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TAX STRUCTURE AND SAVING-INVESTMENT BALANCE

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I. *Introduction*

One of the fundamental factors that lie behind various U.S.-Japan economic problems is the difference in the saving-investment patterns of the two countries. In Japan, excess saving of the domestic private sector has been continuously above three percent of GNP since the latter half of the 1970s, and, in the recent years, it has risen to about five percent of GNP. In spite of the huge budget deficit, which is about three percent of GNP, this brings about a huge surplus in the external current account. The American economy, on the other hand, shows excess domestic investment in the private sector. In the recent years, its magnitude has become around one to three percent of GNP. Together with a huge budget deficit, this causes a tremendous deficit in the external current account.

Many factors has been pointed out as the cause of this phenomenon. It has been argued, for example, that the difference in the household saving behaviors in the two countries is the fundamental cause. It has also been argued that the difference in macroeconomic policies—tight money and easy budget policy in the United States and tight budget policy in Japan—is the essential problem. Based on this argument, it has been suggested that Japan should expand public expenditures and that the United States should reduce budget deficits.

The importance of the above factors cannot be denied. However, it must be noted that there is another important factor which is closely related to the above mentioned phenomenon. It is the difference in tax structures, especially that in the corporate income taxes.

If tax structure of a country is more generous for investments than that of other countries, that country tends to attract more capital from other countries than it would in the case when tax structures were the same everywhere. This may cause a distortion in the world capital market and a serious misalignment of exchange rates. As internatioanl movements of capital become liberalized, this mechanism becomes more and more important.

We will examine in this paper effects of various aspects of tax structure on investment decisions. It is shown that, in principle, tax variables have important implications on investment decisions. It is also shown that, under corporate income tax, investment decisions are affected not only by the rate of corporate income tax but also by the rate of individual income tax and by the method of financing investments. The analysis also shows that inflation changes real tax burdens of firms greatly and hence has significant effects on investment decisions.

Examination of actual data reveals that the Japanese tax system is becoming more and more suppressive for investments in recent years due to changes in the tax structure and to changes in economic conditions, especially a fall in inflation rate. On the other hand, structure of the corporate income tax has been transformed significantly in the United States to the one which favors investments. This asymmetry may be one of the major reasons for the massive capital movements between the United States and Japan, and an important cause of the strong doller.

Based on these analyses, we will argue in the final section that cordination of tax policies is indispensable for a smooth functioning of the international economic system. The best way to achieve this would be to transform corporate taxes in various countries to ones which are neutral to investment decisions.

II. *Investment Decisions under Corporate Income Tax*

In this section, we analyze effects of corporate income tax on investment decisions by using a simple model.[1] In order to derive investment decision rules, we conduct a hypothetical perturbation by which capital stock of a firm is increased marginally by one unit in period j. This is achieved by increasing investment in period j-1 by one unit and decreasing investment in period j by 1-d unit, where d is the rate of economic depreciation. We assume that the firm's financial condition (such as the amount of borrowings and retained earnings) is restored to the original state at the end of period j.

First, consider the case when investments are financed by borrowings.

In period j, the firm's receit increases as much as MRR, the return from the additional investment of one unit. Its fund increases further by 1-d, since that much of investment is reduced in period j. On the other hand, it must pay additional tax and must repay the additional borrowing. Assuming that the tax law allows "true economic depreciation" and full deduction of interest payments, the former is $\mathrm{t}(MRR-d-r)$, where t is the rate of corporate income tax and r is the rate of interest.[2] The latter is $1+r$. Thus, the firm's after-tax net profit increases by

$$MRR+1-d-\mathrm{t}(MRR-d-r)-(1+r)=(1-\mathrm{t})(MRR-d-r).$$

As long as the above expression is positive, investment in period j-1 will increase. Thus, if the original capital stock is optimal, the above must be zero. Therefore, we have

$$MRR-d=r. \tag{1}$$

Thus, corporate income tax is neutral to investments financed by borrowings.

Next, consider the case when investments are financed by retained earnings. In this case, extra tax paid by the firm is $t(MRR-d)$. By assumption, one unit of extra fund must be substracted from the receit of period j in order to restore the amount of retained earnings. Thus, after-tax net profit of the firm increases by

[1] The following analysis is essentially the same as King (1977), but is presented in a somewhat different way.

