PUBLIC FINANCE AND PERFORMANCE OF ENTERPRISES

FINANCES PUBLIQUES ET PERFORMANCE DES ENTREPRISES

Proceedings of the 43rd Congress
of the International Institute of Public Finance
Paris, 1987

Edited by
Manfred Neumann and Karl W. Roskamp

Wayne State University Press, Detroit, 1989

Library of Congress Cataloging-in-Publication Data

International Institute of Public Finance. Congress (1987 : Paris, France)
Public finance and performance of enterprises = Finances publiques et performance des entreprises : proceedings of the 43rd Congress of the International Institute of Public Finance, Paris, 1987 / edited by Manfred Neumann and Karl W. Roskamp.
p. cm.
ISBN 0-8143-2269-7 : $45.00.—ISBN 0-8143-2270-0 (pbk.)
1. Finance, Public—Congresses. 2. Government business enterprises—Congresses. I. Neumann, Manfred. II. Roskamp, Karl W. III. Title. IV. Title: Finances publiques et performance des entreprises.
HJ113.I73 1987
336—dc19 89-5521
CIP

The Policy of Tax-cut-cum-base-broadening: Implications for International Capital Movements

by Hans-Werner Sinn

published in:
M. Neumann and Karl Roskamp (Eds.):
"Public Finance and Performance of Enterprises",
34th Congress and Semicentennial of the
International Institute of Public Finance,
Paris, 24th - 28th August 1987,
Wayne State University Press: Detroit 1989, pp. 153-176.

The Policy of Tax-Cut-cum-Base-Broadening:
Implications for International Capital Movements

*Hans-Werner Sinn**

1. The Purposes of this Study

The introduction of the Accelerated Cost Recovery System (ACRS) in the United States in 1981 shook the world economy. According to official estimates, the joint investment incentive resulting from the Investment Tax Credit (ITC) and the ACRS was equivalent to an immediate write off.[1] This incentive boosted the world interest rate and induced huge capital imports into the United States. A conservative estimate of the longrun U.S. capital import resulting from ACRS was $1 trillion.[2] At the time of writing, more than 40% of this value had been attained.

In 1986 the United States carried out another tax reform that may have similarly dramatic effects, albeit of a different kind.[3] That reform broadened the tax base by eliminating some of the obvious investment incentives and, "in exchange", it reduced the personal and corporate tax rates. Unlike the 1981 reform, it was intended to be revenue neutral (over a period of five years) and can therefore not be expected to create substantial income effects.[4] It will however bring about strong substitution effects. The present paper analyzes some of these effects and studies their implications for the direction of international capital flows. In particular, it will comment on the following reform measures: cut in personal tax rates, cut in corporate tax rates, repeal of the ITC, prolongation of depreciation periods, and increase in capital gains taxation.[5]

It is usually argued that the U.S. policy of tax-cut-cum-base-broadening will have difficult to judge implications for American investment and international capital movements, because there are countervailing effects on the tax burden imposed on corporations. Only the estimated increase in the corporate tax revenue, $120 billion over a five year period, has induced some

*The author is Professor at the University of Munich. He gratefully acknowledges useful comments on this paper by Richard Goode, Manfred Neumann, and an unknown referee.

Public Finance and Performance of Enterprises. Proceedings of the 43rd Congress of the International Institute of Public Finance. Paris, 1987, pp. 153–176.

commentators to suspect that investment in the United States might be discriminated against.

The purpose of the present paper is to demonstrate the fallacy of this view. It will be shown that the reform is likely to discriminate against investment in America, regardless of whether it actually raises the corporate tax revenue. Not only the broadening of the tax base, but even the cut in tax rates may drive capital out of the United States or lower the level of capital imports that would have otherwise occurred!

Though the paper deals with a policy problem, it also contains a theoretical framework for analyzing the influence of taxation on international capital movements. Offered is a simple model of international capital market equilibrium that links the United States with the rest of the world.[6]

In the model capital movements are not viewed exclusively as direct investment, and direct investment is not viewed exclusively as new injections of funds into foreign affiliates. It is true that foreign trade models which are concerned with taxation and international capital movements typically concentrate on direct investment through border crossing equity flows. Yet, these models may be bad idealizations of the real world.[7] Empirically, there is no doubt that bonds and credit contracts are the dominant channels through which marginal reallocations of the world capital stock are brought about.[8] Moreover, although direct investment does play a role in the long run, it does not, in general, take the form of new equity injections into foreign affiliates. According to a study of Wichard (1980), who analyzed the composition of U.S. direct involvement in the year 1979, direct investment consists almost exclusively (93%) of profit retentions within existing foreign affiliates, and direct investment through equity injections into new or existing foreign affiliates is of only minor importance. Unlike the existing literature, the present model focusses on the two empirically relevant types of capital movements—credit contracts and profit retentions within existing subsidiaries—and it even provides an explanation of why new equity injections are so rare.[9]

Neither can the model's predictions be understood by considering the tax reform's impact on the King-Fullerton type of tax wedge between the marginal product of capital and the consumer rate of time preference (i.e. the net return received by savers).[10] This overall wedge would be important for studying the growth repercussions of the reform, but it is useless for predicting international capital flows. The reason is the residence principle for taxing border crossing interest income flows which is applied by the United States and most of its trading partners.[11] The residence principle implies that there is a tendency towards equality of the pre-, and not the post-tax national interest rates, the latter being the quantities to which savers equate their rates of time preference. This makes it necessary to split up the overall tax wedge into two distinct components: the difference between the marginal product of

capital and the pre-tax market rate of interest on the one hand, and the difference between the pre- and post-tax interest rates on the other. The two components have different implications for international capital flows. The larger the first, the more capital is seeking investment opportunities abroad. The larger the second, the lower the volume of domestic savings and the more foreign capital is imported as a substitute. For the purposes of this study it is useful not to focus on the sum of the two components.

2. A Model of Taxation and International Capital Movements

The model distinguishes two countries, x and y, and two types of firm, 1 and 2, within each country. Country x ist the United States and Country y the rest of the world. The firm of Type 1 is a genuine "domestic" firm whose shareholders are resident in the country where this firm is located. The firm of Type 2 is a subsidiary of a foreign parent company which in turn represents the interest of foreign shareholder households. The parent is a holding company which is not itself engaged in production. It transfers the dividends it receives from its subsidiary to its shareholders and (potentially) sells newly issued shares to them in order to raise funds for the subsidiary. Each type of firm employs a given labor force and has a given homogeneous clientele of shareholders which may or may not be determined by the tax systems. In addition to shares, each clientele owns domestic and foreign bonds and, in equilibrium, the net-of-tax rates of return on all three types of asset are the same.

