ON THE FISCAL INCENTIVES TO INVESTMENT: THE CASE OF POSTWAR JAPAN

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I. INTRODUCTION

THERE have been numerous discussions of the role played by postwar Japanese fiscal incentive policies in increasing corporate savings and accelerating investment. Two of the most noteworthy contributions on this issue are those of Komiya [2] and Fujita [1]. They examined the corporate tax savings realized by such provisions as the exemption of certain sources of income from the corporate income tax and the deferral of tax payments made possible by accelerated depreciation allowances and the amassing of corporate reserves. Based on their examination of fiscal institutions for investment, these two authors reached almost the same conclusions: (i) fiscal incentives were granted more or less to every industry and therefore (ii) they failed to gear the allocation of resources toward any specific group of industries.

Although their conclusions were reached through careful studies of the postwar Japanese corporate tax system, we consider them to be open to further examination on the following two grounds: First, that fiscal incentives were institutionally granted to every industry does not imply that they were utilized equally among industries or that they reduced the rate of corporate tax to the same degree among different industries. Second, it has not been settled whether fiscal incentive policies can affect corporate behavior so that the stated objectives are achieved. Therefore, it is still far from certain whether postwar fiscal incentive policies in Japan failed to exert discriminatory effects on corporate behavior of different industries.

Thus, it would be fair to say that the assertions made by the aforementioned authors have not been thoroughly verified. The purpose of this paper is to reexamine their assertions by providing further statistical evidence on the postwar Japanese fiscal incentive policies. To be more specific, we would like to reconstruct and estimate those statistics characterizing the postwar Japanese corporate tax system and to test the effectiveness of fiscal incentive policies in promoting investment.

Before we start our discussion, we must acknowledge a few limitations which

The authors are grateful to Professor Hiromitsu Ishi of Hitotsubashi University, Associate Professor Naoyuki Yoshino of Saitama University, and Dr. Akira Kohsaka of the Institute of Developing Economies for helpful comment and suggestions on the topic.

we will encounter in marshalling the statistical evidence stemming from the unavailability of data related to fiscal incentives. The most important data base for our analysis is *Zeimu-tōkei kara mita hōjin-kigyō no jittai* [Facts relating to corporate firms from the viewpoint of tax statistics] [5], and it was only in 1963 that statistics on fiscal incentives became available. The year 1963 may not be especially satisfactory for starting our analysis, since fiscal incentives seem to have been most actively applied in the late 1950s. Thus, the time period analyzed in this paper, 1963–80, may not fully represent the postwar Japanese fiscal incentive policies.

The second limitation also derives from the limited availability of statistics. Fiscal incentives may in general be classified into two categories: one in which tax savings are immediate, and another in which they are intertemporal. As examples of the former one may consider the exemption of certain sources of income from the corporate income tax and the exemption of commodity taxes (tariffs) on certain goods. Examples of the latter are the deferrals of tax payments associated with accelerated depreciation allowances, the building of corporate reserves and so forth. During the 1950s and early 1960s, both schemes of fiscal incentives existed. However, after this period exemption-type direct incentive policies were gradually replaced by deferral policies, which were considered to be a less straightforward mode of government intervention. Therefore, the scheme of fiscal incentives treated in this paper will be restricted to the latter type in which tax savings are only intertemporal.

The paper consists of four sections. In the next section, we will discuss very briefly the institutional characteristics of the postwar Japanese fiscal incentive policies. In Section III we will deal with corporate reserves and accelerated depreciation, and calculate two statistics for each industry: the degree of utilization of these policies and the rate of tax savings realized. Section IV will amalgamate the results of tax savings obtained in the preceding part and test whether fiscal incentives are effective in accelerating corporate investment. Section V will summarize the major findings of the paper and discuss to what extent we will be able to support the assertions made by the two Japanese economists mentioned earlier concerning postwar Japanese fiscal incentive policies.

II. A BRIEF HISTORY OF POSTWAR JAPANESE FISCAL INCENTIVE POLICIES

A major postwar reform of Japan's corporate tax system was made in 1950 following the recommendations of the Shoup Mission, which was dispatched to Japan under the request of the then Supreme Commander for the Allied Powers to "draw up a plan of a permanent tax system for Japan" [6, p. 2]. In principle, the mission viewed a corporation as a collection of individuals and claimed that tax laws should not interfere in individual choice between corporate and non-corporate forms. A natural consequence of this view was that the mission recommended the abolition of the excess profits tax which had hitherto been levied on corporations.

Since the mission's emphasis was on designing a corporate tax system which was consistent with its view of corporations, it did not deal specifically with fiscal incentives. However, in relation to subsequent policies for encouraging corporate savings and investment, two recommendations of the mission on inventory accounting and methods of depreciation deserve attention.

At the time the mission visited Japan the only authorized inventory accounting method was the weighted average method (average cost method), and taxpayers were allowed to undervalue their inventories by 10 per cent. The mission asserted that inventory accounting should be more adaptive to the nature of specific firms and inventories and recommended the introduction of more flexible inventory accounting methods such as the first-in first-out method (FIFO) and the last-in first-out method (LIFO). It also recommended the practice of the ad hoc 10 per cent undervaluation of inventory cease immediately after the establishment of modern inventory accounting methods.

It was not only in inventory accounting methods that the mission recommended more flexible treatment. On depreciation it said: "A taxpayer should be given a reasonable amount of freedom to use one method or another, and possibly several different methods on different types of assets without too much restriction by the tax authorities" [6, p. 84]. In fact, the only authorized depreciation method which existed at the time was the declining balance method. The mission recommended the introduction of other reasonable methods of depreciation such as the straight line method.

In 1950 major revisions were made in the Corporation Tax Law to make it consistent with the view the Shoup Mission held on corporations. And a year after this reform postwar fiscal incentive policies were initiated with the introduction of accelerated depreciation for special equipment and tax-free reserves to deal with price fluctuations of inventory.

The history of the postwar Japanese fiscal incentives thereafter may be characterized as a series of enactments of special measures to achieve specific policy objectives. Since the incentives were intended to meet the stated objectives of the government, their effective periods were limited, and they were not included in the Corporation Tax Law, but in the Special Taxation Measures Law (*sozei tokubetsu-sochi hō*), a collection of temporary special measures. However, the fact is that either the effective periods of special measures were prolonged or old measures were replaced by new ones, which in fact play the same role as the old. As a result, postwar Japanese fiscal incentive policies became undully complicated. By 1976 the number of measures listed in the Special Taxation Measures Law for fiscal incentives for corporations had reached ninety-eight, and it was only after 1976 that a substantial reduction of ad hoc measures for special purposes was begun [7, p. 541].

Here it will be appropriate to present the construction of postwar Japanese fiscal incentives. As we discussed earlier, fiscal incentives may be classified into exemption- and deferral-type measures. Exemption-type fiscal incentives are prevalent in most countries, especially in developing countries. Japan was no exception at least until the early 1960s (see Table I for some exemption-type

TABLE I

FISCAL INCENTIVES IN POSTWAR JAPAN: SOME EXAMPLES

Measures	Purposes and Conditions of Application	Effective Period
I. Exemption-type measures		
1. Exemption from corporate tax of income raised by producing certain goods.	Applied mostly to petro-chemical products	-1966
2. Exemption from corporate tax of income raised by exports	Promotion of export-oriented industries	1953-63
3. Exemption from corporate tax of income spent for dividends for increased shares	To enhance corporate savings	1954-57
II. Deferral-type measures		
A. Tax-free reserves		
1. Reserves for bad debts	For expected losses in the collection of receivables	1950-
2. Reserve for retirement allowances	To let corporations prepare for payments for employees' retirement	1952-
3. Reserves for loss on returned goods	Applicable to publishers, pharmaceutical producers, etc.	1965-
4. Reserves for special repairs	Repairs of vessels, blast furnaces, etc.	1951-
5. Reserve for repairs and guaranteeing of certain products	Applicable to completed construction works, vessels, cars, television sets, etc.	1971-
6. Reserve for price fluctuations	For losses due to the fluctuation of prices of inventories	1951-
7. Overseas market development reserve for small- and medium-sized enterprises	For export-oriented small- and medium-sized firms	1964-
8. Reserve for drought	To allow power companies to prepare for seasonal fluctuations in output	1952-
B. Accelerated depreciation		
9. Accelerated depreciation for special equipment		1951-61 (revised)
10. Accelerated depreciation for equipment designated under the Modernization Promotion Act		1952-61 (revised)
11. Accelerated depreciation for equipment suitable for modernization	This unified accelerated depreciation measures 9 and 10	1961-

incentives adopted in Japan). A fact to be noted here is that exemption has not been granted to corporations across the board, but only to those in keeping with the objectives of the government, e.g., corporations belonging to infant and export-oriented industries.

