OPEN ECONOMY CASE





investment. 1/ On the investment side, firms equate the required return p to the before-tax return on marginal investment. This latter return includes both the return received by savers and the tax revenues collected by the government. Accordingly, in the absence of externalities, p measures the social benefits that a marginal investment earns for society as a whole. 2/ The total tax wedge, therefore, captures the difference between the social benefits p and the social costs s associated with a marginal investment. In Figure 2 the tax wedge reduces capital accumulation by $I(0)I(1)$. The social benefits of these crowded-out units, as measured by the before-tax return p , exceed their social costs, as measured by the after-tax return s . Accordingly, the tax wedge reduces welfare by the triangle ABC. If investment and savings become more sensitive to rates of return, a given tax wedge implies larger welfare losses.

The total tax wedge in the closed economy must be divided into two parts in order to find the effect of capital income taxes on the market return r . The first part is the corporate tax wedge t_c between the before-tax and market returns:

$$t_c = p - r \quad (5)$$

The second wedge, which is called the personal tax wedge t_p , measures the effect of personal taxes and amounts to the gap between the market return and the after-tax return received by the saver:

$$t_p = r - s \quad (6)$$

In a closed economy, if the size of the total tax wedge is kept unchanged, the personal-corporate split affects neither capital accumulation nor welfare. In these circumstances, the composition of the tax wedge affects only the market return. If the personal tax wedge is reduced to zero and the corporate tax wedge is increased so as to account for the whole predetermined wedge between p and s , there would be pressure on investment to decline. Thus, the market rate would be reduced, while savings would be stimulated, further reducing the market rate. It can be readily demonstrated that the market rate would decline by just the amount needed to offset the effects of the changing tax factors on the after-tax return to savings and the costs of investment. It is only by changing the size of the total tax wedge that savings and investment are modified. If the share of the personal tax wedge in the total tax wedge becomes larger, the market rate falls less. The market

1/ Thus, the social costs of postponing consumption equal the private costs. This assumes that private saving does not generate any externalities, which requires that the government can attain the first-best growth path by transferring income between generations in a lump-sum fashion.

2/ This assumes that the government can use nondistortionary taxes, such as a lump-sum tax. Otherwise, the social value of one marginal unit of tax revenue may exceed unity.

return rises if the share of the personal tax wedge in the total tax wedge becomes large enough.

3. The open economy

a. Savings, investment, and capital flows

In an open economy, domestic savings and domestic investment do not necessarily balance because of the possibility of nonzero net capital flows with the rest of the world. The existence of international capital markets has important implications for the analysis of capital income taxation. In particular, it becomes important to distinguish between savings and investment incentives and to attend to the composition of the tax wedge.

Figure 3 illustrates the differential effects of savings and investment incentives in the case of a small open economy in which international capital markets fix the domestic market return at the rate of return on world capital markets r^* . ^{1/} If taxes are absent, both the before-tax return on investment and the after-tax return on savings equal the return on world markets.

$$p = s = r^* \tag{7}$$

In the case depicted in Figure 3, investment exceeds savings by the distance $I(0)S(0)$ if domestic returns equal the world rate of return. Accordingly, the economy runs a current account deficit of that magnitude. ^{2/}

The introduction of capital income taxes affects investment, savings, and capital flows. Unlike in the closed economy, where the total wedge affects both savings and investment, in the small open economy, the corporate tax component of the wedge affects only investment while the personal tax component affects only savings.

In Figure 3, a corporate tax wedge of the size AB reduces investment by the distance $I(0)I(1)$ but fails to affect domestic savings. Accordingly, the current account deficit falls by $I(0)I(1)$. It is of interest that the infinitely elastic supply of world savings implicit in the fixed market return r^* makes the corporate tax wedge more powerful in affecting domestic investment than in a closed economy. This is because the market rate would decline in a closed economy, which would cushion the effect of raising the corporate tax component.

^{1/} This assumes that assets are perfect substitutes. Moreover, corporate taxes are assumed to be levied on a source basis while the residence principle governs personal taxation. Subsection IV.2 explains and elaborates on these assumptions and relaxes some of them.

^{2/} Over time, the current account deficit may fall as the investment and savings schedules shift in response to the accumulation of capital and wealth.

The personal tax wedge does not affect domestic investment but reduces domestic savings and, therefore, weakens the external current account. In Figure 3, for example, a personal tax wedge of the magnitude DE widens the current account deficit by the distance $S(0)S(1)$. As with the effect of corporate taxes on investment, the more open the economy, the more powerful the effects of the personal tax wedge on domestic savings.

b. National welfare effects

The openness of the economy also has important consequences for the effects of capital income taxation on national welfare. In the small open economy in Figure 3, the rate of return on world markets r^* corresponds to the national cost of financing a marginal investment. 1/ The required before-tax rate of return measures the national benefits associated with a marginal investment (see subsection III.2.b). Accordingly, the corporate tax wedge, which is the difference between the before-tax and market returns, measures the gap between the national benefits and national costs associated with marginal investment. In Figure 3, the corporate tax wedge AB reduces national welfare by the triangle ABC because this tax wedge crowds out the investment units $I(0)I(1)$ for which national benefits exceed national costs. A given corporate tax wedge imposes larger national welfare losses in an open economy than it does in a closed economy owing to its greater affect on investment.

The personal tax wedge corresponds to the gap between the national benefits and costs associated with a marginal unit of domestic savings. In Figure 3, a personal tax wedge of the size DE reduces national welfare by the triangle DEF. In a closed economy, a subsidy at the corporate level could have mitigated the welfare losses. In particular, a negative corporate tax wedge equal in absolute value to the personal tax wedge would have avoided the welfare losses altogether. In an open economy, in contrast, such an investment subsidy only adds welfare costs at the investment side to those imposed by the savings tax. For example, in Figure 3, the investment subsidy implicit in the negative corporate tax wedge $-GH = -DE$ adds welfare losses amounting to the triangle CGH to the welfare costs corresponding to the area DEF imposed by the taxation of savings. 2/

1/ This assumes that the host country collects all corporate taxes while the residence country collects all personal taxes. Accordingly, withholding taxes on personal income are assumed to be zero. Subsection IV.3 discusses and relaxes some of these assumptions.

2/ Only if tax wedges do not affect the market return in a closed economy, would the welfare costs in a closed economy equal those in an open economy. In all other cases, the welfare costs in an open economy exceed those costs in a closed economy.

c. World welfare effects

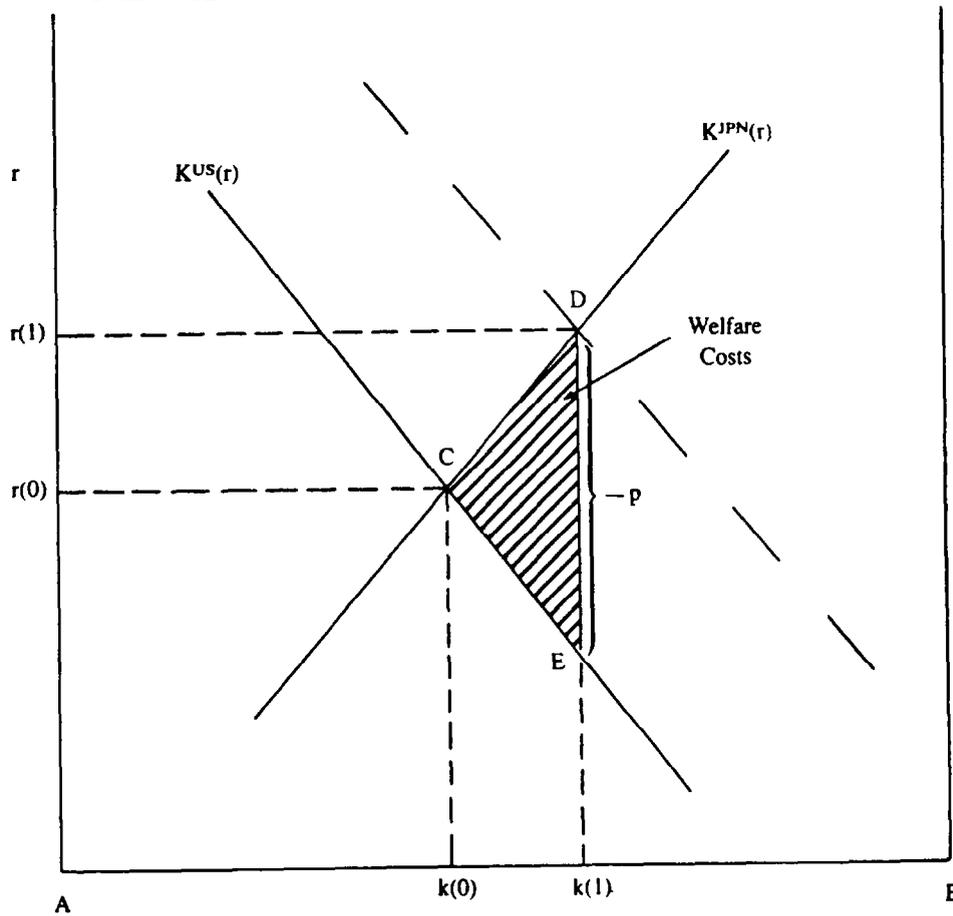
This subsection examines how international differences in investment incentives affect global efficiency. Instead of a small open economy, we now consider a hypothetical world or closed economy consisting of only the United States and Japan. In Figure 4, the distance between the two vertical axes measures the size of the world capital stock, which is assumed to be fixed so as to focus on the international allocation of capital. ^{1/} The solid downward and upward sloping lines represent the marginal product curves in, respectively, the United States and Japan. The schedule for the United States is measured from the left axis and that in Japan from the right axis. If taxes and externalities are absent, these curves coincide with the capital demand curves as a function of the cost of funds. In that case, the intersection of the two solid lines C represents the equilibrium in world capital markets. At this nontax equilibrium, the return on world markets amounts to $r(0)$ while a part $AK(0)$ of the world capital stock is located in the United States.

If the United States provides an investment incentive corresponding to a negative corporate tax wedge equal in absolute value to $-p = DE$, the capital demand curve in the United States shifts upward to the dotted line. As a consequence, the return on world markets rises to $r(1)$ and a part of the world capital stock corresponding to $K(1)K(0)$ gradually moves from Japan to the United States. During the transition to this new long-run equilibrium, net investment in the United States rises relative to that in Japan and the external current account of the United States weakens.