Formally, there are two basic types of arbitrage condition that characterize the capital market equilibrium assumed to hold at each instant of time. The first type characterizes an international portfolio equilibrium:

$$r^z = r, \qquad z = x, y, \tag{1}$$

where r^z is the market rate of interest on bonds in Country z and r the common world market rate of interest. If stationary exchange rate expectations are assumed, (1) follows from the residence principle. Let τ_p^{zi} be the personal tax rate of an investor belonging to clientele zi and $\theta_p^{zi} \equiv 1-\tau_p^{zi}$ the corresponding "tax factor"; $0 \leq \tau_p^{zi} < 1$; $z = x, y$; $i = 1, 2$. This investor is indifferent between domestic and foreign bonds when $r^x\theta_p^{zi} = r^y\theta_p^{zi}$ or, equivalently, when $r^x = r^y$. Since this holds true for any investor, regardless of his tax rate, a common world market rate of interest will indeed emerge. By way of contrast, note that the source principle would equate the market rates of interest net of the national tax rates: $r^x\theta_p^x = r^y\theta_p^y$. As explained in the introduction, this is however only a theoretical possibility.

Equation (1) has straightforward implications for that portion of interna-

tional capital flows which results from diverging national savings flows. Whatever the change in r that the reform brings about, it is clear that the cut in personal tax rates in the U.S. will increase the net-of-tax rates of return for American savers relative to that for foreign savers. Under mild assumptions about intertemporal preferences, this will result in more American savings being channelled abroad than otherwise would have been the case.[12] Of course, income effects in principle could produce ambiguities, but because of the intended revenue neutrality of the reform they can be neglected.[13]

Capital flows emanating from savings may not be very important, though. In the short and medium run, they are clearly dominated by those flows that result from a reallocation of existing stocks. The following sections will be exclusively concerned with the latter.

For this purpose, information is needed that links the national pre-tax returns on real assets with the market rate of interest such that, together with (1), the allocation of a given world capital stock to the different countries is determined. This information can be derived from the second type of arbitrage condition:

$$M^{zi} r \theta_p^{zi} = D_n^{zi} + \dot{p}^{zi} n^{zi} \theta_c^{zi} + (\dot{n}^{zi} p^{zi} - Q^{zi}) \theta_c^{zi}, \qquad z = x,y; \qquad i = 1,2. \quad (2)$$

This condition requires shareholders to be indifferent between keeping their shares and exchanging them for bonds. The left-hand side measures the current net-of-tax return shareholders could realize if they sold their shares at the going market price M and invested the revenue in bonds. The right-hand side indicates the current net-of-tax return from continuous holding of shares. The first item, D_n, is dividends net of all corporate and personal taxes. The second, $\dot{p} n \theta_c$, is capital gains on existing shares net of capital gains tax; p is the price per share, n the number of existing shares, and $\theta_c \equiv 1 - \tau_c$, $0 \leq \tau_c < 1$, is one minus the equivalent tax rate on accrued capital gains. The third term, $(\dot{n}p - Q)\theta_c$, is the net-of-capital-gains-tax flow of purchasing options distributed to existing shareholders with Q as the company's revenue from selling new shares. In some countries, corporations cannot issue such options and hence existing shareholders will require their company to sell new shares at the going market price ($\dot{n}p = Q$). In general, however, we should allow for $\dot{n}p \geq Q$.

Because of $\dot{M} = \dot{p}n + \dot{n}p$, (2) can be transformed into $\dot{M} = Mr\theta_p/\theta_c - D_n/\theta_c + Q$, which, upon integration, gives the following expression for the market value of shares at time t:

$$M^{zi}(t) = \int_t^{\infty} \left[\frac{D_n^{zi}(v)}{\theta_c^{zi}} - Q^{zi}(v) \right] \left[exp \int_t^{v} - \frac{\theta_p^{zi}}{\theta_c^{zi}} r(s)\, ds \right] dv . \quad (3)$$

Here it is assumed that the time path of r is positive and bounded away from zero. Moreover, it is assumed that the integrand of the outer integral converges sufficiently fast to ensure existence.[14] The integration constant is set equal to zero assuming that $M(0) = 0$ if the firm never issues new shares and never pays out dividends. In line with Fisher's separation theorem, the firm chooses the time paths of its real net investment $\dot{K}$, its net increase in debt $\dot{B}$, its new share issues Q, and its employment of labor L, so as to maximize its shareholders' wealth:

$$\max_{\{\dot{K}^{zi}, \dot{B}^{zi}, Q^{zi}, L^{zi}\}} M^{zi}(0). \quad (4)$$

The state variables of this problem are the stocks of real capital, K, and debt, B. The constraints are $K, Q, L \geq 0$; $K(0) = \text{const.} > 0$, $B(0) = \text{const.}$; and $\dot{B} \leq \sigma \dot{K}$ where σ is a constant ($0 < \sigma < 1$) that denotes an upper limit for the firm's marginal debt-asset ratio.

It is assumed that all firms produce the same commodity where $f(K,L) - \delta K$ is a Jorgenson production function satisfying the Inada conditions. The true economic depreciation rate is δ. The government provides an investment tax credit at the rate s and allows for accelerated depreciation such that the proportion α, $0 \leq \alpha \leq 1$, of gross investment net of the investment tax credit can be written off immediately and $1 - \alpha$ gradually over time, in line with true economic depreciation. This is not precisely the type of accelerated depreciation described by the ACRS, but it is the simplest type able to capture its incentive effects. All firms operating in a country are subject to the same depreciation rules, the same corporate tax rate on retained profits τ_r, and the same rate of investment tax credit. Dividends are subject to corporate taxation at a rate τ_d, possibly measuring the joint burden of taxation in the home and host countries, and to personal taxation, the rate τ_p being determined by the shareholders' country of residence. Analogously to θ_p and θ_c, we define $\theta_d \equiv 1 - \tau_d$ and $\theta_r \equiv 1 - \tau_r$ where $0 \leq \tau_d < 1$ and $0 \leq \tau_r < 1$. Market agents expect all tax parameters to be constants.

Under these assumptions, the relationship sought between the marginal product of capital and the market rate of interest can be derived from (4). As shown in Appendix 2, one obtains

$$r = \frac{f_K(K^{zi}, L^{zi}) - \delta(1 - s^z)}{1 - (1 - s^z)\alpha^z \tau_z^z - \varepsilon^{zi} + (\varepsilon^{zi} - s^z) \dfrac{\theta_p^{zi}}{\theta_r^z \theta_c^{zi}}} \qquad (z = x,y,\ i = 1,2) \quad (5)$$

The parameter ε^{zi} is the minimum marginal equity-asset ratio defined as that portion of an additional unit of capital that cannot be financed with either

interest bearing debt ($\dot{B}/\dot{K}$) or tax deferrals [$(1 - s)\alpha\tau_r$] due to accelerated depreciation. By definition, it holds that $\varepsilon + \sigma + (1 - s)\alpha\tau_r \equiv 1$. It is assumed that $s \leq \varepsilon \leq 1 - \alpha\tau_r(1 - s)$, i.e. that equity formation is no less than the investment tax credit and no more than the part of net investment not covered by tax deferrals. Equation (5) implicitly defines the capital demand curve of firm zi, it shows the level of the market rate of interest at which the firm would choose to employ the amount of capital K^{zi}.