Deferral-type incentive policies consist of the allowance for tax-free reserves and accelerated depreciation. Accelerated depreciation writes off the value of

fixed assets faster than their actual economic value diminishes and thus lessens the tax levied in the early phase of asset lives. This method has been one of the most widely adopted measures for promoting investment in postwar Japan. However, it has not been the only deferral-type incentive in the period.

Actually, the most significant characteristic of postwar Japanese fiscal incentive policies is to be observed in the provision for tax-free reserves. Corporations have been allowed to accumulate as reserves a part of their income for a certain period, the reserves being added back to income and taxed only when the period expires. In other words, corporations can delay the payment of taxes levied on a portion of their income. The rate of tax savings, accordingly, becomes larger as the tax-free reserve period is prolonged.

The stated rationale for this method is to let corporations prepare for unexpected losses. However, it needs be said that the provision for tax-free reserves in postwar Japan has been granted more for increasing corporate retained earnings than for letting corporations reserve decent sums for unexpected eventualities (see II-A in Table I). A clear illustration of this is the reserve for price fluctuations, whereby corporations are allowed to retain a portion of income to offset losses due to the fluctuation of inventory values. However, since the 1950 reform corporations have in any case been permitted to select their inventory accounting method from among several approaches. Hence, they are in a position to cope with fluctuations in inventory prices by the choice of an appropriate accounting method.[1] We may, therefore, conclude that this particular reserve works more as a device for simply reserving income than for preparing for unexpected losses.

This has been a brief review of the history of postwar Japanese fiscal incentive policies. It shows that the present complicated system is the product of an accumulation of measures, each of which was aimed at achieving certain objectives of successive governments. The task of the remainder of this paper is to represent the system in numerical form.

III. UTILIZATION AND TAX SAVINGS OF DEFERRAL-TYPE INCENTIVE POLICIES

The purpose of this section is to provide numerical evidence on the degree to which each industry utilized deferral-type incentive policies and on the rate of tax savings it has realized thereby. In the first subsection we will deal with tax-free reserves and in the second with accelerated depreciation.

[1] Technically, LIFO is regarded as the most effective measure against fluctuations of inventory prices. Moreover, corporations can conduct their inventory accounting on either a cost basis or "the lesser of cost or market price" basis. And yet it was only in 1975 that this reserve became inapplicable to those corporations using LIFO as their inventory accounting method. Hence, allowing a tax-free reserve to cover price fluctuations of inventory may be regarded as serving more as reservation of income than as preparation for unexpected losses.

TABLE II

CLASSIFICATION OF INDUSTRIES

Code	Industry
1	Agriculture and fishing
2	Mining
3	Construction
4	Textiles
5	Chemicals: Paper, organic and inorganic chemicals, and pottery
6	Iron and metal
7	Machinery: Machine tools and transportation vehicles
8	Food and beverages
9	Publishing and printing
10	Other manufacturing industries
11	Wholesale
12	Retail
13	Restaurants and hotels
14	Financial institutions
15	Real estate
16	Public transportation and utilities
17	Services
18	Others: Medical corporations and corporate associations

Note: This classification is applicable from 1969. Before 1969, industries 6 and 7 were lumped together and industries 8 and 9 were included in industry 10.

A. *Tax-free Reserves*

We would like to propose that the rate of inter-industry utilization of tax-free reserves, U^R, be defined as

$$U^R = \frac{\text{the share of tax-free reserves of an industry}}{\text{the share of income of an industry}}.$$

The idea behind this proposal is that if tax-free reserves are granted in a non-discriminatory manner to every industry, the share of reserves of an industry should be proportional to its share of income and therefore U^R should be unity. If, on the contrary, the U^R of a certain industry deviates from, and is greater, than unity, this would imply that it has been favored in the granting of tax-free reserves. Whether U^R should be unity for every industry is quite another problem and will call for examination of the nature of the tax-free reserves granted, e.g., the chances of occurrence of losses.

In what follows industries will be from time to time referred to by their code numbers, which are listed in Table II. And the results of our calculation of U^R for various industries are given in Table III. The averages in the last column of Table II are the means of U^R for each industry for the relevant period.

A few characteristics we can find from the table would be the following:

(i) The two industries which used tax-free reserves the most were financial institutions, and public transportation and utilities (hereinafter public services).

TABLE III

THE UTILIZATION OF TAX-FREE RESERVES BY INDUSTRY, U^R

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Average
1	0.56	0.75	0.79	0.88	0.68	1.29	0.94	1.07	1.07	0.95	1.12	2.41	1.80	1.46	1.11	1.18	1.18	1.51	1.15
2	2.02	1.31	1.21	1.12	1.14	1.40	1.33	1.27	0.92	0.98	0.76	0.39	0.35	0.39	0.61	0.42	0.30	0.43	0.91
3	0.33	0.25	0.27	0.31	0.34	0.32	0.37	0.36	0.35	0.37	0.47	0.53	0.38	0.46	0.58	0.56	0.59	0.66	0.42
4	0.95	1.10	1.20	1.21	1.22	1.17	1.32	1.18	1.32	1.61	1.09	1.49	2.33	1.27	1.51	1.39	1.23	1.24	1.32
5	0.81	0.80	0.89	0.85	0.83	0.79	0.84	0.91	1.03	1.26	1.08	0.91	1.47	1.39	1.23	1.16	1.07	0.99	1.02
6	—	—	—	—	—	—	1.07	1.10	1.31	1.68	1.13	0.98	1.78	2.37	1.97	2.02	1.38	1.07	1.49
7	—	—	—	—	—	—	0.80	0.86	1.01	1.07	1.08	1.28	1.52	1.04	1.03	1.08	1.06	0.91	1.06
6 & 7	0.63	0.84	0.83	0.88	0.80	0.76	0.87	0.93	1.09	1.21	1.10	1.15	1.60	1.28	1.22	1.27	1.14	0.96	1.03
8	—	—	—	—	—	—	0.64	0.65	0.60	0.66	0.76	0.76	0.67	0.74	0.62	0.65	0.77	0.93	0.70
9	—	—	—	—	—	—	0.81	0.83	0.76	0.96	0.87	0.67	0.87	0.76	1.03	0.86	0.95	0.90	0.86
10	0.97	0.61	0.59	0.59	0.60	0.60	0.68	0.67	0.65	0.73	0.68	0.68	0.72	0.74	0.71	0.73	0.76	0.82	0.70
11	0.90	0.95	0.96	0.98	1.01	1.16	1.10	1.09	1.10	1.15	0.94	0.88	0.98	1.01	1.05	1.05	0.98	0.96	1.01
12	0.46	0.43	0.40	0.43	0.44	0.53	0.53	0.54	0.52	0.60	0.60	0.64	0.45	0.47	0.65	0.59	0.63	0.69	0.53
13	0.09	0.08	0.10	0.13	0.13	0.15	0.19	0.16	0.18	0.17	0.23	0.23	0.19	0.24	0.31	0.32	0.44	0.40	0.21
14	2.91	3.36	2.98	2.71	2.87	2.56	2.24	2.18	1.86	1.26	1.85	1.95	1.17	1.28	1.06	1.06	1.57	1.38	2.01
15	0.10	0.13	0.11	0.10	0.15	0.11	0.14	0.15	0.13	0.09	0.11	0.17	0.20	0.22	0.21	0.21	0.22	0.24	0.15
16	1.09	1.11	1.13	1.05	1.23	1.39	1.64	1.75	1.66	1.87	2.12	2.40	1.89	1.99	1.70	1.96	1.87	3.15	1.72
17	0.25	0.22	0.24	0.20	0.25	0.27	0.35	0.34	0.28	0.35	0.45	0.46	0.42	0.45	0.52	0.49	0.59	0.59	0.37

Source: Calculated by the authors, using the data from [5, various editions].
Note: "—" indicates data not available (see note to Table II).