Conceptually, differential investment incentives distort the global playing field and, if externalities are absent, harm global welfare. With differential investment incentives, equal after-tax returns on assets located in different countries correspond to different before-tax returns on those assets. This violates a necessary condition for efficiency in the allocation of capital, namely that before-tax returns on different assets should be equal. Overall welfare could be raised by relocating capital from countries with a lower before-tax return to those with higher returns. For example, in Figure 4 the differential investment incentive corresponding to DE reduces world welfare by the triangle DCE because the capital $K(0)K(1)$ earns a lower before-tax return in the United States than it could earn in Japan.

^{1/} If savings are elastic with respect to the after-tax rate of return, capital income taxation affects the global capital stock and, therefore, global intertemporal efficiency. In the absence of externalities, the total tax wedges measure the gap between the social benefits of a marginal investment and the social costs of financing it by a marginal unit of saving (see subsection III.2.b). Accordingly, they provide information on how marginal changes in the world capital stock affect global welfare.

FIGURE 4
CORPORATE TAX WEDGES AND
THE INTERNATIONAL ALLOCATION OF THE CAPITAL STOCK





IV. Methodology

In this section, the tax wedge concept is extended to cross-border portfolio investments by allowing foreign residents to finance domestic investments and domestic residents to finance foreign investments. In particular, tax wedges are computed for all host-residence (or saver-investment) combinations. A residence country is characterized by a typical saver while a typical investment represents the host country. Regarding the financing instruments, the study distinguishes between debt and equity finance. New share issues and retained earnings are assumed to account for fixed proportions of total equity financing.

The study disaggregates the total tax wedge for each host-residence combination into three separate wedges corresponding to, respectively, corporate taxes (t_c), withholding taxes (t_w), and residence taxes (t_r) (Figure 5). The withholding and residence wedges add up to the personal tax wedge (t_p). Subsection IV.1 discusses the measurement of the corporate tax wedge. Subsection IV.2 defines international differences in investment incentives and explores how differential corporate tax wedges relate to these differences. It shows that the residence principle cannot be assumed, therefore precluding the easier route considered in the preceding section whereby investment incentives would be identified with corporate tax wedges. The effects of investment incentives on international capital flows and global efficiency are analyzed in subsection IV.3. Subsection IV.4 defines international differences in savings incentives, and subsection IV.5 then explores the corresponding effects of savings incentives. Subsection IV.6 defines the host tax wedge (t_h) as the sum of the corporate and withholding tax wedges and explores how the host-residence split affects national welfare. The Appendix contains the mathematical expressions for the tax wedges and their components for, respectively, debt- and equity-financed investments.

1. Corporate tax wedges

To compute the corporate tax wedge, two assumptions are made. First, only the host country collects corporate taxes. Second, corporate taxes do not discriminate between domestic and foreign savers. Accordingly, the corporate tax rate on a given investment is the same irrespective of whether the saver financing the investment is residing abroad or domestically.

The two assumptions are generally met for portfolio investments. Even in the case of direct investments, the host country tax system may determine the effective corporate tax wedge on marginal investments. This is the case, for example, if the residence country has a territorial system of corporate taxation or if firms are in an overall excess

credit position under a system of worldwide taxation. ^{1/} Moreover, residence countries typically tax income from subsidiaries only upon repatriation unless it is earned in a tax haven. Under these circumstances, host taxes determine marginal investment incentives if firms, at the margin, finance foreign investment by retained earnings, which appears to be a dominant form of marginal financing (see Hartman (1985) and Sinn (1987)).

2. The measurement of investment incentives

Section III used the corporate tax wedge to measure the effect of capital income taxation on investment incentives in a small open economy. This procedure, which greatly simplifies the analysis, is valid only if international capital markets equalize market returns across different jurisdictions. This, in turn, requires two assumptions. First, assets located in different countries should be perfect substitutes in demand so that savers residing in a given country require the same after-tax returns on all their assets. Second, personal taxes should be collected on the basis of the residence principle. According to this principle, residence governments tax real capital income (after corporate tax) at a personal tax rate that does not depend on the country where the capital income originates. Only if this principle holds, does the equalization of after-tax returns by savers correspond to the same market returns (Figure 6).

In practice, the residence principle may fail to hold for at least three reasons. ^{2/} First, even if residence countries apply the residence principle to nominal returns, real returns are likely to be taxed differently if inflation rates diverge between host countries. In particular, financial instruments denominated in the currency of low-inflation countries tend to benefit from a preferential tax treatment of capital gains because these securities earn a large part of their returns in the form of an exchange rate appreciation (i.e., capital gains), which are typically taxed at lower rates (see, e.g., Gordon (1986) and Sørensen (1986)).

Second, withholding taxes on income earned by nonresidents violate the residence principle if savers do not have sufficient residence

^{1/} Under a territorial system, the residence country exempts foreign-source income from corporate taxation. Under a system of worldwide taxation, the residence country taxes global income but credits foreign corporate taxes against domestic corporate tax liabilities as long as foreign corporate taxes do not exceed the domestic corporate tax liabilities calculated on the foreign source income.

^{2/} Differential opportunities for tax evasion are a fourth reason why the residence principle may fail. Savers may find it easier to evade residence taxes on foreign assets than corresponding taxes on domestic assets.

TAX WEDGES: SOME CONSTRUCTIONS

FIGURE 5
host B

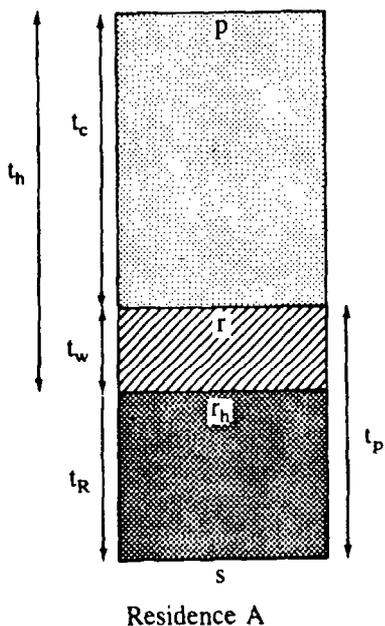


FIGURE 6
host A host B

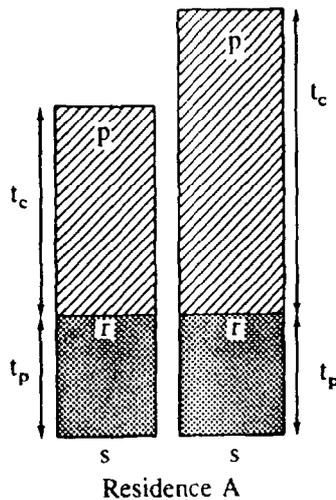


FIGURE 7
host A host B

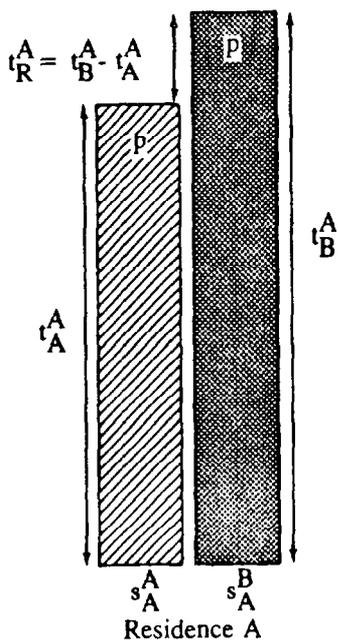
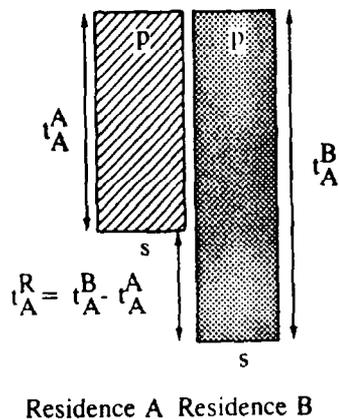


FIGURE 8
host A



liabilities against which to credit the foreign withholding taxes. This may be the case if they save through tax-exempt institutions. 1/

A third reason why the residence principle may fail concerns the integration of corporate and personal taxation. Under the numerous methods of integration, residence countries typically impose different tax rates at the personal level depending on whether corporate tax has been levied domestically or abroad (see Sato and Bird (1975)). Moreover, host countries may allow corporate credits only if dividends are paid to residents.

For these reasons, the residence principle, although it would have simplified the analysis, will not be adopted here. As a consequence, differences in investment incentives cannot be measured simply as differences in corporate tax wedges. Instead, the incentives are measured by comparing, for a given saver, the total tax wedges on investments located in different host countries as illustrated in Figure 7.

Investment incentives may differ for savers residing in different countries if the residence principle does not hold. In that case, the tax systems provide incentives for tax arbitrage between savers residing in different countries. However, savers do not fully exploit these arbitrage opportunities because assets located in different countries--although easily substitutable--are assumed not to be perfect substitutes in demand. 2/

3. The effect of investment incentives on international capital flows and global efficiency

The measure of investment incentives developed here summarizes how personal and corporate income taxes interact to affect international capital flows. If, for example, tax wedges on assets located in country A exceeds those on assets in country B, and if all other conditions are equal, the tax system provides incentives for capital flows from A to B. 3/

1/ Another important case is savings channeled through banks, because withholding taxes are imposed on gross interest income so that no deduction is allowed for interest expense and other costs of making the loan. The withholding taxes, therefore, often exceed the residence tax liability on net income from bank loans.

2/ Accordingly, this study does not assume that savers necessarily require the same after-tax rate of return s on assets located in different countries. Thus, s_A^A is not necessarily equal to s_A^B in Figure 7.

3/ Tax wedges provide an unambiguous indicator of the effect of the tax system on investment incentives only if the tax wedge on assets located in country A exceeds that on assets located in B for all savers, that is, both those residing in A and those in B.

Such differences indicate how the interaction of capital income taxes in various countries distorts the international allocation of capital by violating what may be stated as the principle of capital export neutrality. According to this principle, savers should face the same tax rate on assets located in different countries (in the absence of externalities) so that tax systems do not interfere with an efficient global allocation of capital. The principle requires that investors be indifferent between assets located in different countries both on a before-tax and after-tax basis. If the intercountry tax wedges differ, equal after-tax returns will fail to yield the equal before-tax returns that are required for an efficient allocation of capital. Figure 7 illustrates that a higher tax wedge on assets in B compared with that in A causes the before-tax return in B to rise above that in A. Accordingly, in the absence of externalities, moving capital from A to B would raise overall welfare.