The result stated with equation (5) follows from a simultaneous optimization of the firm's investment and financing decisions assuming that the firm can freely choose between profit retentions and new issues of shares as marginal sources of equity finance and has a limited scope for choosing between debt and equity as defined by ε. In order for the solution of the firm's optimization problem to exist under the given set of constraints, Appendix 2 shows that it is necessary to assume

$$\theta_d^{zi}\ \theta_p^{zi} \leq \theta_r^{z}\ \theta_c^{i} \tag{6}$$

$$\theta_p^{zi} \geq \theta_r^{z}\ \theta_c^{zi} \tag{7}$$

for all i and z. Condition (6) implies that retentions are superior or equivalent to new share issues and condition (7) implies that debt is superior or equivalent to retentions as marginal source of finance. Condition (6) is satisfied as a strict inequality for U.S. firms of Type 1, for example, as $\theta_d = \theta_r$ and $\theta_c > \theta_p$ due to the taxation of capital gains on a realization, rather than accrual basis. Condition (7) may not have been satisfied in every case before the 1986 reform. Nevertheless, it is a plausible condition, at least since the 1981 reform where $0.5 \leq \theta_p \leq 0.6$, $\theta_r = 0.54$, and $\theta_c \leq 0.9$ may have been good guesses concerning the tax situation of the typical shareholder. If a Miller equilibrium had prevailed, then it would even have turned out that $\theta_p = \theta_r\theta_c$.[15] After the 1986 reform, a Miller equilibrium is impossible and (7) must hold as a strict inequality because $\theta_r = 0.66$, $\theta_c \leq 1$, and most shareholders will be in the 28% bracket with $\theta_r = 0.72$.

It is important to note that, in the realistic case $\theta_d\theta_p < \theta_r\theta_c \leq \theta_p$, new equity injections into the firm are discriminated against but, nevertheless, debt may be equivalent to equity capital generated through retentions. The firm will therefore not issue new shares when it is able to provide for the required amount of equity finance ($\varepsilon\dot{K}$) by retaining some of its profit and distributing only the remainder to its shareholders. This is particularly true for the firms of Type 2 as border-crossing profit distributions are frequently subjected to higher taxes than internal distributions. The model therefore explains the cited fact that direct investment nearly exclusively occurs through profit retentions within existing subsidiaries.

There is another general observation about equation (5) that is worth

mentioning at this stage. It is the fact that the divided tax rate does not show up in this equation and hence turns out to be neutral with regard to the firm's investment decision. This is the fundamental neutrality property that induced the Meade Committee (1978) to advocate a dividend tax as the only capital income tax in the economy. The reason is that new issues of shares are not used as a marginal source of finance. Only when insufficient profits force the firm to use this form of equity creation can dividend taxes interfere with the real investment decision. However, firms that are able to pay out dividends can always forgo doing this and thus cannot be forced to issue new shares. Dividend taxes can be distortionary when they are not paid, but when they are paid, they are neutral!

In this paper it is assumed that all types of firms usually pay out dividends and therefore pay dividend taxes. Given the focus on allocation problems, this assumption makes the discussion of how the 1986 reform affects the taxation of internal and border-crossing dividend flows a pointless one.

The following sections will analyze the implications of equations (1) and (5) for the influence of the American tax reform on the direction of international capital movements. For this discussion it is assumed that there is a given world capital stock K that is fully absorbed by the four sectors:

$$K^{z1} + K^{z2} + K^{y1} + K^{y2} = \bar{K}. \tag{8}$$

While capital is perfectly mobile to satisfy (5) and (1) at each instant of time, labor is completely immobile. This assumption is a useful simplification that helps to highlight the tax influence on capital movements. In reality, the kinds of adjustment mechanisms described are slowed down by the sluggishness of trade balance reactions, and it will take a decade or more before they are accomplished.

3. ACRS and ITC

The most significant and most obvious effects of the United States tax reform result from the repeal of the ITC and the prolongation of depreciation periods within the framework of the ACRS.

The ITC had been a substantial investment incentive as it provided that, for most equipment, 10% of the purchasing price could be deducted from the corporate tax liability. Over the next five years the revenue gain from repeal of ITC was officially estimated to be $118 billion which is about the same as the expected revenue loss from the cut in the corporate tax rate, namely $117 billion.

There have been long debates about the depreciation rules. When, in 1981, the Asset Depreciation Range System was replaced by the ACRS, the

typical depreciation period for equipment was cut in half, from about 8–12 years to only 5 years. Early estimates had predicted annual tax losses climbing to $50–$60 billion in 1986 which would have been almost equal to the pre-reform corporate tax revenue ($65 billion in 1980).[16] It turned out that the actual losses were not quite so large since the Reagan administration abolished, as a first reaction, the generous safe-harbor leasing arrangements for inter-firm loss transfers that had come with the reform and were being intensively exploited by industry. Nevertheless, the corporate tax revenue fell to the bottom level of $37 billion in 1984 and the tax share of the corporate tax declined from 12.5% in 1980 to 8.1%.[17]

To reduce the revenue loss, the Treasury advocated abolishing the ACRS and returning to true economic depreciation, albeit with indexed depreciation allowances. It was able to ultimately convince Congress, but the Senate raised many objections. As a compromise, the depreciation periods were somewhat extended to 7 rather than 5 years as typical for equipment. (See Appendix 1 for details). If the typical period of 10 years characterized in the Asset Depreciation Range System can be associated with true economic depreciation, then the 1981 reform can be seen as raising the value of the parameter α from 0 to about 0.5 and the 1986 reform as reducing it from about 0.5 to 0.3.[18]

Figure 1 illustrates the effects the two measures have on the allocation of capital between the United States and the rest of the world. For each of the four sectors ($x1$, $x2$, $y1$, $y2$) the outer diagrams of this figure illustrate the capital demand curves with regard to the world market rate of interest as defined by (5). The two left-hand diagrams show the two types of firm operating in the United States and the two right-hand diagrams, which are mirror images of the left-hand ones, refer to the two types of firm that operate abroad. For example, the diagram directly right of center which is denoted as $y2$ indicates the capital demand of subsidiaries of U.S. parent companies that operate abroad. Analogously, the furthest left diagram $x1$ depicts the capital demand of U.S. firms that are controlled by U.S. residents. The middle diagram contains aggregate capital demand curves for both the United States and the rest of the world.