TABLE IV

TAX SAVINGS BY MEANS OF TAX-FREE RESERVES

A

End of Period	Outstanding Tax-Free Reserves (¥ million)
1	10
2	20
3	5

B

Period	Outstanding Tax-Free Reserves at the End of:		
	First Period	Second Period	Third Period
1	10	10	0
2		10	5
3			0

However, their U^Rs behaved differently during the period; the U^R of financial institutions declined almost steadily, whereas that of public services remained high, especially after the first oil shock in 1973.

(ii) Tax-free reserves were used heavily by both relatively declining and growing industries. That is, the U^Rs of the agricultural and fishing (hereinafter primary) and textile industries were high as well as those of the iron and metal, and chemical industries. Considering the facts that the U^R of primary industry steadily increased and that of textile industry stayed high, it may be claimed that the U^Rs of declining industries were greater than those of growing industries.

A fact which is even more interesting is that the U^R of the machine industry, which was one of the most growth promoting industries toward the end of the period, was lower than those of the growing industries referred to above. It is thus possible to assert that tax-free reserves were not used solely for promoting economic growth.

A second characterization of tax-free reserves is the rate of tax savings realized through their accumulation. Calculation of the tax savings realized by this policy can be most conveniently exposed by presenting a numerical example. Suppose a company operates over three periods and has the outstanding tax-free reserves shown in Table IV. From the time series of the outstanding reserves (Table IV-A) we can see that the company reserved ¥10 million in the first period and a further ¥10 million in the second period, then dissolved ¥15 million in the third period. Therefore, the reserve made in the first period is completely retired and that made in the second period reduced to ¥5 million at the end of the third period (Table IV-B). As for taxes, that on the first period's reserve of ¥10 million is paid in full in the third period. However, only ¥5 million was dissolved from the reserves accumulated in the second period and the tax is levied only on this dissolved portion. Note here that the taxes on the first

period's ¥10 million and the second period's ¥5 million are deferred two and one period respectively.

We can now calculate the tax savings realized by these deferrals. For this let us denote the rate of corporate tax by τ, the rate at which the firm discounts future profits by r and the tax savings realized in the jth period by S_j. Then, S_1 and S_2 are calculated by

$$S_1=10[1-(1+r)^{-2}]\tau\,,$$

$$S_2=5[1-(1+r)^{-1}]\tau\,.$$

Although it is obvious, one should note that S_1 becomes zero if tax payment is not deferred and 10τ if the reserves created in this first period are never dissolved, thus reducing to the case of tax exemption.

A problem of applying these calculations to actual data is how to deal with the reserves outstanding at the end of the period over which the calculation is made, i.e., the third period in the illustrative case. The way we have handled this problem is to consider two polar cases: the case in which the outstanding tax-free reserves are held forever and the one in which they are dissolved at the period succeeding the last one, i.e., the fourth period in our example. The former will hereinafter be referred to as case 1 and the latter as case 2.

So far we have shown how to calculate tax savings realized by the employment of tax-free reserves. We now turn to the calculation of the rate of tax savings. The rate of tax savings realized by this policy, S^R, is defined by

$$S^R=\frac{\text{tax saved by the use of tax-free reserves}}{\text{tax levied were it not for tax-free reserves}}\,.$$

The method for calculating the numerator has already been explained. To obtain the denominator we will first calculate the tax base in the absence of tax-free reserves and then derive the tax levied on the adjusted tax base. The calculation of S^R may be illustrated by extending the example presented above. Denoting the first and second period's taxable income as Y_1 and Y_2 and the rates of tax savings as $S_1{}^R$ and $S_2{}^R$, respectively, $S_1{}^R$ is calculated as

$$S_1{}^R=10[1-(1+r)^{-2}]/(Y_2+10)$$

for both cases 1 and 2, whereas $S_2{}^R$ is given by

$$S_2{}^R=\{5[1-(1+r)^{-1}]+5\}/(Y_1+10)$$

for case 1 and

$$S_2{}^R=\{5[1-(1+r)^{-1}]+5[1-(1+r)^{-2}]\}/(Y_2+10)$$

for case 2. Notice that in the first case of $S_2{}^R$ the tax-free reserves outstanding at the end of the third period are held over, while in the second they are dissolved at the fourth period, which is a period after the last listed in Table IV-A. Notice also that the tax bases of the first and second periods are increased by the amount of tax-free reserves.

For the purpose of comparing the rates of tax savings realized by tax-free

reserves according to industry we will find it convenient to summarize a series of annual tax-saving rates by an index, $\bar{S}^R$, defined by

$$\bar{S}^R = \frac{\sum_{t=0}^{T} [S(t)/(1+r)^t]}{\sum_{t=0}^{T} [Y^R(t)/(1+r)^t]},$$

where $S(t)$ is the tax savings at period t; Y^R the adjusted tax base at t; and T the length of the period over which the calculation is made.

The results of our calculation of the rates of tax savings, S^R, and their summary index, $\bar{S}^R$, are given in Tables V-A and V-B. In this calculation we have used the lending rates of commercial banks as a proxy for the corporate discount rate. The rates in Table V-A are by definition greater than their counterparts in Table V-B. The characteristics we can observe from the tables are the following:

(i) The highest $\bar{S}^R$ in case 1 and the second highest in case 2, were realized by public services, while the third highest in case 1 and the highest in case 2, were achieved by financial institutions. The same time-series characteristics as found in Table III are also observed here; the rates of tax savings of the public services stayed high, whereas those of financial institutions declined steadily.[2]

(ii) Corresponding to the rates of utilization of tax-free reserves, high rates of tax savings were realized by both declining and growing industries. In both Tables V-A and V-B, the rates of tax savings realized by the declining (primary and textile) industries seem to be higher than those of rapidly growing manufacturing industries.

B. *Accelerated Depreciation*

Accelerated depreciation is another policy for deferring corporate tax payments. As has been pointed out earlier, it writes off the value of assets faster than their economic value declines and renders depreciation costs at an early phase of asset lives bigger than they would otherwise be. As long as a firm raises profits, the taxes which would otherwise have been paid when assets were new are postponed to a later date. In this subsection we wish to calculate the rates of inter-industry utilization of accelerated depreciation and the rates of tax savings realized by this means.

In keeping with the idea which led to the definition of U^R in the preceding subsection, we define the rate an industry makes use of accelerated depreciation, U^D, as

[2] Although this is not shown in the table, the reserve contributing significantly to high rates of $\bar{S}^R$s for public services is the reserve for retirement allowances, and that responsible for high rates of $\bar{S}^R$s of financial institutions is the reserve for bad debts. The decline of $\bar{S}^R$s of financial institutions is due to the fact that the proportion of receivables outstanding at the end of the accounting period which is allowed to be deducted from corporate income as the reserve for bad debts has been reduced.