4. The measurement of savings incentives

International differences in saving incentives are measured by comparing, for a given asset, the total tax wedges on savers residing in different countries (Figure 8). In this paper these differences are entirely due to differences in personal tax treatment as a consequence of the assumption (see Section IV.1) that the corporate tax rate on a given asset is the same whether or not it is financed abroad or domestically.

5. The effect of savings incentives on international capital flows and global efficiency

International differences in savings incentives, as measured by differences in the tax wedges borne by savers in different countries, will, *ceteris paribus*, tend to be reflected in lower savings in countries where savers bear the higher tax burden. Accordingly, these differences would contribute to a weaker current account position in those countries, thereby influencing international capital flows.

Differences in savings incentives indicate that capital income taxes violate the so-called principle of capital import neutrality according to which, the tax treatment of a given asset should not discriminate between savers residing in different countries (in the absence of externalities). Departures from capital import neutrality are associated with an inefficient allocation of global savings because they drive a wedge between the marginal rates of time preference of different savers. Figure 8 illustrates that the cost of postponing marginal consumption for the saver residing in A who faces the lower tax burden exceeds that for the saver who resides in B. Thus, the welfare cost from the allocation of savings to meet a given overall investment level would have been lowered if the less heavily taxed saver were to save less and the more heavily taxed saver were to save more.

6. Host and residence tax wedges:
national welfare effects

The personal tax wedge consists of two parts: the withholding tax wedge and the residence tax wedge. The residence country levies the residence tax wedge while the host country collects, in addition to the corporate tax wedge, the withholding tax wedge. Accordingly, the total host tax wedge is defined as the sum of the corporate and withholding tax wedges. The return after host taxes but before residence taxes is defined as r_h (Figure 5). It is the return that the residence country collects from the host country and consists of a part received by the private saver (the after-tax return s) and a part collected by the residence government (the residence tax wedge t_R).

The host-residence split of the total tax wedge provides some insight into the effects of capital income taxation on national welfare. 1/ In particular, the host tax wedge captures the difference between, on the one hand, the national return on a marginal investment, which is measured by the before-tax return p , and, on the other hand, the national costs associated with the financing of such an investment by foreign savings, which is represented by the return after host taxes. 2/ Therefore, a positive host tax wedge implies that the host country gains from a marginal investment financed by foreign savings. Similarly, the residence tax wedge measures, at the margin, the net national benefit of financing a foreign investment by domestic savings because it corresponds to the difference between the return after host taxes, which measures the national benefits, and the return after all taxes, which represents the national costs of marginal savings (see subsection III.2.b).

V. Economic Environment and Tax Parameters:
The United States and Japan

This study computes tax wedges for the United States and Japan for 1980, 1984, and 1987. Both the macroeconomic environment and tax provisions affect these tax wedges. Subsection V.1 discusses how this study

1/ This discussion of national welfare effects abstracts from optimal tariff type arguments by assuming that countries lack market power to affect the cost of funds on world markets. For an application of such arguments to international capital taxation, see Sinn (1987, Chapter 7) and Gordon and Varian (1987). Furthermore, the study does not deal with strategic considerations, which would become relevant if the tax system in one country were perceived to affect tax policy in another country.

2/ For a marginal investment financed by domestic savings, the total tax wedge represents the gap between national benefits and costs. For the assumptions underlying this approach, see subsection III.2.b, and in particular, the footnotes in that subsection. It is assumed, for example, that the government can raise revenue through nondistortionary taxes.

derives the numerical values for the macroeconomic variables in the three years studied. The tax provisions underlying the results are described in subsection V.2.

1. The macroeconomic environment

The tax wedges corresponding to debt instruments can be expressed as a function of tax parameters and of the following variables that describe the economic environment: the nominal interest rate in the host country, 1/ expected inflation rates in the host and residence countries, and expected movements in nominal exchange rates. In the case of equity financing, the nominal after corporate tax return (including retained earnings) on equity issued in the host country replaces the nominal interest rate as an element in the expressions for the tax wedges. 2/

As regards exchange rate expectations, the study assumes that savers expect movements in nominal exchange rates to reflect inflation differentials. The expected rate of inflation in the United States is derived from a survey conducted by Drexel Burnham Lambert on expected inflation ten years ahead. The average of the actual inflation rate in the next three years is used as a proxy for the expected inflation rate in Japan. 3/

The study does not assume that real interest rates are necessarily equalized among countries. Instead, it combines observed long-term nominal interest rates with expected inflation rates to find real interest rates in the two countries. Long-term interest rates are measured by the rate of return on government bonds. The maturity of the bonds is ten years for the United States and seven years for Japan.

This paper imposes arbitrage at the firm level to find the return on equity. 4/ In particular, it assumes that, for any investment project, the gap between the cost of equity financing and the cost of debt financing is fixed at 5 percentage points. This gap is based on estimates for the costs of equity financing (after corporate tax) during the 1980s that are contained in Hatsopoulos and Brooks (1987). The

1/ This paper assumes that firms do not finance their investments with foreign currency bonds.

2/ Projects located in the same country are assumed to pay both a unique nominal interest rate on debt and a unique nominal after corporate tax return on equity.

3/ Thus, perfect foresight is assumed. The inflation rates in 1988 and 1989 are taken from the projections contained in the World Economic Outlook of April 1988.

4/ This construction typically opens up arbitrage opportunities at the savers (or household) level and requires imperfect substitution at the household level between debt and equity.

estimates provided for the 1980s were averaged both over time and over Japan and the United States. 1/

Various other studies link the equity return to the return on debt by imposing an arbitrage condition at the savers' side so that savers earn the same after-tax return on debt and equity. 2/ However, in an open economy framework, arbitrage conditions will generally differ for savers residing in different countries because the tax burden on debt relative to that on equity generally differs across countries. Thus, imposing arbitrage conditions for savers residing in different countries typically yields complete specialization in debt or equity, which is inconsistent with empirical observations. 3/ 4/

2. Tax parameters

Information on key elements of the tax system required for the calculation of the tax wedges is presented in Tables 4 and 5 for the United States and Japan, respectively. The letters in the columns refer to the sources listed at the end of the tables.

The corporate tax parameters are based on a typical corporate investment in machinery. The tables reveal that the Japanese tax system has remained relatively stable during the 1980s. U.S. corporate tax provisions, in contrast, have been altered several times during this

1/ According to the estimates in Hatsopoulos and Brooks (1987) and Ando and Auerbach (1987), the gap between the cost of equity and debt financing was larger in the United States. The current study assumes that the gap is the same in the United States and Japan in order to identify how international differences in tax factors, as opposed to differences in the structure of financial intermediation, affect investment incentives.

2/ Some studies allow for an exogenous risk premium on equity. See, for example, Feldstein (1986). Others measure the return on equity directly by using the inverse of the observed price-earnings ratio on shares. See, for example, Boadway, Bruce, and Mintz (1987).

3/ Even in a closed economy, the tax burden on debt relative to equity can differ among individuals with different marginal tax rates. Moreover, imposing arbitrage conditions on the savers' side is problematic even in a closed economy because it generally implies that a given piece of capital earns a different before-tax rate of return depending on how it is financed (see, e.g., Bradford and Stuart (1984)). Therefore, the firm can typically obtain arbitrage profits by specializing in the least expensive type of financing.

4/ Alternatively, one can use the arbitrage condition for only one particular saver. Sinn (1987), for example, imposes the arbitrage condition only for savers in the host country because he assumes that debt accounts for all international portfolio capital flows and all equity is held domestically. As an alternative procedure, Alworth and Fritz (1988) average the arbitrage conditions for all savers to arrive at a one "world" arbitrage condition.

Table 4. The United States: Parameters

(In percent)

	1980	1984	1987
<u>Tax Parameters</u>			
Corporate tax rate	49.5 A	49.5 A	38.3 A
Lifetime for depreciation purposes (in years) <u>1/</u>	10.5	4.6	6.0
Declining balance rate	200.0	150.0	200.0
Investment grant (rate)	8.7 B	8.9 B	-- B
Withholding tax rate on income to nonresidents:			
Interest income	10.0	--	--
Dividend income	15.0	15.0	15.0
Personal taxes on:			
Interest income	28.5 A	25.8 A	22.4 A
Dividend income	47.5 A	39.6 A	32.0 A
Exchange gains and losses	7.0 A	5.9 A	11.0 A
Capital gains and losses	7.0 A	5.9 A	11.0 A
Portion of foreign withholding tax refunded at the personal level	100.0 C	100.0 C	100.0 C
<u>Nontax Parameters</u>			
Fraction of new shares in marginal equity financing	7.4 A	7.4 <u>2/</u>	7.4 <u>2/</u>
Rate of economic depreciation	12.1 C	12.3 <u>C</u>	12.5 <u>C</u>
Nominal interest rate	11.5	12.5	8.4
Expected inflation rate	8.7	6.2	5.3
Nominal cost of equity <u>3/</u>	10.8	11.3	10.2

Sources: A. Fullerton, A.D., and M. Karayannis, "The Taxation of Income from Capital in the United States, 1980-86," NBER Working Paper 2478 (Cambridge, Massachusetts: National Bureau of Economic Research, 1987).

B. Corker, R.J., O. Evans, and L. Kenward, "Tax Policy and Business Investment in the United States: Evidence From the 1980s" (unpublished, International Monetary Fund, April 17, 1988).

C. Hatsopoulos, B.G., and S. Brooks, "The Cost of Capital in the United States and Japan," conference paper from the International Conference on the Cost of Capital (Harvard University, November 19-21, 1987).

1/ Based on a salvage value of 10 percent of purchase value. The most favorable method permitted by the tax code has been used. Accordingly, if after a certain point in time the straight-line method rather than declining balance yields a larger tax deduction, a switch to that method has been assumed.

2/ Assumed to be the same as in 1980.

3/ Based on a gap of 5 percentage points between the costs of equity and debt finance (see main text). The formulas for these costs of finance r_f are presented in the second rows in Tables 9 and 10.

Table 5. Japan: Parameters
(In percent)

	1980	1984	1987
<u>Tax Parameters</u>			
Corporate tax rate:			
Retained earnings	52.6	56.1	54.7
Dividends	42.1	45.5	44.2
Lifetime for tax purposes (in years) <u>1/</u>	11.0	11.0	11.0
Declining balance rate	100.0	100.0	100.0
Investment grant (rate)	--	--	--
Withholding tax rate on income to nonresidents:			
Interest income	10.0	10.0	10.0
Dividend income	15.0	15.0	15.0
Personal taxes on:			
Domestic interest income	8.2	7.1	7.1
Domestic dividend income	25.8	25.8	25.8
Foreign interest income	11.1	10.1	9.8
Foreign dividend income	47.9	47.9	47.9
Exchange gains and losses	--	--	--
Capital gains and losses	--	--	--
Portion of foreign withholding tax refunded at personal level	100.0	100.0	100.0
<u>Nontax Parameters</u>			
Fraction of new shares in marginal equity financing	8.7 C	8.7 <u>2/</u>	8.7 <u>2/</u>
Rate of economic depreciation	15.1 A	15.3 A	15.5 A
Nominal interest rate	9.2	6.8	4.2
Expected inflation rate	5.2	1.6	0.9
Nominal cost of equity <u>3/</u>	9.4	8.1	7.0

Sources: A. Hatsopoulos, B.G., and S. Brooks, "The Cost of Capital in the United States and Japan," conference paper from the International Conference on the Cost of Capital (Harvard University, November 19-21, 1987).

