DISCUSSION PAPER SERIES

Discussion paper No.251

Impact of Local Corporate Income Taxes on the Effective Corporate Income Tax Rates: Excess Taxation and Tax Deductibility in Japan

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June 2023

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2023/06/07

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Impact of Local Corporate Income Taxes on the Effective Corporate Income Tax Rates: Excess Taxation and Tax Deductibility in Japan

Toshiyuki Uemura*

Abstract

This study explores local corporate income taxes in Japan, which are considered unique from an international perspective. Few countries impose local corporate income taxes. Although corporate income tax rates have decreased worldwide, countries with local corporate income taxes may show less flexibility in corporate income tax reform than countries without, as effective corporate income tax rates based on statutory tax rates remain higher than those without local corporate income taxes. Japan's local corporate income tax system allows for excess taxation and deductibility of corporate enterprise taxes. Countries such as Japan, where local corporate income tax revenues account for a significant share of total tax revenues, may need to reform their local corporate income tax systems. Germany's 2008 business tax reform, which abolished deductibility and lowered the tax rate, provides a helpful reference. This study incorporates the permanent effect of deductibility into the forward-looking effective tax rates by Klemm (2008, 2012) and analyzes the impact of excessive taxation and effective corporate tax rates of reforms of the deductibility of enterprise taxes, following the German business tax reform. First, the excessive taxation of the corporate inhabitant tax rate and the enterprise tax rate impacts 0.9 to 1.1% when converted to the real interest rate. Second, abolishing the deductibility of enterprise taxes and reducing the tax rate improves financing neutrality, possibly reducing the tax rate by approximately 1%. Third, a reform that changes the timing of deductibility in the current period has less impact than abolishing deductibility. Future reforms must be implemented in Japan's local corporate income taxes while considering the current impact on effective corporate income tax rates.

JEL classification: H25 and H32.
Keywords: local corporate income tax, excess taxation, tax deductibility

1.Introduction

This study aimed to examine the impact of local corporate income taxes on effective corporate tax rates. Japan has two types of local taxes for corporate income: corporate inhabitant tax on corporate taxable income and corporate enterprise tax on income. Few countries have local corporate income taxes, and Japan's is unique from an international perspective because they allow for excess taxation and are deductible as tax expenses. These factors may reduce the flexibility of the corporate income tax reform.

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All local governments apply excess corporate tax rates in addition to the standard rate of local inhabitant taxes, leading to the effective corporate tax rate being higher than that of the Ministry of Finance, typically calculated at the standard rate. Moreover, corporate enterprise taxes are deductible in the following fiscal year; however, this mechanism is unique from an international perspective. Germany, which has a local corporate income tax system similar to Japan, reformed its corporate income tax system in 2008 by abolishing deductible expense inclusion and decreasing the tax rate.

This study analyzes the impact of local corporate income taxes on the effective corporate tax rate to examine the future of the corporate inhabitant and enterprise tax rates in Japan. The structure of this study is as follows: Section 2 describes the issues facing local corporate income taxes in Japan; Section 3 presents a modeling of the deductibility of enterprise taxes by formulating a representative effective corporate income tax rate. Section 4 presents the forward-looking effective tax rate model used in this paper. Section 5 sets the parameters and presents the results of the analysis of excess taxation and deductibility of corporate enterprise taxes to the effective tax rates. Section 6 concludes with a summary of the implications of this study.

2. Local corporate income tax concerns in Japan

Japan's local corporate income tax system faces three significant concerns.

First, Japan's local corporate income tax is unique from an international perspective; according to the Organization for Economic Cooperation and Development (OECD, 2022) Revenue Statistics, 29 of the 38 OECD countries have no local corporate income tax revenues. The average local corporate income tax revenues as a percentage of total tax revenues in 2010 were: Canada 14.40%, Switzerland 5.36%, Japan 3.96%, Luxembourg 3.73%, Germany 3.55%, Korea 1.38%, USA 1.23%, Portugal 0.69%, and Italy 0.28%.[1] Among the OECD countries, after Canada and Spain, Japan is the most dependent on local corporate income tax revenues.