TABLE V

RATES OF TAX SAVINGS, S^R AND $\bar{S}^R$

A. Case 1 (%)

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	$\bar{S}^R$
1	9.0	8.8	2.8	3.1	0.5	13.0	6.0	10.8	11.8	7.8	15.9	31.7	16.1	6.9	3.5	18.4	0.5	3.9	10.7
2	16.9	0.0	13.5	9.3	7.2	11.1	8.8	1.8	6.3	0.6	1.5	5.6	4.9	7.7	5.6	0.0	4.8	5.1	5.8
3	14.0	0.6	3.1	2.4	2.9	3.1	9.5	4.6	5.2	4.5	6.2	7.8	4.3	6.2	4.5	3.7	5.3	3.1	5.2
4	18.0	0.8	10.4	1.9	8.4	12.6	4.1	4.2	4.9	18.8	13.1	14.8	10.2	5.1	10.0	0.1	3.2	4.9	9.4
5	26.5	4.1	7.0	5.6	7.3	5.0	11.9	10.2	9.3	3.9	10.7	14.9	16.0	11.0	11.1	2.9	6.4	6.6	9.9
6	—	—	—	—	—	—	30.0	12.4	3.9	11.4	11.1	15.1	17.5	13.4	14.7	16.5	0.6	7.7	13.3
7	—	—	—	—	—	—	29.3	7.5	10.4	7.7	9.9	16.6	14.4	7.9	8.6	8.5	2.2	3.6	10.6
6 & 7	21.8	16.2	2.5	6.2	8.2	8.2	13.8	9.4	8.5	8.6	10.4	16.2	14.3	8.5	9.8	10.3	1.4	4.8	9.9
8	—	—	—	—	—	—	24.1	6.3	5.9	7.9	6.8	10.0	8.7	9.7	5.5	6.5	3.8	1.3	7.8
9	—	—	—	—	—	—	20.6	2.6	9.1	11.4	0.3	5.1	28.4	1.2	8.0	9.0	15.5	2.8	10.5
10	18.1	0.0	6.1	3.6	5.6	3.2	12.7	6.0	5.4	8.9	6.6	8.8	11.6	7.9	5.2	5.0	8.8	1.5	7.2
11	25.4	10.8	6.9	9.9	11.9	13.8	11.4	11.9	11.9	8.3	12.2	9.7	6.1	10.5	3.6	9.3	4.7	2.8	9.3
12	12.2	1.1	2.6	2.0	2.4	6.4	7.1	4.4	6.5	6.8	7.1	13.4	1.3	5.6	8.7	3.2	3.0	3.9	5.9
13	1.9	0.8	1.4	0.4	1.1	2.3	1.9	1.0	4.0	0.0	4.3	11.6	1.6	5.0	6.8	4.7	6.3	0.0	3.0
14	52.6	17.5	19.0	13.9	16.9	20.3	10.5	12.8	19.8	2.6	18.0	7.4	7.1	6.6	3.9	2.9	8.7	2.5	12.7
15	2.3	1.7	0.4	0.3	2.3	0.7	2.9	2.2	1.7	0.3	2.0	2.5	3.8	2.9	1.5	1.5	3.2	1.3	2.0
16	36.3	12.6	9.5	3.8	15.3	11.5	22.0	18.6	11.6	10.8	20.7	22.8	15.8	26.9	18.0	14.5	7.6	12.5	16.7
17	6.9	0.7	2.3	1.0	2.7	5.1	8.1	4.6	4.2	5.4	6.8	4.3	9.6	4.4	7.0	7.6	6.7	2.8	5.6
Overall	28.3	9.6	7.3	6.6	9.2	9.6	12.1	9.4	9.7	6.5	10.9	11.7	9.2	9.3	7.5	6.7	5.4	4.1	9.3

TABLE V (Continued)

B. Case 2 (%)

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	$\bar{S}^R$
1	9.0	8.8	2.8	3.1	0.5	11.2	5.2	7.5	5.8	3.4	6.9	11.8	5.3	2.0	0.8	3.4	0.1	0.3	4.9
2	16.9	0.0	13.5	7.1	4.8	6.9	6.0	1.8	3.4	0.6	1.0	2.5	1.7	2.4	1.4	0.0	0.7	0.4	2.8
3	10.2	0.4	2.1	1.5	1.8	1.7	5.0	2.4	2.5	2.0	2.6	3.0	1.5	1.9	1.1	0.7	0.7	0.2	2.1
4	18.0	0.8	8.2	1.9	6.1	7.7	3.5	2.7	3.2	8.8	5.6	5.8	3.3	1.4	2.3	0.0	0.4	0.4	5.3
5	20.3	2.9	4.8	3.7	4.7	3.2	6.3	5.5	4.5	1.7	4.5	5.7	5.4	3.1	2.5	0.5	0.8	0.5	4.3
6	—	—	—	—	—	—	17.3	6.2	1.8	4.7	5.0	6.2	5.9	3.5	2.9	1.9	0.1	0.6	5.2
7	—	—	—	—	—	—	16.1	4.0	4.9	3.3	4.0	6.3	4.9	2.3	2.0	1.5	0.3	0.3	4.2
6 & 7	16.4	11.6	1.6	4.4	5.2	4.5	7.5	4.8	4.0	3.7	4.3	6.3	4.8	2.4	2.2	1.7	0.2	0.4	4.3
8	—	—	—	—	—	—	14.0	3.4	2.8	3.5	2.7	4.0	2.9	3.2	1.4	1.2	0.5	0.1	3.1
9	—	—	—	—	—	—	13.9	1.4	4.4	5.0	0.1	2.0	9.7	0.3	1.8	1.5	2.0	0.2	3.6
10	16.2	0.0	4.5	2.4	3.8	2.1	6.7	3.1	2.5	3.9	2.7	3.5	4.0	2.4	1.2	0.9	1.2	0.1	3.1
11	20.9	7.8	4.8	6.9	7.2	7.7	6.1	6.1	5.8	3.7	5.0	3.8	2.0	2.9	0.8	1.6	0.6	0.2	4.2
12	11.4	1.1	2.2	1.9	2.0	4.0	4.0	2.4	3.4	2.9	2.8	5.0	0.4	1.6	1.9	0.6	0.4	0.3	2.4
13	1.9	0.8	1.4	0.4	1.1	1.4	1.4	1.0	2.3	0.0	2.2	0.6	0.5	1.4	1.5	0.8	0.8	0.0	1.1
14	40.7	12.9	13.9	9.6	10.4	12.0	5.6	6.7	9.6	1.2	7.5	3.1	2.6	2.0	1.0	0.7	1.2	0.2	7.1
15	2.3	1.7	0.4	0.3	1.7	0.5	1.7	1.2	0.9	0.1	0.9	1.1	1.4	0.8	0.4	0.3	0.4	0.1	0.8
16	25.9	8.7	6.3	2.3	8.9	6.3	11.6	9.4	5.4	4.4	8.0	8.4	5.3	7.4	4.2	2.6	0.9	1.0	6.8
17	6.1	0.7	2.0	0.7	2.3	2.9	4.3	2.4	2.1	2.4	2.8	1.7	3.3	1.2	1.5	1.4	0.9	0.2	1.9
Overall	22.2	7.0	5.2	4.6	5.8	5.6	6.5	4.9	4.7	2.9	4.5	4.5	3.2	2.7	1.7	1.2	0.7	0.3	4.2

Source: Same as for Table III.

$$U^D = \frac{\text{the share of accelerated depreciation used by the industry}}{\text{the share of depreciation of the industry}}.$$

Accordingly, as U^D is greater or smaller than unity, the industry will be regarded as using proportionally more or less accelerated depreciation. The results of our calculation of U^D are shown in Table VI. The average in the last column is, as in Table III, the mean of the U^Ds of each industry for a relevant period. The numbers in the table are quite in line with our economic intuition:

(i) Accelerated depreciation was more than proportionally utilized by manufacturing industries. Among them, the publishing and printing, textile, and iron and metal industries made significant uses of the policy.

(ii) The time trends of U^D for the textile, chemical, iron and metal, and machine industries indicate that these industries utilized accelerated depreciation significantly more than proportionally only until the early 1970s.

(iii) Among nonmanufacturing industries, the mining industry and public services utilized accelerated depreciation relatively more than others. However, the time trends of their utilization rates are not the same as those for the manufacturing industries; over the period the utilization rates of these industries seem to exhibit an increase.