B. Kikutani, F., and T. Tachibanaki, "The Taxation of Income from Capital in Japan: Historical Perspectives and Policy Implications," conference paper from the International Conference on the Cost of Capital (Harvard University, November 19-21, 1987).

C. Shoven, John B., and T. Tachibanaki, "The Taxation of Income from Capital in Japan" (mimeographed, Palo Alto, California: Stanford University, September 1985).

1/ Based on a salvage value of 10 percent of purchase value.

2/ Assumed to be the same as in 1980.

3/ Based on a gap of 5 percentage points between the costs of equity and debt finance (see main text). The formulas for these costs of finance r_f^* are presented in the second rows in Tables 9 and 10.

period. In particular, the Economic Recovery Tax Act of 1981 (ERTA) greatly liberalized depreciation schedules and provided for more generous investment credits. The Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 tightened some of these investment incentives. The Tax Reform Act of 1986 reduced the marginal tax rate on corporate income but further tightened investment incentives by repealing the investment credit and making the tax provisions governing depreciation somewhat less generous.

On the personal side, the United States gradually reduced the marginal tax rates on interest and dividend income during the 1980s. However, the Tax Reform Act of 1986 raised the tax rate on capital gains. The average marginal tax rate on interest income earned by Japanese residents takes into account various methods of tax-exempt savings, such as the Maru-yu accounts. 1/ The marginal tax rate on interest income received from abroad exceeds the marginal rate on interest income from domestic investments because some of the tax preferred savings, such as postal savings, were not invested abroad. The taxation of dividend income in Japan also favors domestic investment because some tax benefits, such as a 10 percent dividend credit, do not apply to dividends from abroad.

This study focuses on portfolio rather than direct investments (see Section II). Accordingly, residence countries neither credit nor levy corporate taxes (see subsection IV.1). However, savers are assumed to receive full credit for any withholding taxes levied by the host government on their personal income. 2/

VI. Tax Wedges in the 1980s: The U.S.-Japan Case

This section interprets the empirical estimates for the tax wedges in 1980, 1984, and 1987 contained in Tables 6, 7, and 8. The two panels in these tables contain the results for, respectively, a debt and an equity-financed investment. Tables 6 and 7 present the tax wedges on

1/ Interest income from small deposits (Maru-yu accounts) with banks and other financial institutions was tax exempt if the total amount of principal did not exceed ¥ 3 million. Tax-exempt savings included holdings of central and local government bonds, not exceeding ¥ 3 million in total face value (special "Maru-yu"), postal savings not exceeding ¥ 3 million, and savings under the Employees' Asset Formation System not exceeding ¥ 5 million. Those tax-exempt savings accounted for about 70 percent of the total balance of personal savings. From April 1988, the tax-exempt systems for Maru-yu, special Maru-yu, and postal savings were abolished and earnings on these savings are now subject to a 20 percent final tax at source.

2/ Thus, if savers channel the funds through a financial intermediary, the intermediary is assumed to have sufficient tax liabilities against which to credit withholding taxes.

Table 6. Taxation of Assets Located in Japan, 1980-87

(In percentage points)

Tax Wedges	Saver Residing in Japan			Saver Residing in the United States			Saver Residing in Japan Relative to Saver Residing in the United States 1/		
	1980	1984	1987	1980	1984	1987	1980	1984	1987
<u>Debt instrument</u>									
Total	-1.36	-0.67	-0.34	0.75	0.87	0.78	-2.12	-1.54	-1.12
Corporate	-2.12	-1.16	-0.64	-2.12	-1.16	-0.64	--	--	--
Personal	0.76	0.48	0.30	2.87	2.03	1.42	-2.12	-1.54	-1.12
Total	-1.36	-0.67	-0.34	0.75	0.87	0.78	-2.12	-1.54	-1.12
Host	-2.12	-1.16	-0.64	-1.20	-0.47	-0.22	-0.92	-0.68	-0.42
Residence	0.76	0.48	0.30	1.95	1.35	1.00	-1.19	-0.86	-0.70
<u>Equity instrument</u>									
Total	6.68	7.77	6.55	7.64	8.56	7.77	-0.96	-0.79	-1.22
Corporate	6.59	7.63	6.42	6.59	7.63	6.42	--	--	--
Personal	0.09	0.14	0.14	1.05	0.93	1.36	-0.96	-0.79	-1.22
Total	6.68	7.77	6.55	7.64	8.56	7.77	-0.96	-0.79	-1.22
Host	6.59	7.63	6.42	6.64	7.71	6.50	-0.05	-0.08	-0.08
Residence	0.09	0.14	0.14	1.00	0.85	1.28	-0.90	-0.71	-1.14

Source: Authors' calculations.

1/ The column for each of the three years is computed by subtracting the results for a U.S. saver from those for a Japanese saver.

Table 7. Taxation of Assets Located in the United States, 1980-87

(In percentage points)

Tax Wedges	Saver Residing in Japan			Saver Residing in the United States			Saver Residing in Japan Relative to Saver Residing in the United States 1/		
	1980	1984	1987	1980	1984	1987	1980	1984	1987
<u>Debt instrument</u>									
Total	-4.30	-5.29	-1.67	-2.31	-3.32	-0.61	-1.99	-1.97	-1.06
Corporate	-5.57	-6.55	-2.49	-5.57	-6.55	-2.49	--	--	--
Personal	1.27	1.26	0.82	3.27	3.23	1.88	-1.99	-1.97	-1.06
Total	-4.30	-5.29	-1.67	-2.31	-3.32	-0.61	-1.99	-1.97	-1.06
Host Residence	-4.43	-6.55	-2.49	-5.57	-6.55	-2.49	1.15	--	--
	0.13	1.26	0.82	3.27	3.23	1.88	-3.14	-1.97	-1.06
<u>Equity instrument</u>									
Total	1.83	0.84	1.98	2.58	1.46	3.01	-0.74	-0.61	-1.02
Corporate	1.76	0.66	1.81	1.76	0.66	1.81	--	--	--
Personal	0.07	0.18	0.17	0.82	0.80	1.19	-0.74	-0.61	-1.02
Total	1.83	0.84	1.98	2.58	1.46	3.01	-0.74	-0.61	-1.02
Host Residence	1.78	0.72	1.87	1.76	0.66	1.81	0.02	0.06	0.05
	0.05	0.12	0.12	0.82	0.80	1.19	-0.77	-0.67	-1.08

Source: Authors' calculations.

1/ The column for each of the three years is computed by subtracting the results for a U.S. saver from those for a Japanese saver.

Table 8. Taxation of Assets Located in Japan Relative to the Taxation of Assets Located in the United States, 1980-87 ^{1/}

(In percentage points)

Tax Wedges	Saver Residing in Japan			Saver Residing in the United States			Saver Residing in Japan Relative to Saver Residing in the United States ^{2/}		
	1980	1984	1987	1980	1984	1987	1980	1984	1987
<u>Debt instrument</u>									
Total	2.94	4.62	1.33	3.06	4.20	1.40	-0.12	0.42	-0.07
Corporate	3.46	5.40	1.85	3.46	5.40	1.85	--	--	--
Personal	-0.52	-0.78	-0.52	-0.39	-1.20	-0.45	-0.12	0.42	-0.07
Total	2.94	4.62	1.33	3.06	4.20	1.40	-0.12	0.42	-0.07
Host	2.31	5.40	1.85	4.38	6.08	2.27	-2.07	-0.68	-0.42
Residence	0.63	-0.78	-0.52	-1.32	-1.88	-0.87	1.95	1.10	0.35
<u>Equity instrument</u>									
Total	4.85	6.93	4.57	5.06	7.10	4.77	-0.21	-0.18	-0.20
Corporate	4.83	6.96	4.61	4.83	6.96	4.61	--	--	--
Personal	0.02	-0.04	-0.04	0.23	0.14	0.16	-0.21	-0.18	-0.20
Total	4.85	6.93	4.57	5.06	7.10	4.77	-0.21	-0.18	-0.20
Host	4.81	6.91	4.55	4.88	7.05	4.68	-0.08	-0.14	-0.13
Residence	0.04	0.02	0.02	0.18	0.06	0.08	-0.13	-0.03	-0.07

Source: Authors' calculations.

^{1/} This table is computed by subtracting the results in Table 7 from the corresponding results in Table 6.

^{2/} The column for each of the three years can be computed by subtracting the results for a U.S. saver from those for a Japanese saver.

assets located in, respectively, Japan and the United States. The first three columns in Tables 6 and 7 show how a Japanese saver was taxed. The tax treatment of a U.S. saver is presented in the next three columns. The last three columns are computed as the difference between the column for the Japanese saver and the column for the U.S. saver. Thus, the last three columns in Tables 6 and 7 measure relative savings incentives because they reveal how, for a given asset, the tax treatment of a Japanese saver differed from that of a saver residing in the United States (see subsection IV.4 and Figure 8). Table 8 measures how the tax system may have affected international capital flows through its effect on investment incentives; it compares, for a given saver, the tax treatment of investments in Japan with that of investments in the United States (see subsection IV.2 and Figure 7). This table is computed by subtracting the results contained in Table 7 from the corresponding results contained in Table 6.

In each column, the total tax burden is broken down in two ways. First, the total tax wedge is the sum of the corporate tax wedge and the personal tax wedge. Second, the total tax wedge consists of the host tax wedge and the residence tax wedge. For investments financed by savers residing in the same country, the distinction between host and residence tax wedge is irrelevant because the host country and residence country are one and the same. For these local investments, the host tax wedge is given by the corporate tax wedge.

The disaggregation of the total tax wedge into host and residence tax wedges provides information on national welfare effects (see subsection IV.6). Moreover, comparing the host tax wedge for a Japanese asset with that for a U.S. asset measures the investment incentive for a saver who does not pay any personal taxes except for those withheld abroad. Savers pay only these personal taxes if they are tax exempt or if they evade taxes.