[2] In the Japanese tax system, different rates are applied to corporate income depending upon whether the profit is paid out or retained. Also, local taxes are levied on corporate income. t is the weighted average of these different rates.

$$MRR+1-d-t(MRR-d)-1=(1-t)(MRR-d).$$

The above amount is transferred to shareholders either in the form of dividend or capital gains. In either case, shareholders must pay individual income tax. Thus the amount that shareholders can obtain is

$$A=(1-z)(1-t)(MRR-d),$$

where z is the weighted average of tax rates on dividend and capital gains income.

Since one unit of retained earning is reduced for one period, shareholders lose the opportunity of obtaining returns from investing the fund in interest bearing assets, whose before tax return is assumed to be r. The loss is

$$B=(1-z)(1-s)r$$

where s is the rate of individual tax on interest income.

As long as A is greater than B, investment in period j-1 would increase. Thus, at the optimal level of capital stock, A should be equal to B. By rearranging the condition, we obtain

$$MRR-d=r+r(t-s)/(1-t).^{3} \tag{2}$$

As long as t is greater than s, corporate income tax has the effect of raising the required rate of return of investments—hereafter referred to as the "cost of capital"—and hence suppressing effects on investments. For example, if $s=0$, $r=0.1$, and $t=0.5$, then $MRR-d$ is 0.2, but becomes 0.22 if t is raised to 0.55.

Thus, cost of capital may be different in different countries even if interest rate is equalized by arbitrage. This will affect international movements of capital.

In order to see this, consider a diagram in which interest rate is measured along the ordinate. Investment demand is represented by a downward sloping curve in this diagram. For simplicity, assume that supply of saving is inelastic with respect to interest rate, so that it is represented by a vertical line. In a closed economy, equilibrium in each country is given by the intersection of the two curves. Equilibrium interset rates may be different in different countries. If, on the other hand, international movement of capital is liberalized, interest rates in various countries will be equalized in the long run equilibrium. In this case, domestic saving is not necessarily equal to domestic investment. In a country where propensity to save is high, domestic saving would exceed domestic investment, and this corresponds to excess investment in other countries. Now, suppose that a country (called A) lowers the rate of its corporate income tax. Then, as shown above, capital cost in country A falls. This will shift country A's investment demand curve upward. Note that, as long as returns remain in country A, direct investments from abroad can also enjoy the same tax advantage as country A's domestic investments. Thus, capital import of country A will increase. In a new equilibrium, not only the saving-investment gap of country A but also that of other countries change. In this way, tax policy of a country has international implications.

[3] Another way of financing investments is new issuance of shares. In this case, B becomes $(1-s)r$, since the fund is originally in the hand of shareholders. This equation (2) becomes

$$MRR-d=r+rt/(1-t)+rv/(1-t), \text{ where } v=(z-s)/(1-z).$$

We do not treat this case in the next because this way of financing investments is not so common in Japan.

TABLE 1. EFFECT OF CORPORATE INCOME TAX ON COST OF CAPITAL

FY	Tax rates t	s	Borrowing ratio b	Interest rate r	Changes in cost of capital RO	WO
1970	0.469	0.083	0.768	0.077	0.056	0.013
1971	0.458	0.083	1.037	0.075	0.052	−0.002
1972	0.471	0.089	1.109	0.067	0.049	−0.005
1973	0.492	0.088	0.808	0.079	0.063	0.012
1974	0.516	0.083	0.772	0.094	0.084	0.019
1975	0.489	0.082	0.891	0.085	0.068	0.007
1976	0.528	0.084	0.801	0.082	0.077	0.015
1977	0.533	0.086	0.578	0.068	0.065	0.027
1978	0.529	0.097	0.448	0.059	0.055	0.030
1979	0.529	0.080	0.576	0.071	0.067	0.029
1980	0.538	0.075	0.570	0.083	0.083	0.036
1981	0.545	0.086	0.634	0.076	0.076	0.028
1982	0.545	0.083	0.676	0.072	0.073	0.024

Notes: 1. Corporate income tax rate t includes that of local taxes. 2. s is average rate of individual income tax on interest income. 3. Borrowing ratio b is the ratio of the sum of long term bond revenues and borrowings to business fixed investments of the non-financial corporate sector. Data source: *National Account Statistics,* Economic Planning Agency. 4. Interest rate r is the average lending rate of commercial banks. Data source: *Monthly Statistics,* The Bank of Japan. 5. $RO=r(t-s)/(1-t)$: the second term of equation (2). $WO=(1-b)r(t-s)/(1-t)$: the second term of equation (3).