Figure 1 shows the changes in the combined corporate income tax rate based on the statutory tax rates; In Japan, this is the Ministry of Finance-type effective tax rate, which is 29.74% in 2022.[2] With progressing globalization, the combined corporate income tax rate has decreased worldwide.

Comparing the average combined corporate income tax rates for the 9 countries with and 29 countries without local corporate income taxes shows that these remain explicitly higher for the

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[1] The sum of "tax revenue" for "State/Regional" and "Local government" is divided by "Total tax revenue.

[2] The combined corporate income tax rate (the Ministry of Finance-type effective tax rate) in Japan is calculated based on the applicable tax rates for corporations with capital above ¥100 million.

former; 2022 showed a difference of five percentage points (27% and 22%). The presence of local corporate income tax may make it challenging to reduce the tax rate. The chart also shows the changes in Japan's combined corporate income tax rate, which is higher than the average rate for countries with local corporate income taxes.

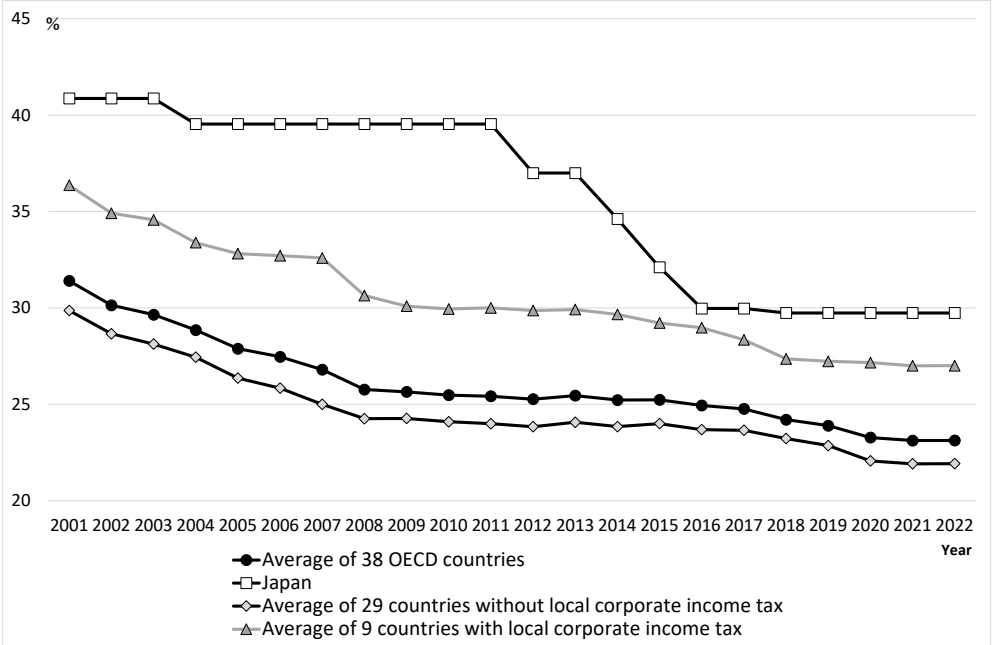

Figure 1 Changes in Combined Corporate Income Tax Rate Based on Statutory Tax Rates

Note: "Revenue Statistics" Combined corporate income tax rate (Organization for Economic Cooperation and Development, 2022).

Second, Japan's local corporate income taxes include an excess taxation system, which complicates the system and raises the cost of tax payments for companies and the effective corporate income tax rate in actuality. Figure 2 shows the distribution of the number of municipalities for applicable tax rates in 2022, including the corporate inhabitant tax rate, excess taxation of corporate enterprise tax, and special corporate enterprise tax. Depending on the combination, tax rates can be divided into several cases. Table 1 presents the number of municipalities in each prefecture for each case.

The number of municipalities applying the standard corporate enterprise tax and special corporate enterprise tax rates of 3.6% and the excess corporate inhabitant tax rate of 10.2% was 777 (43.75% of all municipalities), while those applying the excess corporate inhabitant tax rate of 7.80% was 570 (32.09% of all municipalities). These two cases are combined tax rates adopted by 75% of the municipalities in Japan.