The rest of this section is organized as follows. Subsection VI.1 analyzes tax incentives for international capital flows by investigating, respectively, investment and savings incentives. How capital income taxation affects global efficiency by distorting the international and intertemporal allocation of resources is explored in subsection VI.2. Finally, subsection VI.3 analyzes national welfare effects.

1. Tax incentives for international capital flows

a. Investment incentives

The positive numbers in (the first six columns of) the first rows of the two panels in Table 8 indicate that the tax burden on assets located in Japan exceeded the tax burden on assets located in the United States. Accordingly, taxes encouraged capital flows from Japan to the United States by favoring investments in the United States.

The breakdown over the corporate and personal tax wedges reveal which factors are behind the tax incentives for investments in the United States. For the debt case, the corporate-personal split is contained in the second and third rows of the first panel in Table 8. These rows show that the larger investment incentives in the United States are entirely the consequence of a more favorable corporate tax treatment in the United States, which can be explained by more liberal depreciation rules, more generous investment credits, and, for debt-financed investments, a higher inflation rate that raises the value of the deductibility of nominal interest payments. 1/

Unlike corporate taxes, personal taxes in both Japan and the United States discriminated against debt-financed investments in the United States for two reasons. 2/ A major reason is the relatively low expected inflation rate in Japan. Accordingly, under the assumption that exchange rates reflected inflation differentials, the yen was expected to appreciate relative to the dollar. Consequently, Japanese assets yielded part of their expected returns to U.S. savers in capital gains, which the U.S. personal tax system treated favorably relative to nominal interest income. In addition, Japanese savers could not deduct the expected capital losses on U.S. assets from their personal tax liabilities while they were fully taxed on the higher nominal returns on these assets. A second explanation for the higher personal tax wedge on U.S. assets faced by Japanese residents is that some of the tax sheltered forms of Japanese savings were not allowed to flow abroad (see subsection V.2).

The movements of the relative investment incentives over time reveal that international differentials in investment incentives first rose between 1980 and 1984, and then fell in 1987. These developments were due mainly to tax policy in the United States, which first liberalized its investment incentives but later tightened them (see subsection V.2).

In the case of debt financing, the 1984 increase in the favorable treatment of U.S. investment is particularly dramatic when measured by the change in the relative host tax wedge contained in the fifth row of Table 8. When the United States repealed the withholding tax on interest income to foreigners in 1984, it became a more attractive investment location for those savers who could not fully credit the withholding tax against their residence tax liabilities.

1/ This effect of inflation dominates the negative effect of inflation on the present value of depreciation allowances.

2/ The negative numbers in the third row of the first panel in Table 8 reveal this. The relatively favorable personal tax treatment of assets located in Japan implies that relative corporate tax wedges overestimated the tax incentives for investment in assets located in the United States.

b. Savings incentives

The negative numbers in the last three columns of the first rows of the two panels in Table 6 reveal that, for an asset located in Japan, the U.S. saver faced the heaviest tax burden, especially on debt instruments. The corresponding numbers in Table 7 show that this was also the case for an asset located in the United States. Therefore, if higher after-tax returns raise savings, the tax systems harmed the relative savings performance of the United States. ^{1/} Accordingly, in addition to investment incentives, savings incentives may also have encouraged U.S. capital inflows.

Except for an increase in the relatively favorable tax treatment of equity income earned by Japanese savers in 1987, international differences in tax incentives for savings fell during the 1980s. Two main factors explain the increasing harmonization of tax incentives. First, falling inflation rates and nominal interest rates tended to reduce the absolute value of the tax wedges. Second, as regards debt financing, the United States reduced its personal income tax rates during this period. ^{2/}

2. Global welfare effects

This subsection uses the calculated tax wedges to assess how capital income taxation may have influenced the international allocation of savings and investment as well as the intertemporal allocation of resources between the present and the future.

a. International allocation of investment and saving

The results contained in Table 8 and discussed above in subsection VI.1 (part a) revealed that taxes favored investment in the United States over investment in Japan. In the absence of externalities, these

^{1/} If assets are not close substitutes in portfolios and savers residing in different countries have different preferences for assets, this result may no longer hold. To illustrate, if savers prefer assets located domestically, the higher corporate tax burden on assets located in Japan may have offset the positive incentive effects of the favorable personal tax treatment of Japanese savers. In fact, for both equity and debt financing, the Japanese Government taxed locally financed Japanese assets more heavily than the U.S. Government taxed local assets. Thus, in the extreme case of savers holding only domestic assets, which is equivalent to a closed economy without any international capital flows, Japanese savers were taxed more heavily than U.S. savers. This result illustrates the important role of more open international capital markets in changing the tax incentives for savings and investment behavior. For an analysis within a closed economy, see Shoven and Tachibanaki (1985) and Makin and Shoven (1987).

^{2/} Following the period of analysis, Japan raised its tax rate on interest income in 1988.

differential investment incentives would have interfered with an efficient allocation of the world capital stock. In particular, the relatively favorable treatment of investment in the United States may have caused the social benefit of marginal U.S. investment to fall below the marginal productivity of investment in Japan. Consequently, reallocating capital away from the United States to Japan would have raised world welfare.

The results discussed in subsection VI.1 (part b) indicated that, compared with Japanese residents, U.S. residents were taxed more heavily on their savings. The less favorable tax treatment of U.S. savings may have contributed to an inefficient allocation of world savings to the extent world welfare would have risen if the share of U.S. savings in worldwide savings had been larger.

Developments of the tax wedges over time suggest that differential tax distortions in the international distribution of savings fell during the 1980s. The potential tax distortions in the international allocation of capital, in contrast, rose during 1980-84, after which they also decreased.

b. Intertemporal allocation of resources

The global intertemporal distortions from capital taxation depend on the total tax wedge. The first rows in the second panels of Tables 6 and 7 reveal that the total tax wedges levied on marginal equity investments were positive. This implies that the net benefits of a marginal equity investment exceeded the social costs associated with financing such an investment, once again in the absence of externalities. Consequently, a marginal increase in equity investment would have raised global welfare.

In contrast to their treatment of equity investments, tax systems typically subsidized marginal debt investments. The only marginal debt investment carrying a positive tax wedge was one located in Japan and financed by a U.S. saver. The debt investment enjoying the highest subsidy was one located in the United States and financed by a Japanese saver. These results are explained as follows. The personal-corporate split (second and third rows of the first panels in Tables 6 and 7) reveals that debt instruments were subsidized at the corporate level but taxed at the personal level. Whereas assets located in the United States were more heavily subsidized by the corporate tax system, Japanese savers were taxed lightly at the personal level compared to savers residing in the United States. Only if a U.S. saver, who suffered from a relatively high personal tax burden, financed an asset located in Japan, which enjoyed a relatively small subsidy at the corporate level, was the personal tax large enough to offset the subsidy at the corporate level. Thus, a marginal debt investment, in the absence of externalities, would improve world welfare only if it were located in Japan and financed by a U.S. resident.

The total tax wedges indicate that the absolute values of net subsidies to debt financing for assets located in the United States, after remaining broadly constant between 1980 and 1984, decreased during the period 1984-87. Both the falling expected inflation rate and the repeal of some of the investment incentives in the United States played a role in explaining the mitigation of these intertemporal distortions. After rising between 1980 and 1984, the net tax burdens on equity assets located in Japan fell during 1984-87 to levels close to those in 1980 (Table 6), which is explained in part by movements in the corporate tax rate in Japan. Equity assets located in the United States, in contrast, faced increased tax burdens between 1984 and 1987 after these tax burdens had fallen during 1980-84 (Table 7).

3. National welfare effects

The host-residence split of the tax wedges (fifth and sixth rows of the two panels in Tables 6 and 7) provides information on how marginal cross-border investments affect national welfare (see subsection IV.6). The fifth rows of the two panels in Tables 6 and 7 indicate that, at the margin, host governments subsidized debt investments. On equity investments, in contrast, they levied taxes. Thus, host countries tended to lose from foreign-financed debt investments but gained from equity capital inflows. The reason is that host countries allow interest expenses to be deducted for corporate tax purposes. Consequently, while the corporate tax acts as a withholding tax for equity income, it fails to withhold interest income on debt.

The net subsidy granted to debt capital inflows was largest in the United States. Whereas the Japanese subsidy fell during the 1980s, that in the United States rose during 1980-84. In 1987, however, the U.S. subsidy dropped below its 1980 level.

VII. Conclusions

1. Some limitations of the present study

Tax wedges were estimated separately for investments financed through the issuance of either debt or equity. While this procedure covers the two extremes, it does not address cases where the marginal investment is financed through a mix of debt and equity, which could change some of the results obtained. In particular, a greater preference for debt financing in Japan relative to the United States would reduce the relative incentives to invest in the United States. There is, however, considerable uncertainty as to the actual debt-equity mix of the marginal investment in a particular country. The data are unavailable and, moreover, the ratio itself could vary depending on the residence of the saver financing the investment. In any event, by presenting the two extremes, this study provides sufficient information to facilitate the computation of tax wedges for any selected debt-equity ratio.

Another limitation is that the tax wedges were computed only for corporate investments in machinery. The method developed in the study could be employed for a more comprehensive assessment that would also cover other investments, including those in inventories and business structures. However, as many of the qualifications that would be introduced concern the tax treatment of depreciation, and these were substantially more generous in the United States than in Japan, particularly in the early 1980s, the qualitative ranking of the savings and investment incentives may not change.

A further limitation is the exclusive focus on corporate investment. Other forms of capital flow, for example, investment in government securities, acquisition of real estate, and buy outs of companies are of increasing importance. While a fuller study is needed to adequately account for the role of tax factors in influencing these capital flows, the information presented in the study permits some inferences for savings through government securities. Income from such securities are subject to a host-withholding tax, if levied, and to the residence personal income tax. As the latter is substantially higher in the United States than in Japan, the U.S. saver was taxed more heavily than the Japanese saver irrespective of whether he invested in U.S. or Japanese government securities. Also in this case, the tax systems hurt the savings performance of the United States relative to Japan. However, the differences in tax incentives for investing in government securities decreased during the 1980s.