Equation (2) also shows that the cost of capital is affected not only by the rate of corporate income tax but also by s, the rate of individual income tax on interest income. In the United States, s is fairly high: according to an estimate by Feldstein and Summers, the average effective rate is 42 percent in 1972.[4] Since t is 46 percent, the second term of equation (2) is about 0.7 percent (If state tax is included, t is about 50 percent, and the second term becomes around 2 percent). On the other hand, s is very low in Japan due to special treatments on small savings.[5] As shown in Table 1, s is about 8 percent. Since t is 53 percent including local taxes, the second term of equation (2) is about the same magnitude as the interest rate itself. Thus, while in the United States the corporate income tax has no significant adverse effects on investments financed by retained earnings, it has significant effects in Japan.

It is sometimes argued that low tax rate on interest income in Japan encourages savings and hence causes macroeconomic excess domestic savings. Whether or not such a mechanims is in fact working is hard to verify. But even if tax on interest income has no effects on savings, it is related to investment-saving balance through the above mentioned effect on investments.

The condition for the general case can be obtained by calculating the weighted average of the above formulas. Thus, if b denotes the ratio of investments financed by borrowings, the condition for optimal capital stock becomes

[4] Feldstein and Summers (1977).

[5] Interest income from savings less than 3 million yen is non-taxable regardless of the form of the savings. In addition, interests from postal savings and government bonds are tax free (There is an upper limit of 3 million yen for the balance of each). Interest income above these limits are subject to taxation. In this case, one can choose either separate taxation from other incomes or comprehensive taxation.

$$MRR-d=r+(1-b)r(t-s)/(1-t). \tag{3}$$

In general, the required rate of return depends not only on tax rates but also on the method of financing investments. The above formula shows that the required rate is higher for the case when the ratio of self-financing is higher.[6]

Table 1 shows the trend of values of the second terms of equations (2) and (3) since the 1970s. For investments financed by retained earnings, corporate income tax raises the cost of capital by about five to eight percentage points. The average increment in the cost of capital due to corporate tax was about one percentage point until the mid-1970s. But it has risen to about two to three percentage points in recent years. In this sense, adverse effect of corporate income tax on investments is getting stronger.

There are two factors which have caused this change. One is the increase in the rate of corporate income tax. It was 45.8 percent in FY 1971, but has risen to 54.5 percent in FY 1981 (including local taxes). The other is the fall in the borrowing ratio. There were years when the ratio exceeded unity during the early 1970s, but the ratio fell significantly during the latter half of the 1970s and became less than one half in FY 1978.

III. *Effects of Special Depreciation Treatments*

In the previous section, we assumed that depreciation allowed in the tax law coincides with true economic depreciation. The actual treatment is different from this in two respects. In the first place, depreciation allowance for tax purpose is calculated by mechanical formulas and there is no guarantee that the result is equal to true economic depreciation. In the second place, in many countries including Japan, special favourable treatments are provided for depreciation in order to stimulate investments. In this section, we analyze the effects of the latter aspect.

The provision which exists in Japan is the one which allows special additional depreciation in the year in which investment is undertaken. This provision is admitted for certain kinds of investments such as anti-pollution devices.

Let f the amount of special depreciation for one unit of investment. Assume as before that investment is increased by one unit in period j-1. Then, due to the special depreciation provision, tax payment of a firm is reduced by tf in period j-1. Thus, the amount of fund necessary for one unit of additional investment is $H=1-tf$. On the other hand, increase in depreciation allowance in period j becomes dG, where $G=1-f$.