Assume now that, for simplicity, before the 1986 tax reform the world economy was in the equilibrium characterized by number 1. (Of course, it was not, but the purpose of this paper is to isolate the effects resulting from the reform itself). Then the repeal of the ITC and the prolongation of depreciation periods shift the capital demand curves for the two types of firm operating in the United States downward. This is obvious from (5) which indicates that, given K^{x1} and K^{x2} and hence given f_K^{x1} and f_K^{x2}, $dr/d\alpha^x > 0$ and $dr/ds^x > 0$, where the latter follows from the facts that $\theta_p/(\theta_r\theta_c) \geq 1$ and $\alpha\tau_r < 1$. As a consequence, the aggregate demand curve in the middle diagram also

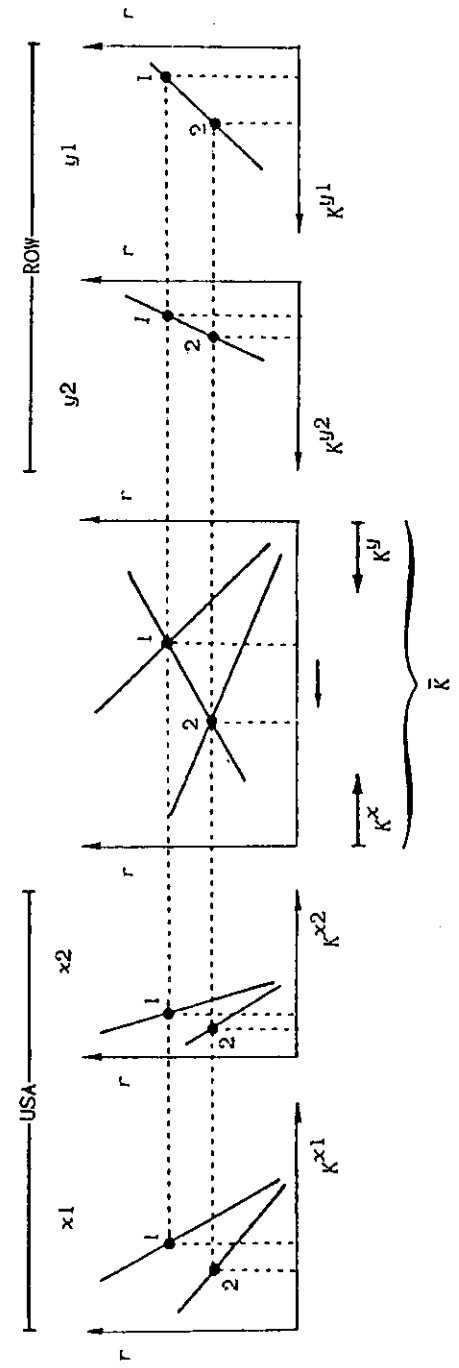

Figure 1 *The repeal of the ITC and the prolongation of depreciation periods (and corporate tax cut with accelerated depreciation and high financial flexibility)*

shifts downward and the new equilibrium characterized by the number 2 emerges. There is a lower world interest rate and a capital export from the United States to the rest of the world.

4. Why an Isolated Cut in Personal Tax Rates Expels Capital from the United States

The perhaps most spectacular change brought about by the 1986 tax reform is the cut in personal tax rates. The maximum marginal rate of the federal income tax had been reduced from 70% to 50% in 1981. Last year's reform reduced the marginal tax rate in the highest tax bracket from 50% to only 28%. It is true that the maximum marginal tax rate exceeds this value by five percentage points for some intermediate income range, but this is to phase out the bottom 15 % rate and to equate the average with the marginal tax rate for top income earners. Although 80% of U.S. citizens will be in the 15% bracket, the marginal personal tax rate of the representative shareholder household is likely to be in the 28% plus bracket which starts at a joint income of $29,750 in 1988 prices.

Apart from the stimulation of U.S. savings and the capital export thus generated, the cut in personal tax rates will also effect a reallocation of any given world capital stock among the four sectors.[19] At first sight it seems that the tax cut will stimulate American investment and attract some of the capital that currently is operating outside the United States. But this expectation is clearly not confirmed by the model.

In the realistic case where firms must reinvest at least some of their profits in addition to the investment tax credit ($\varepsilon > s$), it is obvious from (5) that a decline in τ_p, which is a rise in θ_p, reduces r with any given value of K, and this effect is the stronger the lower the degree of financial flexibility, i.e. the higher the minimum marginal equity-asset ratio ε. As the cut in personal tax rates affects the shareholders of genuine American firms ($x1$) and of U.S. subsidiaries operating abroad ($y2$), this means that the capital demand curves in the outmost left diagram and the one right of the middle in Figure 2 shift downward.

While the world interest rate will definitely decline, the direction of international capital movements remains theoretically undetermined as both domestic American firms and American subsidiaries abroad reduce their capital demands. In practical terms, however, there is no ambiguity as the order of magnitude of the sector of domestic American firms is many times larger than that of American subsidiaries operating abroad. There can be no doubt that the reduced capital demand of normal American firms dominates

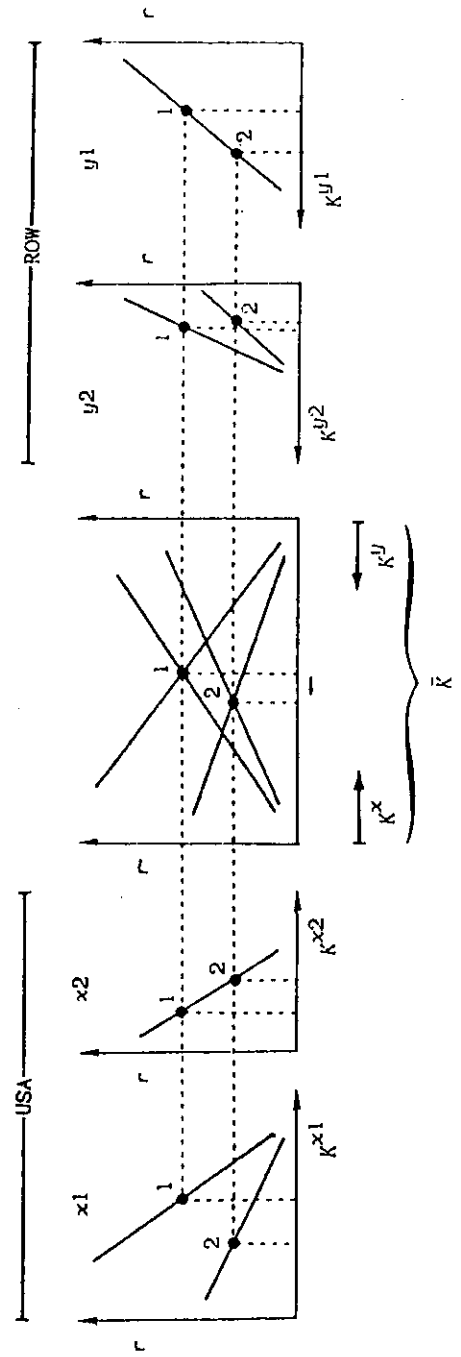

Figure 2: *The cut in personal tax rates (and the rise in capital gains tax rates)*

and that there should be a net capital export from the United States to the rest of the world.