2. Some implications for savings-investment balances

The tax wedges obtained for Japanese savers investing in Japan can be compared with those for U.S. savers investing in the United States, as has been done in some studies. Such a comparison may be useful if capital is not mobile internationally. This appears to have been characteristic of Japanese capital markets before a major liberalization occurred in the early 1980s. As was noted in Section III, in a relatively closed capital market, the composition of the tax wedge needs to be known in order to establish tax effects on real interest rates. Larger corporate tax factors and lower personal tax factors in Japan relative to those in the United States may have contributed to a lower Japanese real interest rate level, although the actual outcome for domestic interest rates may also have been affected by other demands for credit, especially from the public sector. As Figure 9 demonstrates, the general government fiscal deficit was fairly sizable in Japan up to about 1981, but declined substantially thereafter. Over the same period, real interest rate levels in Japan, which in the years immediately preceding were higher, fell below those in the United States (Figure 10). If the Japanese capital market had not been liberalized in the early 1980s, the growing Japanese savings surpluses would have been bottled up within the domestic economy. Accordingly, the equilibrating responses may well have involved greater deflation, with Japanese real

interest rates declining further. However, the major liberalization of Japanese capital markets provided a vent for the excess savings by allowing more capital outflows.

Over this period, developments in the United States accommodated the growing Japanese savings surpluses. The U.S. fiscal balance moved into persistent and substantial deficit (see Figure 11). If the international capital market had not become more integrated, and resources from abroad had not become available, ensuing adjustments would most likely have added to inflationary pressures in the United States, accompanied by rising real interest rates crowding out investment in the United States in a manner reminiscent of an earlier episode in the late 1960s. The crowding out of investment was also avoided by the more liberal U.S. investment incentives introduced in 1981, which prevented higher real interest rates from harming investment.

Without a detailed econometric study, it is difficult to assess the contribution of tax factors to capital flows although some broad inferences can be drawn. In 1982, the net outflow of private capital from the United States was reversed (Table 1). At the same time, a positive real interest differential in favor of the United States emerged (Figure 10) and the value of the U.S. dollar rose. These phenomena are consistent with more generous tax incentives for investment in the United States between 1981 and 1984 (Table 8). These incentives put upward pressure on the U.S. interest rates, thereby attracting foreign capital and raising the value of the dollar. It is, perhaps, no coincidence that the sharp decline in the tax differential favoring investment in the United States in 1986 is associated with a major reduction in net private capital inflows in 1987, forcing official intervention to finance a much larger share of the U.S. current account deficit, a narrowing of the real interest differential, and downward pressure on the U.S. dollar.

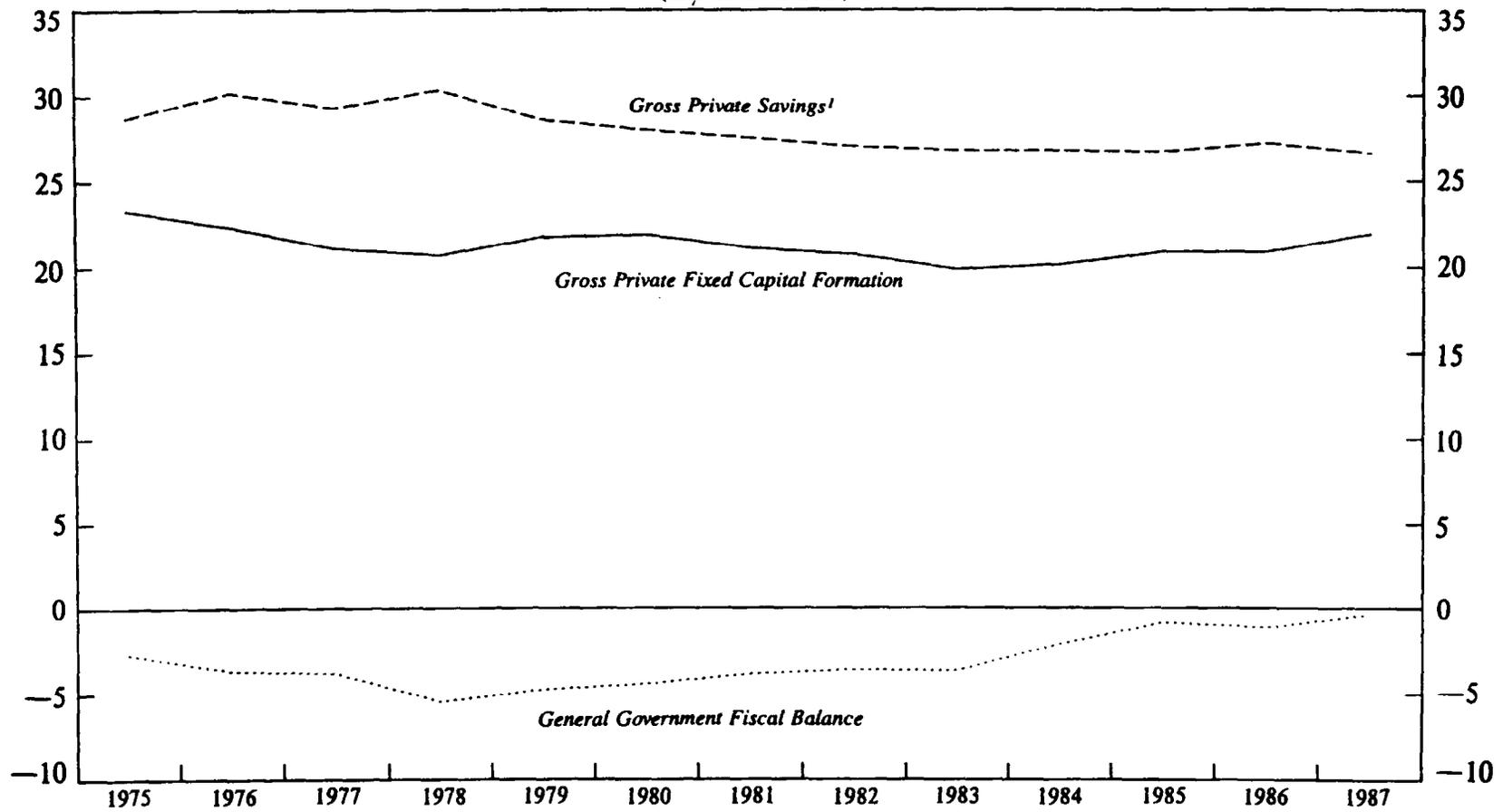
3. The role of tax coordination

It is interesting to enquire, in the context of the study's findings, whether or not the systems of capital income taxes were adequately coordinated. A widespread presumption is that tax systems should be neutral and not distort the accumulation and allocation of capital. In an international context, this requires that before-tax marginal products on capital and after-tax returns on savings are equalized across countries. It is a short but contentious step to conclude from this that tax systems in different countries should, therefore, be harmonized. In the context of this study, complete harmonization occurs if the different tax wedges are equalized so that the tax incentives provided are the same for savers and investors in different countries.

However, in practice, complete tax harmonization is elusive and an attempt to enforce it may well reduce welfare. A greater concern with environmental issues, or different perceptions of national contingencies

FIGURE 9
FISCAL BALANCE, PRIVATE SAVINGS AND INVESTMENT PATTERNS
IN JAPAN, 1975-87

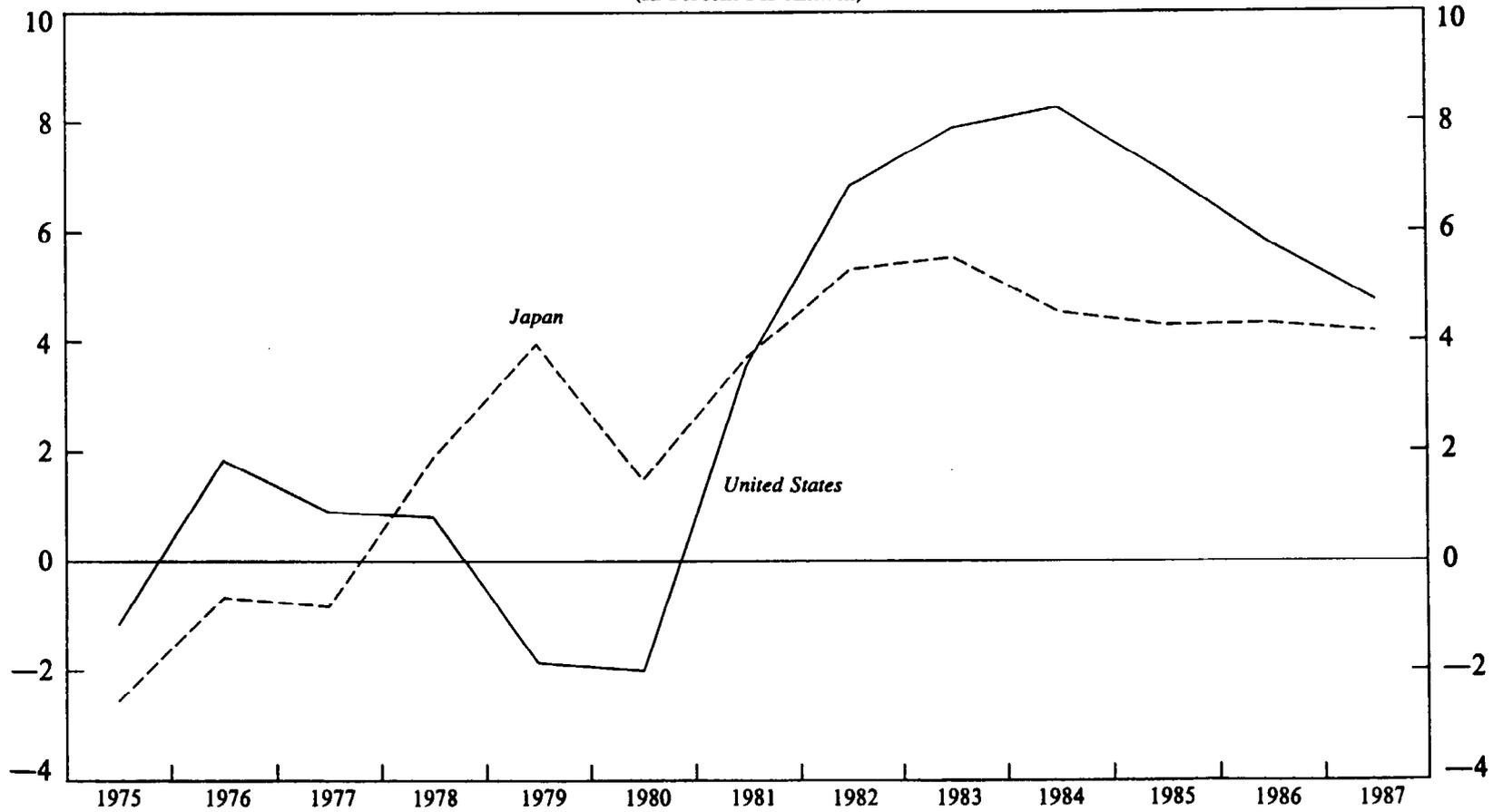
(In Percent of GNP)



Source: O.E.C.D., National Accounts, and staff calculations.
¹Private savings defined as the sum of household and corporate savings.