We now proceed to measurement of the tax savings realized by making use of accelerated depreciation. A typical accelerated depreciation scheme employed in Japan since 1961 (see Table I) is to write off a certain percentage of the value of assets in the year of acquisition and then let the remaining values be depreciated at normal rates. Our problem is to find a formula for the rate of tax savings realized by this accelerated depreciation policy. Again, we will employ a simple example to illustrate a method for obtaining such a formula.

Let us suppose that a company acquired an asset valued at ¥10 million whose useful life is ten years, and that the law of accelerated depreciation allows a third of its value to be written off in the first year. As for the method of depreciation of the remainder, the declining balance method is assumed, with 10 per cent of the initial value of the asset remaining at the end of the tenth year.

Under these assumptions, the rate of depreciation for an ordinary asset is 0.206 and the present value of its depreciation from the first to the last year, Z^N, is equal to ¥7.463 million, where the corporate discount rate is set equal to 0.077.[3] When the accelerated depreciation formula is applied, a third of the ¥10 million value is depreciated immediately and the remaining value of the asset is depreciated as an ordinary asset with the rate of depreciation equal to 0.173. Using the same discount rate as above, the present value of depreciations under this scheme, Z^A, is equal to ¥7.945 million. Thus, the present value of depreciations of the asset increases by $Z^A - Z^N$ or ¥0.482 million by switching from the ordinary to the accelerated depreciation method. Since a company can deduct this amount (expressed in present value) from its taxable income, it will save corporate income

[3] The particular rate chosen is an average of the discount rates employed over the period from 1963 to 1980.

TABLE VI

THE UTILIZATION OF ACCELERATED DEPRECIATION, BY INDUSTRY, U^D

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Average
1	0.10	0.29	0.39	0.47	0.27	0.50	0.56	0.34	0.64	0.43	0.87	0.57	0.89	0.92	1.18	0.75	0.56	0.21	0.55
2	1.12	1.92	1.44	1.12	0.72	0.81	0.71	0.40	0.38	0.40	0.80	1.08	1.51	1.54	0.97	4.57	4.80	2.21	1.47
3	0.86	0.41	0.40	0.47	0.42	0.40	0.35	0.28	0.21	0.43	0.79	0.60	0.91	0.85	0.88	1.07	1.57	1.19	0.67
4	2.44	2.43	2.04	2.18	1.90	1.87	1.70	1.58	2.02	1.62	1.91	1.29	1.05	1.30	1.23	1.31	1.90	1.90	1.76
5	1.04	1.28	1.07	0.98	0.89	0.98	0.90	0.80	0.84	0.97	0.96	1.25	1.23	0.98	1.39	1.24	0.96	0.92	1.04
6	—	—	—	—	—	—	2.15	2.11	1.12	1.00	1.41	1.21	1.78	2.08	1.39	1.54	1.09	1.14	1.50
7	—	—	—	—	—	—	2.08	1.80	2.05	1.54	1.16	0.97	1.10	0.98	1.16	0.87	0.99	0.94	1.30
6 & 7	2.24	1.79	1.83	1.83	2.02	2.01	2.11	1.93	1.66	1.31	1.28	1.08	1.40	1.48	1.26	1.16	1.03	1.02	1.58
8	—	—	—	—	—	—	0.51	0.59	0.59	1.05	1.26	1.59	1.56	1.57	2.11	1.24	1.73	1.11	1.24
9	—	—	—	—	—	—	1.26	1.19	1.34	1.59	1.98	2.05	2.09	2.05	1.83	2.14	2.05	2.37	1.83
10	1.25	1.24	1.08	1.16	1.07	1.10	0.98	0.95	0.90	1.17	1.41	1.42	1.32	1.43	1.67	1.37	1.62	1.35	1.25
11	0.23	0.28	0.30	0.35	0.35	0.31	0.34	0.34	0.31	0.45	0.45	0.48	0.49	0.42	0.39	0.36	0.50	0.38	0.37
12	0.11	0.10	0.07	0.05	0.06	0.09	0.08	0.09	0.10	0.16	0.16	0.18	0.21	0.17	0.23	0.31	0.26	0.08	0.14
13	0.01	0.01	0.02	0.02	0.02	0.04	0.02	0.02	0.05	0.09	0.09	0.05	0.10	0.38	0.15	0.15	0.12	0.07	0.08
14	0.58	0.47	0.51	0.72	0.46	0.32	0.37	0.29	0.73	0.70	0.73	0.73	1.68	0.91	0.91	0.64	0.25	0.16	0.62
15	0.98	0.60	0.50	0.49	0.64	0.52	0.59	0.57	0.57	0.86	1.03	0.98	1.48	1.23	1.33	1.19	1.01	0.76	0.85
16	0.20	0.31	0.58	0.65	0.71	0.62	0.58	0.84	1.23	1.44	1.14	1.35	0.89	0.93	0.84	0.99	1.09	1.71	0.90
17	0.35	0.25	0.14	0.28	0.29	0.39	0.20	0.18	0.27	0.21	0.25	0.29	0.31	0.28	0.38	0.29	0.26	0.31	0.27

Source: Same as for Table III.

tax $(Z^A-Z^N)\tau$, where τ is the tax rate. This, then, is the method by which we calculate tax savings realized by the use of the accelerated depreciation formula.

With a method available for calculating the tax savings, the next problem we have to solve is how to estimate the useful lives of assets to which accelerated depreciation has been applied. Ideally, the method we should be after is one by which the useful lives of assets under accelerated depreciation can be estimated separately from those of other assets. However, it proves to be very difficult to estimate, from the available data, the values of investment and assets under accelerated depreciation, without which, depreciations over the period (1963–80) cannot be simulated. Therefore, we are forced to resort to a less satisfactory method of estimation. The method actually employed is the following: first we estimate the useful lives of assets of capital intensive industries; and, second, we regard these as proxies for the useful lives of assets under accelerated depreciation, for the assets to which accelerated depreciation has been applied are mostly equipment which seems in turn to comprise most of the investment of capital intensive industries.

Before passing on to the results of our estimation, it will be useful to state more clearly how we estimated the useful lives of assets of an industry of the capital-intensive type. We let I_t and K_t denote respectively the values of investment and fixed assets of the industry at time t, and δ the rate of depreciation. The duration of the period under scrutiny extends from $t=0$ to $t=T$. Now, with the values of I_t known from $t=1$ to $t=T$, the value of fixed assets at t, $\hat{K}_t$, should be

$$\hat{K}_t=\sum_{i=0}^{t-1}(1-\delta)^{t+1}I_{t-i}+(1-\delta)^tK_0\,.$$

Our method of estimating δ is to find such δ as minimizes the sum of square errors over the period: $\sum_{t=1}^{T}(K_t-\hat{K}_t)^2$.

As is obvious from the foregoing explanation, our method for estimating δ itself is immune to variations in the capital intensity of industries and may therefore be applied to every industry. Thus Table VII reports the results of our estimation for all industries. Industries typically classified as capital intensive are industries 5, 6 and 7, and the useful life of assets of these industries is about 14.5 years. Since not all assets are equipment, the useful life of equipment of these industries would be no longer than our estimates. This realization led us to set the useful lives of assets under accelerated depreciation at 14 years.

The rate of tax savings realized by accelerated depreciation, S^D, may be defined in the same manner as that realized by tax-free reserves, S^R:

$$S^D=\frac{\text{tax saved by the use of accelerated depreciation}}{\text{tax levied were it not for accelerated depreciation}}\,.$$

We have already illustrated how the numerator is calculated. The denominator is given as the sum of taxable income and the amount of accelerated depreciation. A summary index of S^D, $\bar{S}^D$, is also defined in the same way as $\bar{S}^R$: the ratio of the present values of the numerator and denominator of S^D.

TABLE VII

USEFUL LIVES OF ASSETS

Industry	Useful Lives (Years)	Industry	Useful Lives (Years)
1	12.5	9	—
2	11.5	10	14.5
3	10.5	11	16.5
4	14.5	12	18.0
5	14.5	13	—
6	18.0	14	—
7	12.0	15	35.0
6 & 7	14.5	16	19.5
8	—	17	17.0

Source: Estimated by the authors, using the data from [3, various editions].
Note: "—" indicates data not available.