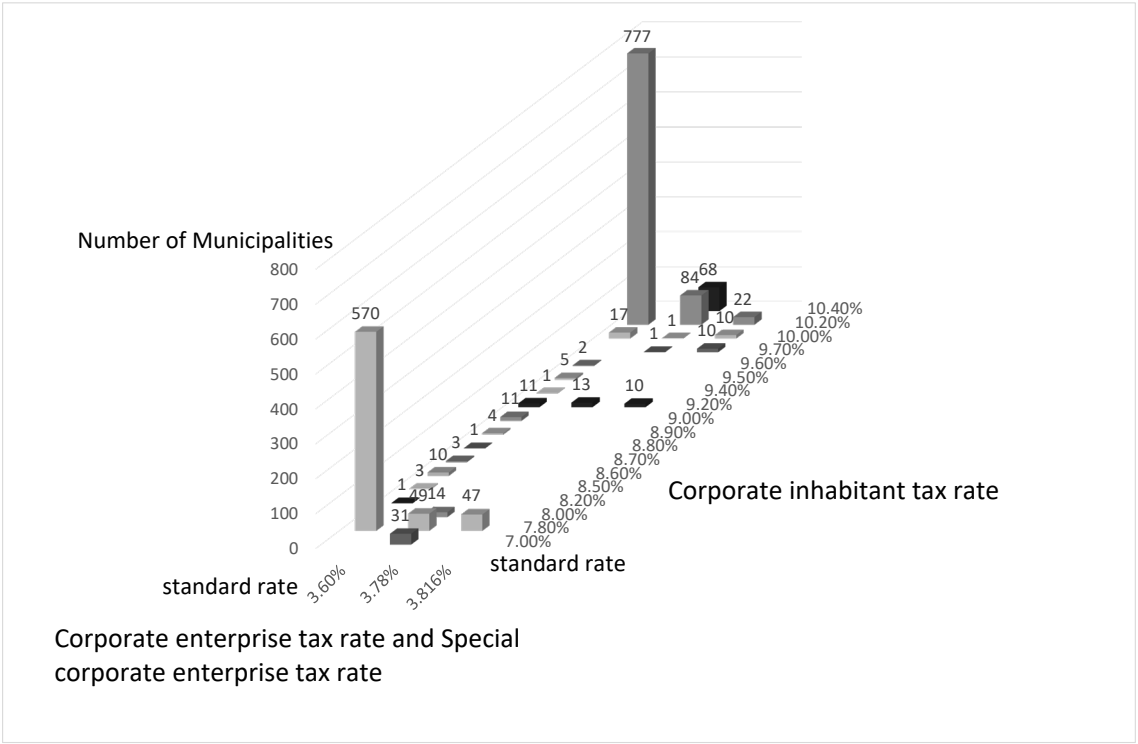

Figure 2 Distribution of the Number of Municipalities with Applicable Local Corporate Income Tax Rates, including Excess Tax

Note: List of Corporate Resident Tax and Enterprise Tax Rates for Fiscal 2022 (Ministry of Internal Affairs and Communications, 2022). When the corporate enterprise tax rate is 1.18%, the total tax rate, along with the 260% special corporate enterprise tax rate, is 3.78% [= 1.18% + 1% * (1+260%)]; when it is 1.216%, the total tax rate is 3.816% [= 1.216% + 1% * (1+260%)].

The number of municipalities applying a combined corporate inhabitant tax rate of 3.78% and a special local corporation tax rate of 10.20% above the corporate inhabitant tax rate was 84 (4.73% of all municipalities), while those applying a rate of 10.40% above the corporate inhabitant tax rate was 68 (3.83% of all municipalities). These cases are relatively prevalent in urban areas.

In Japan, all municipalities apply tax rates that exceed the standard tax rate, resulting in a corporate effective tax rate that exceeds the Ministry of Finance's effective tax rate, typically calculated using the standard tax rate. While this is ideal considering decentralization, it increases the effective corporate tax rate and raises concerns about tax payment costs, owing to the tax system complexity, which requires evaluation for efficiency.