First, consider the case when investments are financed by borrowings. Since the increase in interest payment is rH, extra tax in period j is

$$t(MRR-dG-rH).$$

Before tax receit of the firm increases by $MRR+1-d$ as before, and the repayment of the borrowing is $(1+r)H$. It must be noted that, in period j, tax advantage of $(1-d)tf$ is lost, since investment is reduced by $1-d$ compared to the case when the perturbation is not undertaken. Thus, increase in after-tax net profit of the firm is

[6] The present model assumes that decisions concerning the method of financing is made prior to independent of the investment decision. In the actual practices, these decisions may be interrelated. The dichotomy between the two decisions may be said to be a serious shortcomings of the current investment theory.

$$MRR+1-d-t(MRR-dG-rH)-(1+r)tf-(1-d)tf.$$

By a similar argument as before, the above expression must be zero at the optimal capital stock. Thus, we obtain the following condition.

(4) $$MRR-d=r', \text{ where } r'=Hr.$$

Next, consider the case when investments are financed by retained earnings. In this case, extra tax in period j is

$$t(MRR-dG).$$

Increase in the firm's after-tax net profit is

$$MRR+1-d-t(MRR-dG)-(1-d)tf-H=(1-t)MRR-dH+tdG.$$

Shareholders' after tax receits increase by

$$A=(1-z)[(1-t)MRR-dH+tdG].$$

As before, this must be equal to

$$B=(1-z)(1-s)rH.$$

Rearranging the condition, we get

(5) $$MRR-d=r'+r'(t-s)/(1-t).$$

Note that the relationship between equations (4) and (5) is analogous to that between equations (1) and (2). Thus, regardless of the method of financing, the effect of this provision is equivalent to a fall in the interest rate by tfr.

The magnitude of this effect is not so large in Japan even for those investments for which the provision applies, since f is around 0.1 to 0.2. For the case when $r=0.1$, $t=0.5$, and $f=0.1$, the change in the cost of capital is only 0.5 percentage points. Moreover, since the provision is allowed only for a very limited kinds of investments, the effect on overall investments is still smaller, as evaluated below.

Let h be the fraction of investments for which the provision is admitted, and I be the amount of total investments. Then the amount of tax reduced by this provision is $tfhI$, and the effect of the treatments as expressed by an equivalent fall in the interest rate is $tfhr$. In FY 1984, $tfhI$ was ¥152 billion, and I was ¥42,900 billion (fixed investments by private non-financial corporations). It follows that $tfhr=0.0002$, which is almost negligible.

The situation is quite different for the British capital allowance system which existed until 1984. In this system, f was 100 percent for machinery and other productive equipments. Thus, r' becomes $(1-t)r$. Since t is about 50 percent, the effect of the provision was the same as when the interest rate was reduced by one-half.

A similar thing can be said for the American tax system, although the provisions are different from the one mentioned above. In the United States, investment credits and ACRS have been introduced for the purpose of stimulating investments. The effects of these provisions are estimated to be equivalent to a several percentage points fall in the interest rate. Therefore, required rate of return of investments is made much lower than the market rate of interest in these countries.

IV. *Effects of Tax-Free Reserves*

In the Japanese corporate income tax system, accumulation of certain kinds of reserves can be deducted from the tax base. For example, a firm can accumulate a tax-free fund up to 40 percent of the amount which is necessary for paying lump-sum retirement benefits for the employees. Thus, if the necessary amount increases due to an increase in the number of employees or in the payment level, the difference from the previous year can be deducted from the tax base. These reserves are "book reserves" in the sense that there is no restriction on the use of the reserved funds by the firms.[7]

There are several tax-free reserves which are admitted in the current system. Among them, major ones are: reserve for retirement payments, reserve for irrecoverable debts, and reserve for bonus payments. Table 2 shows the balance and the estimated tax losses for the case of the reserve for retirement payments. Total amount of tax revenue reduced by the three reserves mentioned above is shown in Table 3 both in terms of absolute amounts and their ratios to the actual tax revenue.

The following points are noteworthy. First, until the 1960s, loss of tax revenue due to this provision was as high as about ten percent of the total revenue of the corporate income tax. Among them, the largest was the loss due to reserve for retirement payments, which alone accounted for about five percent of the corporate income tax revenue. Second,