This result must be surprising for those who look at the overall tax wedge between $f_K - \delta$ and $r\theta_p$, i.e., between the marginal product of capital and the savers' net rate of return. Certainly, this overall wedge is being reduced through the cut in personal tax rates.[20] However, what matters according to (1) and (5) is simply the wedge between the marginal product of capital and the market rate of interest, and this wedge is being increased by the personal tax cut.

The reason for the capital export can easily be understood in terms of a portfolio effect. The cut in personal tax rates favors financial capital market investment of households over profit financed real investment within the firms and, because of the residence principle, the favored financial investment includes financial investment abroad. This is why the world economy is driven towards a new equilibrium, with a lower portion of its capital stock operating in the United States. The personal tax cut does not counteract, it reinforces, the base broadening effects resulting from the reform of the ACRS and the repeal of the ITC.

This would not be true if new issues of shares in lieu of profit retentions were used as the marginal source of finance, for then the reduced dividend tax burden that accompanies the cut in personal tax rates would compensate for the effects resulting from a reduced taxation of interest income. Yet as stated above, this case does not deserve much attention on either empirical or theoretical grounds. Firms that pay dividend taxes enjoy enough financial flexibility to avoid new share issues and will therefore not react to (unforseen) changes in the dividend tax rate.[21] For them, only the increase in their shareholders' discount rate matters, and this induces them to pay out more dividends and reduce their demand for loans so that resources are set free for other uses abroad.

5. The Corporate Tax Cut, the Personal Tax Cut, and the Role of Accelerated Depreciation

Not only personal, but also corporate tax rates were dramatically reduced with the reform. While most firms faced an average and marginal corporate tax rate of 46% before the reform, the typical rate after the reform is 34%. This value is among the lowest in the world.

A cut in the corporate tax rate unambiguously favors profit retentions relative to personal capital market investment, and for this reason it is able to produce stimulating effect on real investment to the extent that profit retentions are used as a marginal source of finance. Equation (5) shows this effect

because a fall in τ_r makes the term $+(\varepsilon - s)\theta_p/(\theta_r\theta_c)$ in the denominator decline when $\varepsilon > s$ so that r increases with any given value of the marginal product of capital.

However, when accelerated depreciation is allowed for ($\alpha > 0$), there is a countervailing second effect captured by the term $-(1 - s)\alpha\tau_r$ in the denominator. Via this effect, a fall in τ_r reduces r with any given value of the marginal product of capital. The reason is that, compared to true economic depreciation, accelerated depreciation subsidises marginal investment projects, whose size is positively related to the tax rate. The cut in corporate tax rates reduces this subsidy and hence reduces the investment stimulus accelerated depreciation produces.

On theoretical grounds alone, it is impossible to find out which of these countervailing effects will dominate. With little acceleration in depreciation allowances and low financial flexibility at the margin, i.e. a high value of ε, the popular view that investment is stimulated by the corporate tax cut is clearly confirmed. But the reverse is also possible.

Suppose accelerated depreciation is allowed and the firm enjoys a high degree of financial flexibility in the sense that it can freely choose the cheapest source of finance for marginal investment projects, i.e. suppose that $\varepsilon - s$ is sufficiently small and marginal projects can be financed nearly exclusively with debt, deferred taxes, and the ITC. Then the second effect will dominate and, given the rate of interest, the stock of capital employed by the firm is a locally rising function of the corporate tax rate. With accelerated depreciation and a sufficient financial flexibility, the firm can save corporate tax by investing more rather than less and the amount it can save is the lower the lower the tax rate. This is why even the corporate tax cut in itself may discriminate against American investment and induce a capital export.[22]

Which of the two cases prevails is an empirical matter. Clearly, U.S. tax laws allow for a substantial amount of accelerated depreciation, even after the 1986 reform. This is not only obvious if one compares the typical 7 year period for equipment with the asset lifes as stated in the Asset Depreciation Range System. It also follows from a comparison of the depreciation rules used outside the Anglo-Saxon countries. In West Germany, for example, the relevant depreciation periods are 10–12 years, and empirical estimates revealed even higher values for the true economic life of equipment.[23] It is unclear, however, where the *bottom* line for equity financing of *marginal* investment projects lies. Various studies suggest that there is a general international trend towards increased debt-asset ratios, and this suggests that, for most firms, the minimum marginal equity-asset ratio was significantly below the actual average equity-asset ratio.[24] But no direct empirical estimates are available that would allow to decide the matter.

The "paradox" case implies the kind of reaction shown in Figure 1. The

other case implies an adverse reaction where, in Figure 1, the equilibrium is characterized by point 2 before the tax cut and by point 1 thereafter.

Although the ambiguities with regard to an isolated cut in the corporate tax rate cannot be removed here, a clearer result emerges if the cuts in corporate and personal tax rates are compared. The corporate tax cut was shown to expel capital from the United States when firms enjoy a high degree of financial flexibility and the personal tax cut was seen to expel the capital when the flexibility is low. At least one of these seemingly paradoxical results must be true and the weaker the forces producing one of them, the stronger are those producing the other.

This suggests that, with accelerated depreciation, simultaneous cuts in corporate and personal tax rates may have robust implications for private investment that are independent of the assumed degree of financial flexibility. Equation (5) reveals that this is indeed so. Except for the case where the ratio $\theta_p/(\theta_r\theta_c)$ is reduced sufficiently strongly—i.e. the case where profit retentions are sufficiently preferred to personal capital market investments—accelerated depreciation will do to ensure that the tax cuts reduce the amount of capital employed at each given level of interest or reduce the interest rate for each given level of capital.

Concerning genuine American firms ($x1$), the 1986 reform does not seem to have been an exceptional case. The new ratio of θ_p/θ_r is 1.09 for the typical shareholder and the typical firm. Before the reform, $\theta_r = 0.54$. Given θ_c, the critical value for the pre-reform marginal personal tax rate—where $\theta_p/(\theta_r\theta_c)$ would just have remained constant—is therefore $1 - 0.54 \cdot 1.09 = 0.41$. Any lower value would have meant a fall, and any higher value a rise, in $\theta_p/(\theta_r\theta_c)$. In view of the facts that the top personal rate was 50% and that those shareholders of American firms that ultimately decided on the investment and financing policies will have been in high tax brackets, it seems likely that τ_p was above the critical value. Thus, even with a given taxation of capital gains, the corporate and personal cuts seem to have favored personal capital market investment at least as much as profit retentions. The case where capital demand is reduced does, in fact, seem to apply to the American industry.