We are now in a position to present our results, and these are reported in Table VIII. A few observations emerge from the table:

(i) The rates of tax savings were higher in manufacturing industries, with the notable exception of public services, which in fact realized the second highest saving rate. Among manufacturing industries, the rates of tax savings of the textile, and iron and metal industries were especially high.

(ii) The rate of tax savings of all industries (see the bottom row) increased steadily until 1970 and declined thereafter. This time trend is equally observable in the textile, chemical, and iron and metal industries.

IV. THE CORRELATION BETWEEN GROWTH RATES OF INVESTMENT AND THE RATES OF CORPORATE TAX SAVINGS

In the preceding section we have shown how each industry utilized deferral-type incentives and how much tax savings it eventually realized. The purpose of this section is to synthesize the results of tax savings realized by making use of both tax-free reserves and accelerated depreciation, and to find out the relation between growth rates of corporate investment and the rates of tax savings.

The rate of tax savings, S^T, which a corporation can realize by using both kinds of incentive policies may be defined in the same manner as that realized from adoption of each kind taken separately: the ratio between the amount of tax savings and the tax paid were it not for resort to the two policies. The tax base of a corporation without reference to the two policies, which may be referred to as its adjusted income, consists of its income under the policies plus the sum of tax-free reserves and the amount involved in accelerated depreciation.

Our results are presented in Table IX, where $\bar{S}^T$ is, like $\bar{S}^R$ and $\bar{S}^D$, a summary index of the rates of tax savings, S^T. Cases 1 and 2 correspond respectively to those defined in the calculation of the rates of tax savings realized by the use

TABLE VIII

RATES OF TAX SAVINGS, S^D AND $\bar{S}^D$

(%)

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	$\bar{S}^D$
1	0.2	0.4	0.9	1.2	0.8	2.8	2.3	1.7	2.7	1.1	1.8	2.1	2.8	2.2	2.5	0.9	0.7	0.3	1.5
2	1.3	2.4	1.8	1.3	1.1	1.6	1.4	0.9	0.7	0.5	0.9	0.6	0.6	0.7	0.6	1.3	0.7	0.5	0.8
3	0.3	0.2	0.2	0.3	0.4	0.4	0.4	0.3	0.2	0.3	0.5	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4
4	1.2	1.8	2.4	2.8	2.7	2.8	3.0	3.0	4.2	2.7	1.8	1.7	1.8	1.3	1.1	0.8	0.7	0.8	2.0
5	0.5	0.8	1.2	1.0	1.0	1.3	1.3	1.4	1.6	1.4	1.1	1.3	1.4	1.1	1.2	0.7	0.4	0.3	1.0
6	—	—	—	—	—	—	3.2	3.9	2.7	1.9	1.6	1.3	2.1	3.7	1.9	1.5	0.6	0.5	1.9
7	—	—	—	—	—	—	1.8	2.0	2.5	1.2	0.8	1.0	0.9	0.6	0.6	0.3	0.3	0.3	1.0
6 & 7	0.8	0.9	1.4	1.4	1.7	1.8	2.2	2.6	2.5	1.4	1.1	1.1	1.3	1.2	0.9	0.6	0.4	0.3	1.3
8	—	—	—	—	—	—	0.6	0.8	0.7	0.8	1.0	1.5	1.0	0.9	0.9	0.4	0.5	0.4	0.8
9	—	—	—	—	—	—	1.1	1.4	1.3	1.1	1.3	1.3	0.9	0.8	0.9	0.5	0.4	0.5	0.9
10	0.7	0.6	0.7	0.7	0.9	1.1	1.0	1.1	1.0	0.8	0.8	1.1	0.8	0.7	0.8	0.4	0.4	0.4	0.8
11	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
12	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
13	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.4	0.2	0.1	0.1	0.0	0.1
14	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1
15	0.5	0.4	0.4	0.4	0.8	0.6	0.6	0.6	0.5	0.4	0.4	0.8	1.0	0.9	0.7	0.5	0.3	0.3	0.6
16	0.2	0.4	0.9	1.2	1.7	1.8	2.0	3.1	3.9	3.2	2.5	3.8	1.7	1.6	1.2	0.8	0.8	2.2	1.9
17	0.2	0.1	0.1	0.2	0.4	0.5	0.3	0.3	0.4	0.2	0.3	0.4	0.4	0.3	0.4	0.2	0.2	0.2	0.3
Overall	0.4	0.5	0.8	0.8	1.0	1.1	1.2	1.4	1.3	0.8	0.7	0.9	0.7	0.7	0.6	0.4	0.3	0.3	0.7

Sources: Same as for Table III and Table VII.

TABLE IX

RATES OF TAX SAVINGS, S^T AND $\bar{S}^T$

A. Case 1 (%)

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	$\bar{S}^T$
1	9.1	9.0	3.6	4.0	1.4	13.8	7.4	11.4	12.7	8.5	16.2	30.8	16.6	8.3	5.9	18.5	1.2	4.1	11.3
2	17.0	4.5	13.9	9.9	7.9	11.7	9.5	2.6	6.8	1.0	2.4	6.0	5.3	8.1	6.0	1.5	5.3	5.5	6.3
3	14.0	0.7	3.3	2.7	3.3	3.4	9.7	4.8	5.3	4.7	6.5	8.1	4.7	6.5	4.8	4.0	5.5	3.4	5.5
4	18.1	2.5	11.4	4.5	9.8	13.5	6.3	6.4	7.9	19.0	13.7	15.2	11.6	6.1	10.6	0.9	3.8	5.4	10.4
5	26.4	4.8	7.7	6.2	7.9	5.9	12.3	10.8	10.1	5.0	11.1	15.2	16.2	11.4	11.6	3.5	6.6	6.9	10.4
6	—	—	—	—	—	—	28.9	13.7	6.1	12.1	11.7	15.4	17.8	14.5	15.2	16.7	1.2	8.0	13.9
7	—	—	—	—	—	—	28.7	8.6	11.5	8.4	10.2	16.7	14.6	8.2	8.9	8.7	2.4	3.8	11.0
6 & 7	21.7	16.4	3.7	7.1	9.1	9.1	14.4	10.7	9.8	9.3	10.9	16.4	14.7	9.1	10.2	10.5	1.7	5.0	10.5
8	—	—	—	—	—	—	24.0	6.8	6.3	8.3	7.4	10.7	9.2	10.1	6.1	6.8	4.2	1.7	8.2
9	—	—	—	—	—	—	20.6	3.7	9.7	11.8	1.6	6.1	28.2	2.0	8.5	9.3	15.5	3.2	10.9
10	18.1	0.7	6.5	4.2	6.2	4.1	13.1	6.7	6.1	9.3	7.2	9.3	11.9	8.3	5.7	5.3	8.9	1.8	7.7
11	25.4	10.8	7.0	9.9	11.9	13.8	11.5	12.0	12.0	8.4	12.3	9.8	6.2	10.5	3.7	9.3	4.7	2.9	9.4
12	12.2	1.1	2.6	2.1	2.5	6.5	7.1	4.4	6.6	6.9	7.1	13.4	1.4	5.7	8.8	3.2	3.1	3.9	6.0
13	1.9	0.8	1.4	0.4	1.2	2.4	1.9	1.1	4.1	0.2	4.3	1.7	1.7	5.3	6.9	4.7	6.3	0.1	3.0
14	52.6	17.5	19.0	14.0	16.9	20.3	10.5	12.9	19.8	2.7	18.0	7.4	7.2	6.6	3.9	3.0	8.7	2.5	12.8
15	2.8	2.0	0.8	0.8	3.0	1.3	3.4	2.7	2.2	0.6	2.3	3.2	4.6	3.6	2.2	1.9	3.4	1.5	2.5
16	36.2	12.8	10.0	4.7	15.7	12.2	21.9	18.8	13.1	12.1	20.7	22.4	16.1	26.5	18.1	14.7	8.0	13.3	17.0
17	7.0	0.8	2.4	1.2	3.0	5.4	8.3	4.9	4.6	5.6	7.0	4.6	9.8	4.6	7.2	7.8	6.8	3.0	5.8
Overall	28.1	9.9	7.7	7.1	9.7	10.1	12.5	10.1	10.4	7.0	11.2	12.0	9.6	9.7	7.9	7.0	5.6	4.4	9.7