TABLE 2. REDUCTION OF TAX REVENUE DUE TO TAX-FREE RESERVE FOR RETIREMENT PAYMENTS

FY	Reserves	Increment (A)	Rate of increase	Tax rate t	Loss tA	Ratio
1966	8,076	625	(8.3)	35.0	219	(2.12)
1967	9,787	1,711	(21.1)	35.0	599	(4.58)
1968	11,904	2,117	(21.6)	35.0	741	(4.65)
1969	14,096	2,192	(18.4)	35.0	767	(3.82)
1970	17,061	2,965	(21.0)	35.0	1,037	(4.04)
1971	19,712	2,651	(15.5)	36.75	974	(3.81)
1972	22,970	3,258	(16.5)	36.75	1,197	(4.00)
1973	29,025	6,055	(26.4)	36.75	2,225	(4.92)
1974	37,330	8,305	(28.6)	40.0	3,322	(5.71)
1975	42,042	4,712	(12.6)	40.0	1,885	(4.57)
1976	49,990	7,948	(18.9)	40.0	3,179	(6.63)
1977	56,643	6,653	(13.3)	40.0	2,661	(4.78)
1978	62,871	6,228	(11.0)	40.0	2,491	(3.15)
1979	68,431	5,560	(8.8)	40.0	2,224	(3.01)
1980	71,352	2,921	(4.3)	40.0	1,168	(1.31)
1981	73,688	2,316	(3.2)	42.0	973	(1.10)
1982	73,750	62	(0.084)	42.0	26	(0.028)
1983	76,688	2,938	(4.0)	42.0	1,233	(1.29)

Notes: 1. t is the rate of national corporate income tax on retained earnings. 2. "Ratio" is the ratio of the loss of revenue due to tax-free reserve for retirement payments to national corporate income tax revenue.
Data source: National Tax Agency, *Present State of Corporations,* each year.

[7] In this respect, they are similar to the system of book reserves for occupational pensions in Germany.

TABLE 3. EFFECTS OF TAX-FREE RESERVES

FY	Ratio of tax loss x	Tax rates t	t'	Changes in cost of capital ROO	WOO
1970	0.096	0.469	0.424	0.046	0.011
1971	0.109	0.458	0.408	0.041	−0.002
1972	0.067	0.471	0.440	0.042	−0.005
1973	0.105	0.492	0.440	0.050	0.010
1974	0.111	0.516	0.459	0.065	0.015
1975	0.094	0.489	0.443	0.055	0.006
1976	0.092	0.528	0.480	0.062	0.012
1977	0.072	0.533	0.494	0.055	0.023
1978	0.051	0.529	0.502	0.048	0.027
1979	0.056	0.529	0.499	0.059	0.025
1980	0.034	0.538	0.520	0.077	0.033
1981	0.034	0.545	0.527	0.070	0.026
1982	0.001	0.545	0.544	0.073	0.024

Notes: 1. x is the ratio of tax lost by tax-free reserves to corporate income tax revenue. 2. $t'=(1-x)t$. 3. $ROO=r(t'-s)/(1-t')$. $WOO=(1-b)r(t'-s)/(1-t')$.

the effect has been diminished significantly in the recent years. In FY 1982, the total amount of reduction is only 0.1 percent of the corporate income tax revenue.

There are two reasons for this change. One is the changes in the tax law which have lowered the upper limit of reserves. The upper limit for reserve for retirement payments has been reduced from 50 percent of the necessary payments to 40 percent in FY 1980. Note, however, that the actual reduction shown in Table 2 is greater than the long-run effect of this change. This is because additional accumulation becomes impossible in the short-run until the amount of necessary payments grows to a level which satisfies the new condition.

The other reason is the slowing down of the rate of economic growth. This will lower the rate at which the balance grows, so that the annual amount that can be deducted from the tax base will decrease. In fact, it can be shown that if the rate of growth falls from 15 percent to 5 percent, tax advantage will be reduced by 34 percent. During the rapid growth era, tax burden of firms were reduced significantly by the tax-free reserve provision, and this in turn contributed to the rapid growth of the economy. Moreover, since tax advantage is greater for a firm which grows faster, the provision had a further effect of encouraging growth. The result in Table 3 shows that this kind of growth promoting mechanism no longer exists in Japan.

Now, since tax advantages due to tax-free reserves are not directly related to investment activities, their effects on investment decisions can be regarded as the same as a reduction in the tax rate. Thus, the results shown in Table 1 are modified as shown in Table 3. Comparing them, we see that the effect of tax-free reserves is almost negligible in the recent years but had the effect of reducing the cost of capital by about 0.3 percentage points until the mid-1970s.