To understand this result it is useful to see it in relationship to the neutral case where the American corporate and personal tax cuts leave the ratio $\theta_p/(\theta_r\theta_c)$ unchanged and where true economic depreciation is allowed. In this case, the demand for capital is not affected and no capital movements are induced. Foreign financial investment is favored just as much as domestic real investment (in Sector $x1$). However, in the realistic case, where accelerated depreciation is allowed and/or $\theta_p/(\theta_r\theta_c)$ rises, foreign financial investment is more preferred than domestic real investment. Consequently, a capital export is induced to the extent that international capital movements take place through portfolio investment and credit contracts.

With regard to direct investment, the situation is less clear. Foreign subsidiaries operating in the United States ($x2$) are only subject to the corporate tax cut, and thus their reaction depends on their degree of financial flexibility as already explained. Moreover, as discussed in the previous section, the personal tax cut induces American subsidiaries operating abroad to reduce their capital demand. The net effect on direct investment is therefore ambiguous. Yet whatever its sign, it seems doubtful that it is comparable in size to the portfolio effect just described, for this links the whole of the U.S. economy to the whole of the rest of the world. It still remains true that the tax cuts in themselves may expel capital from the United States rather than attracting it from abroad!

6. Capital Gains Taxation

Another important change brought about by the 1986 reform lies in the fact that now 100% rather than 40% of *realized* capital gains are included in the personal tax base. Taking into account the usual holding period of company shares, it had been estimated that, before 1981, when the rate of inclusion was 50%, the effective tax rate on *accrued* capital gains was ¼ of the representative shareholders' marginal personal tax rate.[25] As the latter may have been between 40 and 50% before the 1986 reform, the effective tax rate on *accrued* capital gains was probably in the range between 9 and 11%. Now, the effective tax rate on accrued capital gains is about 50% of the personal tax rate or, as the latter can be taken to be 28%, about 14%. Despite the cut in personal tax rates, the reform therefore raised the effective tax rate on accrued capital gains.

The taxation of capital gains from company shares is an indirect taxation of retained profits and it can thus be expected to create distortions similar to the corporate tax on retained profits. There is, however, one important difference. While corporate taxation brings about a subsidy effect in addition to a discrimination effect when accelerated depreciation is allowed, capital gains taxation is unable to produce a subsidy effect, either explicitly or implicitly. As the capital gains result from market valuations, the capital gains tax is implicitly a tax on retained earnings where true economic depreciation is applied. For this reason, the rise in the capital gains tax rate unambiguously discriminates against real investment when retained earnings contribute to financing marginal investment projects.

Equation (5) shows this in that a rise in τ_c, i.e. a fall in θ_c, reduces r with any given level of f_K when $\varepsilon > s$. Obviously θ_c affects investment in the same way as the corporate tax factor θ_r if, and only if, true economic depreciation is required for tax purposes ($\alpha = 0$).

The sectors affected by the rise in the American capital gains tax rate are $x1$ and $y2$: the sectors of genuine American firms and of American subsidiaries abroad. For both of these sectors, the capital demand curves shift downward and, due to the relatively smaller size of sector $y2$, a capital export can be expected.

The result is the same as that illustrated in Fig. 2 for the case of a personal tax cut. Indeed, it is evident from equation (5) that a rise in θ_p must have the same effects as a fall in θ_c. Both measures have in common that they induce a portfolio reallocation away from profit financed real investment towards a personal capital market investment of shareholder households. Moreover, they both affect the same types of shareholders. It is therefore not surprising that they result in the same kind of reallocation of the world capital stock.

7. Conclusion

This paper studied the interactions between real and financial investment decisions in an open economy tax model with international portfolio and direct investment. Its theoretical results were applied to the 1986 U.S. tax reform. The basic idea of this reform is to broaden the tax base and to cut the tax rates in exchange. While these measures counteract each other in terms of tax revenue, it is shown that they may be mutually reinforcing with regard to their influence on the direction of international capital movements. The base broadening effects in the form of a prolongation of depreciation periods, a repeal of the Investment Tax Credit, and a full inclusion of realized capital gains in the personal income tax base clearly induce capital exports. However, when portfolio investment is the dominant channel for international capital movements, cuts in corporate and personal tax rates themselves imply such exports in conjunction with the residence principle and accelerated depreciation, they favor financial investment abroad more than real investment at home.

The policy of tax-cut-cum-base-broadening can for these reasons be expected to counteract the gigantic capital flows that were channelled into the United States during the last few years, bringing in its wake a lower world interest rate, a lower value of the Dollar, and a reduced U.S. trade deficit.[26] The new policy will help to correct the imbalances in the world economy that, in all likelihood, were induced by the 1981 tax reform. The falling interest rates will be a relief to the indebted developing countries. Europe on the other hand will be gladdened to find that its capital is no longer in response to by the artificial means through which tax authorities enriched American investment opportunities.

Appendix 1

*Tax Reform Act of 1986**

	Until 1986	*After transition period (1988 . . .)*
Income tax rates	Progressive rates with up to 15 indexed brackets, average and marginal tax rates between 11% and 50%	Progressive rates with 4 indexed brackets, marginal rates between 15% and 33%, average rates between 15% and 28%
Personal allowances	\$1.080** per family member	Stepwise increase from \$1.990 per family member to \$2.000 in 1989 ; from 1990 onwards, this amount will be indexed.
Zero bracket amount or standard deduction	\$3.670** for couples, \$2. 480** for singles, indexed	\$5.000** for couples, \$3.000** for singles, indexed
Allowance for working spouse	Minimum of \$3.000 or 10% of the lower of the two incomes	Repealed
Interest on consumer loans	Deductible	Not deductible, except where housing investment serves as collateral
Personal capital gains	100% inclusion of short run and 40% inclusion of long run capital gains in personal tax base	100% inclusion of all realized capital gains in personal tax base
Corporate tax rates	Progressive rates with 7 brackets, marginal rates between 15% and 51%, average rates between 15% and 46%	Progressive rates with 5 brackets, marginal rates between 15% and 39%, average rates between 15% and 34%

	Until 1986	*After transition period (1988 . . .)*
Investment tax credit	6–10% of gross investment, deductible from (corporate or personal) income tax liability	Repealed
Depreciation allowances	4 depreciation periods (3,5,15,19 years) with 5 years as most frequent period for equipment and 19 years for buildings	8 depreciation periods (3,5,7,10,15,20,27.5,31.5 years) with 5 and 7 years as most frequent periods for equipment (for 4 years $< x <$ 10 years or 10 years $< x <$ 16 years respectively, x ≡ depreciation period according to Asset Depreciation Range System) and 27.5 years for housing investment
Minimum tax for households	Tax rate: 20% on extended tax base; deductions: between \$40,000 (couples) and \$30,000 (singles)	Tax rate: 21% on extended tax base; deductions: as before but with reduction formula for income in excess of \$150,000 (couples) or \$112,000 (singles)
Minimum tax for corporations	Tax rate: 15% on extended tax base; deduction: minimum of ordinary tax liability and \$10,000	Tax rate: 20% on extended tax base; deduction: \$40,000 with reduction formula for profits exceeding \$150,000

* See Joint Committee on Taxation (1986).
** In 1986 prices

Appendix 2

This appendix derives the marginal condition for the firm's investment decision from problem (4), using accounting identities and the maximum principle.