TABLE IX (Continued)

B. Case 2 (%)

Industry	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	$\bar{S}^T$
1	9.1	9.0	3.6	4.0	1.4	12.2	6.7	8.4	7.5	4.3	7.9	12.4	7.2	3.8	3.6	4.0	0.8	0.6	6.0
2	17.0	4.5	13.9	7.8	5.6	7.8	6.9	2.6	4.0	1.0	1.9	3.1	2.3	2.9	1.8	1.5	1.3	0.8	3.5
3	10.3	0.6	2.3	1.8	2.2	2.1	5.3	2.6	2.7	2.3	3.1	3.5	1.9	2.2	1.4	1.0	1.1	0.6	2.4
4	18.1	2.5	9.4	4.5	7.8	9.2	5.8	5.1	6.5	10.0	6.7	6.9	5.6	2.7	3.2	0.9	1.1	1.1	6.7
5	20.2	3.6	5.6	4.5	5.4	4.2	7.1	6.5	5.6	2.9	5.3	6.6	6.4	4.0	3.5	1.2	1.1	0.8	5.1
6	—	—	—	—	—	—	17.6	8.6	4.2	6.0	6.0	7.0	7.2	6.4	4.4	3.0	0.7	1.0	6.4
7	—	—	—	—	—	—	16.4	5.5	6.6	4.2	4.5	6.8	5.5	2.8	2.5	1.8	0.5	0.5	4.9
6 & 7	16.5	11.9	2.9	5.4	6.3	5.7	8.7	6.6	5.9	4.7	5.0	6.9	5.7	3.4	2.9	2.2	0.5	0.7	5.2
8	—	—	—	—	—	—	14.1	4.0	3.4	4.1	3.5	5.1	3.8	3.8	2.2	1.6	0.9	0.5	3.7
9	—	—	—	—	—	—	14.2	2.6	5.3	5.7	1.5	3.1	10.1	1.2	2.5	2.0	2.3	0.7	4.3
10	16.3	0.7	4.9	3.0	4.4	3.0	7.3	4.0	3.4	4.5	3.4	4.3	4.5	3.0	1.9	1.3	1.5	0.5	3.7
11	20.9	7.9	4.9	6.9	7.3	7.8	6.2	6.3	5.9	3.8	5.1	3.9	2.2	3.0	0.9	1.7	0.6	0.3	4.3
12	11.4	1.1	2.3	1.9	2.1	4.0	4.0	2.5	3.5	3.0	2.9	5.1	0.5	1.6	2.0	0.7	0.5	0.3	2.5
13	1.9	0.8	1.4	0.4	1.2	1.5	1.4	1.0	2.4	0.1	2.3	0.7	0.6	1.8	1.6	0.9	0.9	0.1	1.2
14	40.7	12.9	13.9	9.7	10.5	12.0	5.6	6.7	9.6	1.2	7.6	3.2	2.7	2.1	1.1	0.8	1.2	0.2	7.1
15	2.8	2.0	0.8	0.8	2.4	1.1	2.2	1.8	1.4	0.5	1.3	1.8	2.3	1.7	1.1	0.8	0.7	0.4	1.3
16	25.8	8.9	6.9	3.3	9.7	7.4	12.2	10.8	8.0	6.7	9.3	10.2	6.3	8.2	5.0	3.2	1.6	2.8	7.9
17	6.2	0.8	2.1	0.9	2.6	3.4	4.5	2.7	2.4	2.6	3.1	2.1	3.6	1.5	1.9	1.5	1.0	0.4	2.2
Overall	22.2	7.3	5.8	5.1	6.4	6.3	7.2	5.8	5.6	3.5	5.0	5.1	3.7	3.2	2.3	1.5	1.0	0.6	4.8

Sources: Same as for Table III and Table VII.

of tax-free reserves. From the table the following characteristics, similar to those observed from Tables V and VIII, may be observed:

(i) Public services and financial institutions achieved significantly high rates of tax savings. However, as was already noted, the rate of tax savings of financial institutions steadily declined, whereas that of public services stayed high over almost the entire period.

(ii) Among manufacturing industries, the textile, iron and metal, machine and chemical industries achieved high rates of tax savings. The rates of tax savings of these industries seem to have declined, though the trends are not so conspicuous as that of financial institutions.

Now, with the data on tax savings realized through utilization of the incentive policies available, we want to determine how corporate investment was affected. A rigorous way of dealing with this problem would be to derive an investment function which captures the behavior of Japanese firms, and to test the effectiveness of tax parameters on investment. However, this clearly deserves another paper. In the present paper we satisfy ourselves with a more modest attempt—an examination of the relationship between the growth rates of investment and the rates of change in tax-savings rates, i.e., the rates of change of S^R, S^D, and S^T. Formally, our analysis amounts to a testing of the following (null) hypothesis:

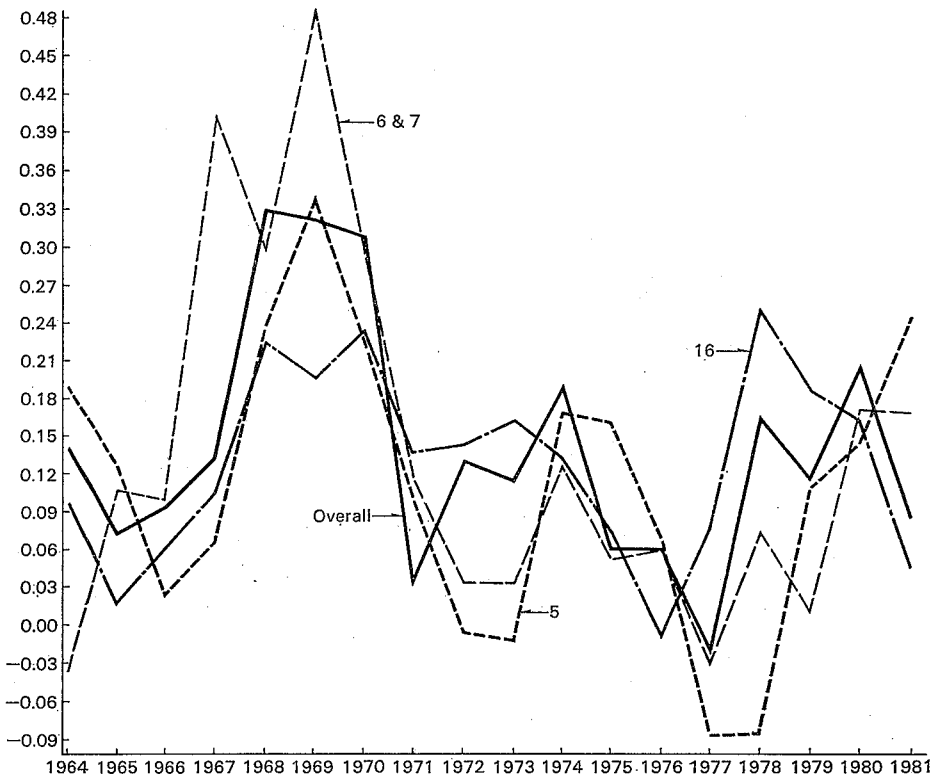
H_0: There exists no correlation between the rates of change of tax-savings rates and the growth rates of investment.

The idea behind this test is that when the growth rates of investment respond positively to the rise in the tax-savings rates, this implies that fiscal incentive policies are effective in promoting investment. In this section, therefore, we wish to test whether hypothesis H_0 is rejected at a level of relevant significance and whether correlation coefficients may be claimed to be positive.