In order to see the relative importance of the factors mentioned so far, changes in the cost of capital for cases when values of one of the parameters are kept constant to their 1970 levels are shown in Table 4. For example, if tax rates were the same as in the 1970, the change in the cost of capital in 1982 would be 1.7 percentage points rather than 2.4 percent-

TABLE 4. CHANGES IN COST OF CAPITAL WHEN ONE OF THE FACTORS IS KEPT CONSTANT

FY	*WOO*	Variables kept constant *b*	*x*	*t*
1970	0.011	0.011	0.011	0.011
1971	−0.002	0.009	−0.002	−0.002
1972	−0.005	0.010	−0.004	−0.005
1973	0.010	0.012	0.010	0.009
1974	0.015	0.015	0.015	0.012
1975	0.006	0.013	0.006	0.006
1976	0.012	0.014	0.012	0.010
1977	0.023	0.013	0.022	0.018
1978	0.027	0.011	0.024	0.021
1979	0.025	0.014	0.023	0.019
1980	0.033	0.018	0.028	0.025
1981	0.026	0.016	0.022	0.019
1982	0.024	0.017	0.019	0.017

Notes: 1. *WOO* is the original case shown in Table 3. 2. In other cases, the indicated variable is kept constant at its 1970 value.

age points. By comparing one of these results with the original case, we can see the effect of individual factors.

The effect caused by the changes in the borrowing ratio was about one percentage points during the late 1970s, and is about 0.7 percentage points in the recent years. The effects caused by the change in tax-free reserve provisions was almost nil until the late 1970s, but has become about 0.5 percentage points in the recent years. It is interesting to note that there is no significant difference between the effects caused by changes in the tax rates and that of the tax-free reserve provisions.

V. *Effects of Inflation*

In the aboves, we assumed constant prices. In this section, we examine effects of inflation.

Inflation affects investment decisions because it changes real tax burden of a firm through the following two routes.[8] First, since depreciation allowed by the tax law is not indexed to infaltion, real value of depreciation falls and hence real tax burden increases during inflation periods. Second, the tax law admits deduction of nominal, rather than real, interest payments. Thus, if interest rate adjust to inflation, real tax burden of a firm is reduced[9]. We will analyze these effects using the same model as in the previous sections. In what follows, *MRR*, *d* and *r* will represent real values.

Let p be the rate of inflation. We assume that all prices, including those of the firm's products and capital goods, rise at the same rate p. We also assume that the real interest

[8] Another route through which inflation affects real tax burden of firms is the effect on inventory. However, since there is no inventory in our model, this effects cannot be analyzed.

[9] If nominal interest rate does not adjust to inflation completely, then "borrowers' benefit" will realize. Since this not taxed, the result becomes the same, except for the factor $(1+p)$.

rate is unaffected by inflation so that the nominal rate becomes $r+p+rp$. Let us conduct the same perturbation as before.

First, consider the case when investments are financed by borrowings. Then, extra tax in period j is

$$t[(1+p)MRR-d-(r+p+rp)].$$

Thus, increase in after-tax net profit of the firm is

$$(1+p)(MRR+1-d)-t[(1+p)MRR-d-(r+p+rp)]-(1+r+p+rp)$$

As before, the above must be zero at the optimal capital stock. By rearranging, we obtain

$$MRR-d=r-(1-d)pt/(1+p)(1-t). \tag{6}$$

Thus, inflation reduces the required rate of return of investments finance by borrowings. This effect could be quite large. For instance, if $t=0.5$, $d=0.1$ and $p=0.1$, then the second term of the right hand side of the above equation is 8 percent.

Next, consider the case when investments are financed by retained earnings. In this case, extra tax is

$$t[(1+p)MRR-d].$$

In order to restore retained earnings at the end of period j to the same level as in the no-perturbation case, one unit of fund must be subtracted. Thus, the firm's after-tax net profit increases by

$$(1+p)(MRR+1-d)-t[(1+p)MRR-d]-1=(1-t)(1+p)(MRR-d)-p(1-td).$$

Then, increase in shareholders' receit is

$$A=(1-z)(1-t)(1+p)(MRR-d)-(1-z)p(1-td).$$

On the other hand, shareholders' opportunity rate of return is

$$B=(1-z)(1-s)(r+p+rp)$$

As before, A must be equal to B. Thus,

$$MRR-d=r+r(t-s)/(1-t)+p(td-s)/(1+p)(1-t). \tag{7}$$

If s is zero, the third term of the above equation is positive, i.e. inflation increases the real cost of capital. This result is natural since in this case the benefit of subtracting nominal interest rate is absent. However, this is not necessarily the case if s is sufficiently high. In such countries as the United States where s is high, it is very likely that inflation reduces the real cost of capital even for those investments financed by retained earnings.[10]