Let s be the rate of investment tax credit, K the firm's stock of real assets, δ the true economic depreciation rate, and α the proportion of gross investment, net of the investment tax credit, that can immediately be written off, where $1 - \alpha$ is written off in proportion to true depreciation. Then the current flow of tax depreciation is

$$\alpha(1 - s)(\dot{K} + \delta K) + (1 - \alpha)(1 - s)\delta K = (\alpha\dot{K} + \delta K)(1 - s). \tag{A1}$$

Accordingly the corporate tax on retained profits is given by

$$T_r \equiv \tau_r[f - wL - rB - (\delta K + \alpha\dot{K})(1 - s) - D] - s(\delta K + \dot{K}) \tag{A2}$$

where $f = f(K,L)$ is output, w the wage rate, L employment, r the market rate of interest, B the firm's stock of debt, and D the pre-tax volume of dividends defined as

$$D \equiv f - \delta K - wL - rB + \dot{B} + Q - \dot{K} - T_r \tag{A3}$$

Q is the flow of net equity capital from new issues of shares. Dividends net of all taxes are

$$D_n = D\theta_d\theta_p \tag{A4}$$

where θ_d and θ_p are one minus the corporate and personal tax rates, respectively. Inserting (A2) into (A3), solving for D, and using (A4) gives

$$D_n = \theta_d\theta_p[f - \delta K(1 - s) - wL - rB] + \frac{\theta_d\theta_p}{\theta_r}[\dot{B} + Q - \dot{K}(1 - s)(1 - \alpha\tau_r)] \tag{A5}$$

Associating the Kuhn-Tucker multipliers μ_1 and μ_2 with the flow constraints of problem (4), the current-value Hamiltonian of the firm's decision problem is

$$\mathcal{L} = \frac{D_n}{\theta_c} - Q + \lambda_K\dot{K} + \lambda_B\dot{B} + \mu_1 Q + \mu_2(\dot{K}\sigma - \dot{B}) + \mu_3 L. \tag{A6}$$

The control variables of this problem are $\dot{K}$, $\dot{B}$, Q, and L; the state variables are K and B; and the corresponding co-state variables are λ_K and λ_B.

The necessary optimization conditions are

$$\frac{\partial\mathcal{L}}{\partial\dot{K}} = -\frac{\theta_d\theta_p}{\theta_r\theta_c}(1-s)(1-\alpha\tau_r) + \lambda_K + \mu_2\sigma = 0; \tag{A7}$$

$$\frac{\partial \mathcal{L}}{\partial \dot{B}} = \frac{\theta_d \theta_p}{\theta_r \theta_c} + \lambda_B - \mu_2 = 0; \tag{A8}$$

$$\frac{\partial \mathcal{L}}{\partial Q} = \frac{\theta_d \theta_p}{\theta_r \theta_c} - 1 + \mu_1 = 0; \tag{A9}$$

$$\frac{\partial \mathcal{L}}{\partial L} = \frac{\theta_d \theta_p}{\theta_c} (f_L - w) = 0; \tag{A10}$$

$$\mu_1 Q = 0;\ \mu_2(\dot{K}\sigma - \dot{B}) = 0;\ \mu_3 L = 0;\ \mu_1, \mu_2, \mu_3 \geq 0; \tag{A11}$$

$$\dot{\lambda}_K - r \frac{\theta_p}{\theta_c} \lambda_K = - \frac{\theta_d \theta_p}{\theta_c} [f_K - \delta(1-s)]; \tag{A12}$$

$$\dot{\lambda}_B - r \frac{\theta_p}{\theta_c} \lambda_B = \frac{\theta_d \theta_p}{\theta_c} r. \tag{A13}$$

It is assumed that the transversality conditions are satisfied. See Sinn (1987, esp. Appendix C) for details.

Consider equation (A 13) first. Suppose $\dot{\lambda}_B < 0$ for some $t = t^*$. Then, as $r >$ const. > 0, $\dot{\lambda}_B <$ const. < 0 for all $t \geq t^*$ so that $\lim_{t\to\infty} \lambda_B(t) = -\infty$ or, because of (A8), $\lim_{t\to\infty} \mu_2 = -\infty$. As the latter violates (A11), it has been proved that $\dot{\lambda}_B \geq 0$. Suppose, alternatively, that $\dot{\lambda}_B > 0$ for some t $= t^*$. Then, obviously, $\dot{\lambda}_B >$ const. > 0 for all $t \geq t^*$ and $\lim_{t\to\infty} \lambda_B(t) = +\infty$. However, $\lambda_B > 0$ is impossible as, by definition, $\lambda_B(t) = \partial M(t)/\partial B(t)$ and, according to (3) and (A5), it is obvious that $\partial M/\partial B < 0$ for all t. Thus $\dot{\lambda}_B = 0$, and hence (A13) implies

$$\lambda_B = -\theta_d. \tag{A14}$$

Inserting (A14) into (A8) gives

$$\mu_2 = \theta_d \left[\frac{\theta_p}{\theta_r \theta_c} - 1\right] \tag{A15}$$

and inserting (A15) into (A7) gives

$$\lambda_K = \frac{\theta_d \theta_p}{\theta_r \theta_c} (\varepsilon - s) + \theta_d [1 - \varepsilon - (1-s)\alpha\tau_r] \tag{A16}$$

where

$$\varepsilon \equiv 1 - \sigma - (1-s)\alpha\tau_r \tag{A17}$$

Note that $\mu_2 \geq 0$ from (A11) and (A15) imply that

$$\theta_p \geq \theta_r \theta_c. \tag{A18}$$

This condition is an existence requirement for, if it is not satisfied, the Hamiltonian (A6) is unbounded for $\dot{B} \to -\infty$. It is obvious from (A15) and (A6) that (A18) implies that debt is superior or equivalent to profit retentions as source of finance. (Introducing a lower bound for $\dot{B}$ since the capital market investment of the firm cannot exceed its profits would be no help as, at this constraint, the firm would never pay out any dividends and a solution to the planning problem of the firm would still fail to exist).