Before presenting the results of our calculations, it is relevant to observe the investment growth rates of a few industries. Figure 1 illustrates three-year moving averages of the growth rates of investment of major manufacturing industries, public services, and industry as a whole. At a glance we can see that the growth rates of investments were significantly cyclical, with a peak at around 1968–69 and troughs at 1972–74 and around 1977. Although the figure was compressed to save space, we can still observe that growth rates of investment were not free from short-term disturbances. A question which thus arises is which growth rates are more appropriate for testing the hypothesis, H_0, the yearly rates or smoothed ones. The answer seems to hinge upon the length of period over which fiscal incentives may work their effect on decisions of corporate investment. Since most of the deferral-type incentive policies we have been concerned with were practiced in one way or another until the middle of the 1970s, we consider smoothed investment growth rates the better variable to use for testing the hypothesis. This has led us to employ the three-year moving averages.

Table X presents the results of our calculations. Correlation coefficients were calculated between the rates of change of tax-savings rates, S^T, S^R, and S^D, on the one hand, and the growth rates of investment of various industries on the

Fig. 1. Growth Rates of Investment



Source: Same as for Table VII.
Notes: 1. Growth rates: Three-year moving average.
2. The numbers in the figure refer to industry codes.

other. The industries and incentive policies selected for calculating correlation coefficients are shown respectively at the first column and row of Table X. From the table we can observe the following relationships between the rates of tax savings and corporate investment:

(i) For manufacturing industries, i.e., industries 4, 5, 6 & 7,[4] and 10, there exist correlation coefficients different from zero with a significance level of 10 per cent, and they are all positive in sign.[5]

As for the effectiveness of fiscal incentive policies on investment, there appear to be differences according to both industry and the policy adopted. To start with the differences in effectiveness according to industry, we find the following:

[4] Since industries 6 and 7 were lumped together before 1969, the rate of tax savings for each of them individually was not available. Therefore, these industries were combined over the entire period so that rates of tax savings could be obtained throughout.

[5] Some coefficients, positive in sign, are significantly non-zero even at a significance level of 5 per cent.

TABLE X

CORRELATION BETWEEN RATES OF CHANGE OF TAX-SAVINGS RATES AND GROWTH RATES OF INVESTMENT

Industry	S^T		S^R		S^D
	Case 1	Case 2	Case 1	Case 2	
1	−0.043	0.011	−0.114	−0.092	−0.049
2	−0.128	−0.031	−0.116	−0.145	0.398
3	−0.312	−0.328	−0.310	−0.341	−0.183
4	0.113	−0.186	0.465*	0.457*	−0.090
5	0.338	0.365	0.288	0.241	0.493*
6 & 7	0.261	0.389	0.218	0.260	0.554**
10	0.493*	0.527**	0.515**	0.527**	0.411
11	0.343	0.320	0.344	0.329	−0.080
12	−0.090	−0.062	−0.108	−0.100	0.204
15	0.297	0.298	0.283	0.262	0.314
16	−0.072	−0.030	−0.070	−0.073	−0.100
17	0.006	−0.072	0.005	−0.077	−0.028
5 and 6 & 7	0.283	0.360**	0.241	0.242	0.522**
Manufacturing industries	0.198	−0.005	0.504**	0.497**	0.064
All industries	0.033	0.045	0.006	0.011	0.013

Sources: Same as for Table III and Table VII and Figure 1.

Notes: 1. Growth rates: Three-year moving average.
2. Industry 6 & 7 are lumped together over the entire period.
3. "Manufacturing industries" consist of industries 4, 5, 6 & 7, and 10.
4. "All industries" consist of those listed in the table.

* H_0 is rejected at a significance level of 10 per cent.

** H_0 is rejected at a significance level of 5 per cent.

in growing industries (industries 5 and 6 & 7) the correlation coefficients are all positive and those which are significantly non-zero are obtained when the growth rates of investment were correlated with the rates of change of tax-savings rates due to accelerated depreciation, whereas in a declining industry (industry 4) the effect of accelerated depreciation on investment appears almost negligible, while tax-free reserves seem to have affected investment positively. Differences in effectiveness are also observed among policies. In the growing industries, which have sustained postwar economic development of Japan, accelerated depreciation seems to be a more effective means for promoting investment than tax-free reserves.

(ii) In industries other than manufacturing ones no correlation coefficients are found to differ from zero at a significance level of 10 per cent. When all industries are pooled, the correlation coefficients come out positive, but none of them are sufficiently significant to establish the effectiveness of fiscal incentives on investment.

These are the findings we can extract from Table X. With a simple test

like the one conducted here precise evidence can hardly be established on the effectiveness of fiscal incentive policies on investment, but if anything certain comes from our analysis it would be the following: fiscal incentive policies were more effective in promoting investment in manufacturing industries, especially growing ones, than they were for other industries; and accelerated depreciation was a stronger investment-promoting means than were tax-free reserves in growing industries.

V. CONCLUSIONS

In this paper we have concentrated our attention on tax-free reserves and accelerated depreciation, the two most important fiscal incentive policies of the deferral-type in postwar Japan, and have presented two measures to characterize them: the rates of inter-industry utilization and the rates of tax savings realized by making use of them. Preliminary though it is, we have also made an attempt to determine the relationship between corporate investment and fiscal incentives by calculating the correlation coefficients between the growth rates of investment and the rates of change of tax-savings rates.

Our major findings with respect to the utilization of the two policies and the realized rates of tax-savings are that rather significant differences are observed among industries and periods. It should be recalled here that one of the assertions made by the two Japanese economists alluded to on the characteristics of postwar Japanese fiscal incentive policies was that they were granted more or less to every industry. Our response is that this assertion is correct only in a very general sense and that it overlooks the important fact that opportunities for tax savings through deferral-type policies were more favorably granted to certain industries than to others.

The second assertion made by the two economists was that fiscal incentives in postwar Japan failed to gear the allocation of resources toward a specific group of industries. As was mentioned at the outset of this section we have not tested this claim directly, but have tried to find more fundamental evidence: the relationship between fiscal incentives and investment. The results we have obtained from calculating the correlation coefficients seem to support the conclusion that fiscal incentives were more effective in promoting the investment of manufacturing industries, especially such growth-promoting industries as the chemical, iron and steel, and machine industries, than of the rest of the industries, and that among growing industries accelerated depreciation was a more effective means than tax-free reserves. Needless to say, the correlation coefficients alone will not suffice to establish the effectiveness of fiscal policies on investment and more work is definitely called for in providing a final answer to this issue. However, in the meantime, the correlation coefficients obtained from a careful handling of corporate statistics and a sound reading of fiscal institutions deserve to be treated as relevant information for testing the effectiveness of policies.

REFERENCES

1. FUJITA, S. "Zaisei-seisaku to kokumin chochiku-ritsu" [Fiscal policies and the national saving rate], in *Nihon zaisei-ron* [Japan's public finance] (Tokyo: Keisō-shobō, 1972).
2. KOMIYA, R. "Sengo-Nihon no zeisei to shihon-chikuseki [Taxation and capital formation in postwar Japan], University of Tokyo, *Keizaigaku ronshū*, Vol. 32, No. 2 (July 1966).
3. Ministry of Finance. *Hōjin-kigyō tōkei nempō* [Corporate statistics annual].
4. Ministry of Finance, Tax Bureau. *An Outline of Japanese Taxes* (various editions).
5. National Tax Administration Agency. *Zeimu-tōkei kara mita hōjin-kigyō no jittai* [Facts relating to corporate firms from the viewpoint of tax statistics].
6. Shoup Mission. "Report on Japanese Taxation by the Shoup Mission" (1949), in *Shōwa zaisei-shi—shūsen kara kōwa made* [Fiscal history of the Shōwa period—from the end of the war to the effectuation of the peace treaty], Vol. 8, ed. Ministry of Finance (Tokyo: Toyo-keizaishimposha, 1977).
7. Zaisei-kenkyūjo (Institute of Public Finance), ed. *Kōmoku-betsu Zeisei-chōsakai toshin-shū* [An itemized collection of recommendations of the Inquiry Commission for Taxation System] (Tokyo: Zeikei-shōhō-sha, 1983).