The condition for the general case is the weighted average of the above formulas. Thus,

$$MRR-d=r+(1-b)r(t-s)/(1-t)+[td-s-b(t-s)]p/(1+p)(1-t). \tag{8}$$

If s is zero, the third term of the above equation becomes

$$(d-b)pt/(1+p)(1-t).$$

[10] Feldstein and Summers argued that inflation increased tax burden of American firms. It must be noted that increase in tax burden does not necessarily imply adverse effects on investment.

Thus, whether or not inflation reduces the real cost of capital is determined by the magnitude of the borrowing ratio relative to the depreciation rate. The existence of tax on interest income complicates this relationship.

In what follows, we will evaluate the effects of inflation for the Japanese case. For this purpose, it is necessary to know the magnitude of the parameter d.

One method to estimate d is to use the capital stock vintage data. According to the National Wealth Survey conducted in 1970, the average vintage of capital stocks in the manufacturing sector was 26.5 years. Assuming that the scrap value is 10 percent of the purchase value, this corresponds to $d=0.083$.

Another method is to use the annual depreciation and fixed capital formation data. If the latter grows at a constant rate g, its ratio to the former becomes $(1+g)d/(d+g)$. By solving this for d, the value of d can be estimated. The average value of d obtained by this method using the National Account Statistics data of the period 1968 through 1980 is 0.081, which is almost the same as the above. Considering these results, we use the value $d=0.082$ in what follows.

The effects of inflation on the real cost of capital as represented by the last terms of equations (6), (7) and (8) are shown in Table 5 as *BI* (borrowing case), *RI* (retained earning case), and *WI* (weighted average of the two), respectively. In case of borrowing, real cost of capital was reduced as much as 13.9 percentage points immediately after the first oil crisis[11].

TABLE 5. EFFECTS OF INFLATION ON COST OF CAPITAL

			Changes in Cost of Capital						
FY	p	rr	BI	RO	RI	RT	WO	WI	WT
1970	0.073	0.004	−0.046	0.002	−0.006	0.003	0.001	−0.037	−0.036
1971	0.057	0.018	−0.034	0.010	−0.005	0.005	−0.000	−0.035	−0.036
1972	0.052	0.015	−0.036	0.010	−0.005	0.005	−0.001	−0.039	−0.040
1973	0.161	−0.082	−0.100	−0.052	−0.013	−0.064	−0.010	−0.083	−0.093
1974	0.218	−0.124	−0.139	−0.086	−0.015	−0.101	−0.020	−0.111	−0.131
1975	0.104	−0.019	−0.069	−0.012	−0.008	−0.020	−0.001	−0.062	−0.063
1976	0.094	−0.012	−0.073	−0.009	−0.007	−0.017	−0.002	−0.060	−0.062
1977	0.067	0.001	−0.056	0.001	−0.006	−0.005	0.000	−0.035	−0.035
1978	0.034	0.025	−0.030	0.021	−0.004	0.017	0.011	−0.016	−0.004
1979	0.048	0.023	−0.042	0.019	−0.004	0.015	0.008	−0.026	−0.018
1980	0.078	0.005	−0.072	0.004	−0.005	−0.000	0.002	−0.043	−0.041
1981	0.040	0.036	−0.039	0.033	−0.003	0.030	0.012	−0.026	−0.014
1982	0.024	0.048	−0.026	0.049	−0.002	0.047	0.016	−0.018	−0.002

Notes: 1. Inflation rate p is the rate of increase of CPI.
2. rr is real interest rate: $rr=r-p$.
3. $BI=-(1-d)pt'/(1+p)(1-t')$: the second term of equation (6).
$RO=rr(t'-s)/(1-t')$: the second term of equation (7).
$RI=p(t'd-s)/(1+p)(1-t')$: the third term of equation (7).
$RT=RO+RI$.
$WO=(1-b)rr(t'-s)/(1-t)$: the second term of equation (8).
$WI=p[t'd-s-b(t'-s)]/(1+p)(1-t')$: the third term of equation (8).
$WT=WO+WI$.