FIGURE 10
REAL LONG-TERM INTEREST RATES IN JAPAN AND
THE UNITED STATES, 1975-87¹

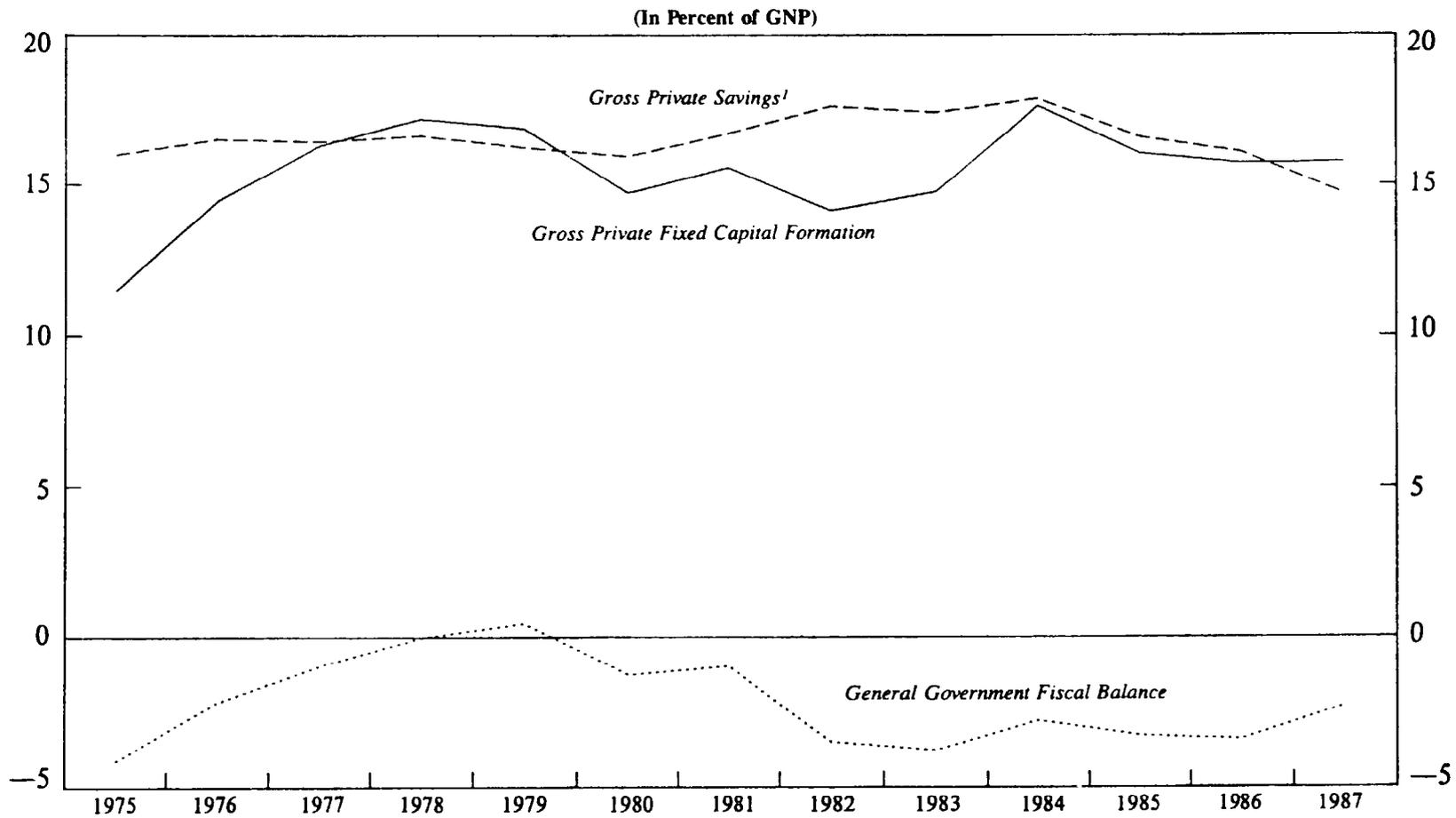
(In Percent Per Annum)



Source: IFS, IMF

¹Nominal interest rate on long-term government bonds deflated by CPI inflation rate.

FIGURE 11
FISCAL BALANCE, PRIVATE SAVINGS AND INVESTMENT PATTERNS
IN THE UNITED STATES, 1975-87



Source: U.S. Department of Commerce, Survey of Current Business.
¹Private savings defined as the sum of household and corporate savings.

and other externalities may lead to diverse needs for the accumulation of capital and its allocation. Intercountry differences in capital income taxes may, therefore, be necessary to accommodate such needs. There is, nevertheless, a role for tax coordination in order to ensure that the interaction of national tax policies does not unduly damage global efficiency. In particular, tax systems and the interaction among them, should not excessively bias savings and investment incentives in favor of any one country, thereby misallocating capital. However, the complex considerations involved suggest that circumspection should be used in determining what is an "excessive" bias.

The more generous investment incentives introduced by the United States in 1981 may be interpreted as an attempt to offset the adverse effects on investment of the sharp rise in real interest rates. Nevertheless, the reduction in capital income taxes contributed to the decline in income tax collections from 12.9 percent of GDP in 1980 to 9.8 percent in 1986, more than matching the increase in the general government fiscal deficit from 1.3 percent of GDP to 3.4 percent of GDP over the same period. To the extent the persistent fiscal deficit pre-empted a significant part of the world's pool of savings and keeps real interest rates high, a vicious circle is generated: cuts in capital income taxes are required to offset the adverse effects on the cost of capital from their deficit enhancing effects. In increasingly integrated world financial markets, such a policy generates a widening imbalance between domestic savings and investment resulting in large capital inflows and shifts in exchange rates. Moreover, the required subsidies to investments tend to be inconsistent with the requirements for global and national efficiency. An alternative policy of maintaining 1980 tax levels could have lowered the fiscal deficit and lessened the upward pressures on real interest rates. Such a policy would have protected private investment without having to rely on capital inflows and investment subsidies that were distorting the international allocation of capital. Some adjustment at the margin in the early 1980s, involving an increase in savings incentives for residents of the United States and a decrease in the fiscal deficit, financed by a reduction in the generous investment incentives through increases in corporate taxation (as occurred in 1986) might have been appropriate.

A critical consideration is that as economies become more integrated, the alleviating role of purely domestic adjustment mechanisms is reduced, for example, the impact of imbalances on domestic interest rates. Consequently, the distortionary effects of taxes on global and national welfare as well as on international capital flows become more pronounced. If these distortions are to be mitigated, policymakers must pay increasing attention to the international implications of their domestic tax policies.

Derivation of the Tax Wedges

This Appendix describes how one can derive the real rates of return and the tax wedges introduced in Section IV from expected inflation rates, nominal interest rates (for a debt instrument), and nominal equity returns (for an equity instrument).

Tables 9 and 10 present these tax wedges for a debt- and equity-financed investment, respectively. Table 11 defines the different variables and lists the tax parameters required to find the wedges presented in Tables 9 and 10. 1/ A variable marked with an asterisk refers to the host country. A variable without an asterisk relates to the residence country. 2/

The real market rate of return r^* , which is contained in the first row of the tables, is the return that is earned after all corporate taxes but before any personal tax. The second row in the tables presents the real cost of finance r_f^* . Investors (usually the firm) adopt this rate as the discount rate at which they compare all receipts and outlays (after corporate tax) occurring at different points in time. The nominal after-tax cost to debt finance is $i^*(1-u_f^*)$, where u_f^* is the effective (corporate) tax rate at which the investor can deduct interest payments in calculating taxable income. In the absence of a split rate system (i.e., $u_s^* = u_k^*$), the real cost of equity finance is simply the market return on equity because, in contrast to interest payments, equity returns are not deductible from taxable income.

The cost of capital p^* , given in the third row of the tables, is the required real rate of return before corporate income taxes are levied and tax allowances are granted. The expression for p^* is derived from the equality between the marginal benefit and the marginal cost on an investment project:

$$(1 - u_k^*) (p^* + \delta^*) = (1 - A^*) (r_f^* + \delta^*) \quad (A1)$$

Here, δ^* is the exponential rate of economic depreciation. The left-hand side of (A1) corresponds to the revenues after corporate income tax has been levied on the user cost of capital $p^* + \delta^*$ at an effective rate of u_k^* . 3/ For a marginal investment project, these revenues are equal to the real marginal costs of holding capital, which are represented by the right-hand side of (A1). These costs amount to

1/ In principle, computing the effective tax rate requires expected rather than actual tax parameters. This study, however, uses actual tax provisions to approximate the anticipated provisions.

2/ If a saver finances an investment located in his or her own country, the residence and host countries coincide.

3/ It is assumed that corporate taxes are not credited in the residence country. See subsection IV.1.

Table 9. Tax Wedges and Rates of Return: Debt Financing

Real Rate of Return or Tax Wedge	Symbol	Derivation	Expression
(1) Market return	r^*		$i^* - \pi^*$
(2) Discount rate investor	r_f^*		$(1-u_f^*) i^* - \pi^*$
(3) Cost of capital	p^*		$\frac{(1-A^*)}{(1-u_k^*)} \{ (1-u_f^*) i^* - \pi^* + \delta^* \} - \delta^*$
(4) Effective subsidy on capital goods	A^*		$f_1^* u_d^* A_d^* + f_2^* u_d^* + f_3^* g^*$
(5) Corporate tax wedge	t_c^*	(3)-(1)	$\left\{ \frac{(1-A^*)}{(1-u_k^*)} [u_k^* - u_f^*] - A^* \right\} i^* + \left\{ \frac{A^* - u_k^*}{(1-u_k^*)} \right\} (\pi^* - \delta^*)$
(6) Return after withholding tax	r_w^*		$(1-w_i^*) i^* - \pi^*$
(7) Withholding tax wedge	t_w^*	(1)-(6)	$w_i^* i^*$
(8) Host tax wedge	t_H^*	(3)-(6) = (5)+(7)	$\left\{ \frac{(1-A^*)(u_k^* - u_f^*)}{(1-u_k^*)} + w_i^* - A^* \right\} i^* + \left\{ \frac{A^* - u_k^*}{(1-u_k^*)} \right\} (\pi^* - \delta^*)$

Table 9 (concluded). Tax Wedges and Rates of Return: Debt Financing

Real Rate of Return or Tax Wedge	Symbol	Derivation	Expression
(9) Return after tax	s		$(1-m_i) \theta_i (1-w_i^*) i^* - (1-z) \pi^* - z \pi$
(10) Residence tax wedge	t_R	(6)-(9)	$\{1-(1-m_i) \theta_i\} (1-w_i^*) i^* + z(\pi-\pi^*)$
(11) Personal tax wedge	t_P	(1)-(9) = (7)+(10)	$\{1-(1-m_i) \theta_i (1-w_i^*)\} i^* + z(\pi-\pi^*)$
(12) Total tax wedge	t	(3)-(9) = (8)+(10) = (5)+(11)	$\left\{ \frac{(1-A^*)(u_k^* - u_f^*)}{(1-u_k^*)} + 1 - A^* - (1-m_i) \theta_i (1-w_i^*) \right\} i^*$ $+ \left\{ \frac{A^* - u_k^*}{(1-u_k^*)} \right\} (\pi^* - \delta^*) + z(\pi - \pi^*)$

Source: Authors' calculations.