Analogously, (A9) and $\mu_1 \geq 0$ imply that

$$\theta_d \theta_p \leq \theta_r \theta_c. \tag{A19}$$

According to (A9) and (A6), this condition ensures that retained profits are superior or equivalent to new share issues as source of finance. A violation of (A19) means that the Hamiltonian is unbounded for $Q \to +\infty$.

It is now possible to determine the firm's factor demands. As f satisfies the Inada conditions, it is clear that, with regard to the firm's labor demand, (A10) and (A11) imply an interior solution with $\mu_3 > 0$ for any w, $K > 0$:

$$f_L = w. \tag{A20}$$

Moreover, as (A16) reveals that $\dot{\lambda}_K = 0$ it follows in conjunction with (A12) after a few manipulations that

$$r = \frac{f_K - \delta(1-s)}{1 - \alpha\tau_r(1-s) - \varepsilon + (\varepsilon - s)\dfrac{\theta_p}{\theta_r \theta_c}} \tag{A21}$$

Notes

1. See U.S. Department of the Treasury (1984, pp. 106, 107, and 112; and 1985, p. 135).
2. Sinn (1984).
3. See Joint Committee on Taxation (1986).

4. Because of the differences in the marginal propensities to consume, there may be income effects from the intended shift in the tax burden between the household and the corporate sectors. However the volume of this shift, $120 billion over five years, is not comparable to the $190 billion tax cut which the 1981 reform had been expected to bring about in only one year. Even if a difference in the marginal propensities to consume of 0.5 was assumed, the annual demand stimulus resulting from this shift would only be about 0.15% of the U.S. GDP.

5. A more detailed overview of the reform is given in Appendix 1.

6. For a more elaborate version of this model see Sinn (1987a, Chapter 7).

7. Cf. Jones (1967) or Hamada (1966), to mention only two examples of many.

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

9. To the best of the author's knowledge, no other tax model exists that simultaneously allows for profit retentions and credit contracts as channels for international capital movements. Cf. however Hartman (1985) who analyzes alternatively the cases of direct investment through retentions and direct investment through new equity injections.

10. See Fullerton and King (1984).

11. With the establishment of double taxation agreements, the residence principle has been substituted for the source principle where the taxation of interest income flows is concerned. It is true that, according to the OECD Model Double Taxation Convention of 1977, the source country still has the right to impose a withholding tax of up to 10%. [See OECD (1977, Articles 11 and 23 A2).] However, the residence country has to allow the deduction of the withheld tax from its own income or corporate tax. As the rates of the two latter taxes are usually above 10%, the withheld taxes are obviously meaningless for the properties of the international capital market equilibrium.

12. This is a fortiori true if the fact that interest on consumer loans will no longer be tax deductible is taken into account. For dissavers, the relevant marginal interest income tax rate has dropped to zero! See Appendix 1.

13. There are some doubts though whether the reform will really be revenue neutral over a five year period as intended. Pessimists expect that it will result in an increased government budget deficit and will thereby induce further capital imports. Yet, these capital imports would be flow phenomena to which the remarks of the next paragraph apply. Cf. footnote 4.

14. In particular, it is necessary to assume that

$$\lim_{v\to\infty}\{[D_n(v)/\theta_v]-Q(v)\}\exp\textstyle\int_t^v-(\theta_p/\theta_v)r(s)ds=0.$$

See Sinn (1987a, pp. 62–65) for a more detailed discussion of (3).

15. See Miller (1977).

16. See *Changes in Fiscal Year Receipts resulting from the Conference Agreement on H.R. 4242, the Economic Recovery Tax Act of 1981*, table issued by the Office of the Secretary of the Treasury, Office of Tax Analysis, August 3, 1981, and Joint Committee on Taxation (1981).

17. See *Economic Report of the President*, Washington 1986, p. 341 (Table B-74).

18. Suppose that, using some discount rate i, the present values y_1 and y_2 of economic and tax depreciation have been calculated from empirical facts. Equating the present value of declining balance depreciation, $\delta/(i+\delta)$, with the present value of economic depreciation, y_1, then gives $\delta = iy_1/(1-y_1)$. It follows from $y_2 = \alpha\cdot 1 + (1-\alpha)y_1$ that $\alpha = (y_2-y_1)/(1-y_1)$. For discount rates between 3% and 10%, assuming straight-line depreciation, it then follows that $0.21 \le \delta \le 0.22$. Furthermore a reduction of the depreciation period from ten to five or seven years increases the depreciation parameter α from zero to a value in the range $0.49 \le \alpha \le 0.53$ or $0.25 \le \alpha \le 0.32$, respectively.

19. Cf. footnotes 4 and 13.

20. This is obvious if both sides of (5) are multiplied with θ_p. Clearly $\theta_p r$ falls with a given value of f_K when $1-(1-s)\alpha\tau_r-\varepsilon > 0$, i.e., when debt contributes to financing marginal investment projects.

21. See Howitt and Sinn (1989) for an analysis of forseen changes in the dividend tax rate.

22. See Sinn (1987a, Ch. 5) for an extensive discussion of the taxation paradox. It is shown there that, even with a growing firm, this paradox does not imply that the corporate tax base is becoming negative or vanishing in comparison to the other aggregates in the economy.

23. Cf. Jatzek and Leibfritz (1982, Table 5, p. 55) who estimated an average life of 13 years for equipment expiring at the end of the seventies.

24. Cf. the international comparisons of Gruhler (1976, p. 43) and Richter/Petrusch (1983, p. 138).

25. See Fullerton et al. (1981, p. 684).

26. Perhaps the fall in the Dollar that started in February 1985 can be attributed to an anticipation of these effects. This suspicion is nourished by the fact that the first reform proposal of the Department of the Treasury that ultimately resulted in the 1986 reform was launched in November 1984, only three months before the peak of the Dollar. See Sinn (1987b) for a more detailed argumentation along these lines. A similar view was independently expressed to the author by W. Niskanen in a private conversation after this paper had been written.

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Résumé

La réforme fiscale américaine de 1986 relève d'une politique fiscale de réduction des taux avec élargissement de la base. On avance généralement que cette politique a des effets ambigus sur les mouvements internationaux de capitaux. Or, ce rapport démontre que la combinaison d'un élargissement de la base (périodes plus longues d'amortissement, abrogation du crédit fiscal pour investissement, imposition à 100% des gains en capital) avec une diminution des taux de l'impôt sur le revenu des personnes physiques et de celui sur les sociétés agit dans la même direction, à savoir faire sortir le capital des USA. L'analyse se fonde sur un modèle qui tient compte des mouvements de capital aussi bien sous la forme d'investissements de portefeuille que d'investissements directs et où ces derniers comprennent les nouvelles émissions d'actions et les réserves de bénéfices. Contrairement à la littérature précédente sur l'imposition et les mouvements internationaux de capitaux, les conditions d'arbitrage sont microéconomiquement fondées et on insiste particulièrement sur l'interaction entre les décisions d'investissement réel et financier.