[11] In spite of this remarkable fall in real cost of capital, investment did not increase after the oil crisis. This is due to the increase in uncertainties for the future.

[12] The Institute of Fiscal Studies (1978), chapter 12.

In the recent years, however, the corresponding value has been diminished to about 2 percentage points due to falls in the inflation rate. In case of retained earnings, inflation reduces the real cost of capital, although the absolute value of the effects is not so large. The weighted average of the two was about minus 10 percentage points in the years after the first oil crisis, but has fallen to about two percentage points in the recent years.

The second terms of equations (7) and (8) are shown in Table 5 as *RO* (retained earning case), and *WO* (weighted average), respectively. These correspond to *ROO* and *WOO* in Table 3. Note that in Table 6, real interest rates are used instead of nominal interest rates. As far as these terms are concerned, corporate income taxation raises the real cost of capital (except for years 1973 through 74, when real interest rate calculated by nominal rate minus inflation rate became negative). However, since inflation reduces the real cost of capital, this effect is cancelled. This is especially true for the weighted average case. Until now, the net effect as represented by *WT* is negative, i.e., corporate income taxation makes the real cost of capital lower than the real market rate of interest. In the recent years, the magnitude of the effect has been diminished, and has become almost zero. Namely, corporate income taxation in present Japan is almost neutral to investment decisions.

It must be noted, however, that this does not imply that taxation is unimportant for investment decisions. The above neutrality is only superficial in the sense that it is a result of cancelling out of various factors, each of which works in different directions. If tax rate is raised and borrowing ratio falls, while inflation rate remains low, then the cost of capital is likely to increase further in the future.

VI. *Conclusion and a Policy Proposal*

In the above analyses, we saw that the cost of capital of Japanese firms has increased in the recent years. There are several reasons for this:

(i) increase in the tax rate
(ii) fall in the borrowing ratio
(iii) reduction of tax-free reserve provisions
(iv) fall in the economic growth rate (which reduced the effect of tax-free reserve provisions)
(v) fall in the rate of inflation

Among these, the most important is the last factor.

The changes in the cost of capital must have affected the macroeconomic saving-investment balance through their effects on investment decisions. Together with the introduction of investment stimulating tax policies in the United States, this must have affected international movements of capital and exchange rates greatly.

Needless to say, the present analysis is insufficient to verify the above proposition. First, cost of capital must be calculated for the United States and other countries. Second, explicit models must be constructed which relate cost of capital with the trends in investments and international capital movements. We have not undertaken such analysis in this paper. In this sense, this should be regarded as a first step of a research on this issue. The present analysis is also insufficient in that it does not pay adequate attentions to the details of actual tax treatments concerning income which originates in foreign countries.

This is also a task of a future research.

In spite of these, it can be said that the difference in tax structures in various countries has important implications on the workings of the international economic system. Therefore, it is necessary to cordinate tax policies among the major countries, especially between the United States and Japan.

One way to achieve this is to adjust tax rates and other aspects of the tax system within the framework of the present corporate income tax. However, there are a number of difficult problems in this alternative. For example, unless the United States abolishes all investment inducing tax provisions, it is necessary for Japan to lower the tax rate and/or to strengthen special provisions. But since these policies reduce tax revenues, it is difficult to implement them under the present situation where the national budget is suffering from huge deficits. Furthermore, since effects of corporate income tax on the cost of capital depend not only on tax structure but also on various variables such as the inflation rate and the borrowing ratio, it is necessary to make adjustments whenever these conditions change.

Another way of tax cordination is to change the structure of corporation tax itself. Regarding this, the idea of "flow-of-funds based corporation tax" proposed in the Mead Report is worth considering.[12] This is a corporation tax whose tax base is the difference between the total inflow and outflow of funds of firms. It can be shown that under the flow-of-funds based tax, cost of capital becomes independent of tax rates. Therefore, the objective of raising fiscal revenue can be achieved without distorting investment activities of firms. If every country adopts this system, distortions in the international flow of capital will be removed, and hence, misalignment of exchange rates will be corrected.

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