Table 10. Tax Wedges and Rates of Return: Equity Financing

Real Rate of Return or Tax Wedge	Symbol	Derivation	Expression
(1) Market return	r^*		$\rho^* - \pi^*$
(2) Discount rate investor	r_f^*		$(\rho^* - \pi^*) (1 - \epsilon^* (u_k^* - u_s^*))$
(3) Cost of capital	p^*		$\frac{(1-A^*)}{(1-u_k^*)} ((\rho^* - \pi^*) [1 - \epsilon^* (u_k^* - u_s^*)] + \delta^*) - \delta^*$
(4) Effective subsidy on capital goods	A^*		$f_1^* u_d^* A_d^* + f_2^* u_d^* + f_3^* g^*$
(5) Corporate tax wedge	t_c^*	(3)-(1)	$\left\{ \frac{u_k^* - A^*}{(1-u_k^*)} (\rho^* + \delta^* - \pi^*) - \epsilon^* (u_k^* - u_s^*) \frac{(1-A^*)}{(1-u_k^*)} (\rho^* - \pi^*) \right\}$
(6) Return after withholding tax	r_w^*		$(1 - \epsilon^* w_d^*) (\rho^* - \pi^*)$
(7) Withholding tax wedge	t_w^*	(1)-(6)	$\epsilon^* w_d^* (\rho^* - \pi^*)$
(8) Host tax wedge	t_H^*	(3)-(6) = (5)+(7)	$\epsilon^* w_d^* (\rho^* - \pi^*) + \left\{ \frac{u_k^* - A^*}{(1-u_k^*)} (\rho^* + \delta^* - \pi^*) - \epsilon^* (u_k^* - u_s^*) \frac{(1-A^*)}{(1-u_k^*)} (\rho^* - \pi^*) \right\}$

Table 10 (concluded). Tax Wedges and Rates of Return: Equity Financing

Real Rate of Return or Tax Wedge	Symbol	Derivation	Expression
(9) Return after tax	s		$\{(\epsilon^* (1-m_d)\theta_d(1-w_d^*) + (1-\epsilon^*)(1-c))(\rho^* - \pi^*) - \{(c-z)\pi^* + z\pi\}$
(10) Residence tax wedge	t _R	(6)-(9)	$\{\epsilon^* (1-w_d^*)[1-(1-m_d)\theta_d] + (1-\epsilon^*)c\}(\rho^* - \pi^*) + (c-z)\pi^* + z\pi$
(11) Personal tax wedge	t _P	(1)-(9) = (7)+(10)	$\{\epsilon^* [1-(1-m_d)\theta_d(1-w_d^*)] + (1-\epsilon^*)c\}(\rho^* - \pi^*) + (c-z)\pi^* + z\pi$
			$\left\{ \frac{\epsilon^* [(1-A^*)(1-(u_k^*-u_s^*)) - (1-m_d)\theta_d(1-w_d^*)(1-u_k^*)]}{(1-u_k^*)} \right\} (\rho^* - \pi^*)$
(12) Total tax wedge	t	(3)-(9) = (8)+(10) = (5)+(11)	$+ \left\{ \frac{(1-\epsilon^*)[1-A^* - (1-c)(1-u_k^*)]}{(1-u_k^*)} \right\} (\rho^* - \pi^*)$ $+ \left\{ \frac{u_k^* - A^*}{(1-u_k^*)} \right\} \delta^* + \{(c-z)\pi^* + z\pi\}$

Source: Authors' calculations.

Table 11. Definition of Parameters

	Description
Host Tax Parameters:	
u_f^*	Effective income tax rate at which investors can deduct interest expenses.
u_k^*	Effective corporate income tax rate at which retained corporate income is taxed.
u_s^*	Effective corporate tax rate at which dividends are taxed.
A^*	Effective rate of subsidy on capital goods (includes effect of tax credits and depreciation allowances).
u_d^*	Effective corporate income tax rates at which investors can deduct depreciation allowances.
A_d^*	The present value of standard depreciation allowances on a unit of investment.
f_1	The portion of the cost of an asset that is entitled to standard depreciation allowances.
f_2	The portion of the cost of an asset that qualifies for immediate expensing.
f_3	The portion of the cost of an asset that qualifies for an investment grant.
g	The rate of investment grant.
w_i^*	Withholding tax rate on nominal interest income.
w_d^*	Withholding tax rate on dividend income (includes effect of double taxation relief for corporate tax).
Residence Tax Parameters:	
m_i	Personal tax rate on nominal interest income.
m_d	Personal tax rate on dividend income.
θ_i	Parameter representing relief at personal level for foreign withholding taxes on interest income.
θ_d	Parameter representing relief at personal level for corporate taxes and foreign withholding taxes on dividends.
z	Personal tax rate on exchange rate gains and losses.
c	Personal tax rate on nominal capital gains (excluding exchange rate gains and losses).

Table 11 (concluded). Definition of Parameters

Description	
Other Symbols:	
ϵ^*	Fraction of real earnings on equity paid as dividends (or fraction financed by new share issues).
δ^*	Rate of economic depreciation.
i^*	Nominal interest rates.
ρ^*	Nominal return on equity before personal tax.
π^*	Expected inflation rate, host country.
π	Expected inflation rate, residence country.

Source: Authors' calculations.

the after-tax cost of a unit of investment $(1-A^*)$ times the sum of the after-tax financing costs r_f^* , and the costs of depreciation.

Following King and Fullerton (1984, p. 19), A^* denotes the present value of investment grants and depreciation allowances on a project with a cost (before tax allowances) of unity. This parameter reduces the after-tax cost of a unit of capital. The fourth row in the tables shows that this paper accounts for three forms of grants and allowances: standard depreciation allowances, immediate expensing (or free depreciation), and cash grants.

The fifth row contains the corporate tax wedge t_c^* . This gap between the cost of capital and the market return corresponds to the "investment tax wedge" in Sorenson (1987), Sinn (1987), and Boadway, Bruce, and Mintz (1984 and 1987). 1/ These papers use the investment tax wedge as a measure for the incentive to invest in a small open economy that takes the real market return r^* as given. 2/

The sixth and seventh rows in the tables contain, respectively, the real return after withholding taxes r_w^* and the withholding tax wedge t_w^* . The withholding tax wedge on dividends includes the effects of provisions to mitigate the double taxation of dividends, such as a split rate or imputation system. Withholding taxes on dividend income influence investment incentives only if the firm uses new share issues to finance marginal investment (see Table 10). 3/ 4/

1/ The corporate tax wedge does not depend on whether the investment is financed by domestic or foreign savers. In Sinn (1987), the corporate tax wedge depends on the tax treatment of interest and equity income at the personal level in the host country. This is because Sinn (1987) assumes that domestic equity finances a fixed part of domestic investment and that domestic households earn the same after-tax return on equity and debt.

2/ For a critical evaluation of this approach, see subsection IV.2.

3/ The expressions in Table 10 assume that the real return on new share issues is paid in dividends. The purely nominal inflationary gain is reflected in capital gains. This is similar to the procedure in Feldstein (1986) and Boadway, Bruce, and Mintz (1987) but different from that in King and Fullerton (1984).

4/ Sinn (1987) argues, along the lines of the "new" view of dividend taxation, that investors generally adopt profit retentions rather than new share issues as the marginal source of equity finance. In that case, dividend taxes, including withholding taxes on dividends, fail to distort investment decisions and amount to a lump-sum tax on existing rather than a tax on new capital. Dividend taxes affect new investment only when dividends are not paid; in that case internal investment absorbs all profits, and investors are forced to generate new equity capital through new share issues. Hartman (1985) uses similar arguments to argue that home taxation of direct investment is largely irrelevant for direct investment decisions in the presence of deferral provisions.

The eighth row in the tables aggregates the tax wedges for all host taxes. This host tax wedge t_h^* is important in determining the national welfare effects associated with capital taxation because it corresponds to the wedge between the social return on capital, which at the margin is equal to the cost of capital p^* , and the cost of capital to the host country as a whole, r_w^* .

The after-tax return, which is presented in the ninth row in the tables, affects the incentive to save. The total tax wedge, contained in the twelfth row, reflects the total effect of the tax system on these incentives. This wedge is important in determining the worldwide intertemporal efficiency costs resulting from capital taxation. It corresponds to the wedge between the social return on marginal investment p^* and the social costs associated with the financing of such an investment s .

The residence tax factor for debt instruments, contained in the tenth row in Table 9, depends on how the residence country credits foreign withholding taxes on dividend and interest income. The parameters θ_d and θ_i summarize these crediting arrangements for, respectively, dividend and interest income. Relative expected inflation rates may affect the residence tax burden imposed on domestic debt instruments relative to that imposed on foreign debt if the tax rate on interest income exceeds the tax rate on exchange rate gains and losses. 1/ In that case, the residence tax burden on domestic debt relative to that on foreign debt generally rises if the expected domestic inflation rate increases relative to the expected foreign rate of inflation. 2/

1/ The tax rate on exchange rate gains is generally lower than the tax rate on interest income because it is the rate on accrued gains and losses rather than the statutory rate on realized gains. Moreover, countries often set the tax rate on capital gains, including exchange rate gains, at a rather low level in order to encourage investors to trade their assets and realize their capital gains so as to avoid large efficiency losses and, in some cases, revenue losses.

2/ The paper assumes that savers expect nominal exchange rates to adjust fully for the effects of intercountry differences in expected inflation rates. See also Boadway, Bruce, and Mintz (1984) and Gordon (1986).

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