Table 1 Combination of Applicable Tax Rates for Corporate Inhabitant Tax Rate, Corporate Enterprise Tax, and Number of Municipalities

Enterprise tax + special local corporation tax 3.60% (Standard tax rate)	Corporate inhabitant tax rate of 10.20% (777 municipalities; 43.75% of all municipalities)	7.80% tax rate for the corporate inhabitant tax rate (570 municipalities; 32.09% of all municipalities)
	Hokkaido 169, Aomori 15, Iwate 15, Akita 7, Yamagata 23, Fukushima 1, Ibaraki 30, Gunma 25, Saitama 32, Chiba 25, Niigata 27, Toyama 15, Ishikawa 19, Fukui 19, Nagano 24, Gifu 9, Mie 2, Shiga 10, Nara 16, Wakayama 16, Tottori 14, Okayama 27, Hiroshima 16, Yamaguchi 19, Tokushima 10, Kagawa 11, Ehime 12, Kochi 11, Fukuoka 43, Saga 12, Nagasaki 14, Kumamoto 12, Oita 38, Kagoshima 14	Hokkaido 8, Aomori 25, Iwate 17, Akita 18, Yamagata 5, Fukushima 53, Ibaraki 14, Gunma 10, Saitama 23, Chiba 29, Niigata 3, Yamanashi 17, Nagano 45, Gifu 33, Mie 23, Nara 23, Wakayama 33, Tottori 5, Hiroshima 7, Tokushima 10, Kagawa 4, Ehime 8, Kochi 19, Fukuoka 14, Saga 8, Kumamoto 33, Oita 6, Kagoshima 29, Okinawa 41
Enterprise tax + special local corporation tax 3.78%	Corporate inhabitant tax rate of 10.20% (84 municipalities; 4.73% of all municipalities)	Corporate inhabitant tax rate of 10.40% (68 municipalities; 3.83% of all municipalities)
	Miyagi 6, Kanagawa 25, Kyoto 25, Osaka 1, Hyogo 27	Tokyo 31, Osaka 37

Note: List of Corporate Resident Tax and Enterprise Tax Rates for Fiscal 2022 (Ministry of Internal Affairs and Communications, 2022). The Tokyo Special Wards were counted as a single ward.

Third, according to the OECD (2022) "Revenue Statistics," among the 38 OECD countries, only four countries (Japan, Italy, Switzerland, and the United States) allow local corporate income tax deductibility. This study focuses on Germany's local corporate income and business taxes,[3] wherein the business tax was reformed in 2008, with deductibility abolished and the base rate reduced from 5% to 3.5%. Similarly, Japan can consider reforming Japan's corporate enterprise tax, wherein deductibility is prohibited, and the tax base is broadened to lower the tax rate.

Principally, according to Article 72-12 of the Local Tax Act (Tax Base of Corporate Enterprise Tax), deductible expenses must be included in the current fiscal year when the tax is

[3] The business tax is calculated by multiplying operating revenues by a base tax rate and a multiplying factor. The tax base of the operating tax is calculated by adding and subtracting from income, which is the tax base of the corporate income tax and is taxed on corporate income, similar to the income tax rate of the corporate enterprise tax in Japan. For more information on the German business tax system and the 2008 tax reform, see Mitsubishi UFJ Research and Consulting (2019). Multiplier rates vary by local government.

imposed.[4] However, for corporate enterprise taxes, special treatment is permitted under Basic Notice 9-5-2 of the Corporate Tax Act (Special Exception to the Timing of Inclusion in Deductible Expenses for Enterprise Tax and Local Enterprise Special Tax), allowing for the inclusion of deductible expenses in the following fiscal year. This may be because the burden could be revised in conjunction with corporate tax reassessment and determination, a technical situation in tax collection. However, before the 2008 reform, German business tax was deductible in the current year and could be included in the deductible expenses when accrued.[5] Changes in the timing of Japan's corporate enterprise tax deductibility should also be considered.

There is also an economic modeling interest in analyzing deductibility. Previous studies analyzing the effective corporate tax rate have not incorporated the characteristics of Japan's corporate enterprise tax deductibility into their models. This study shows that the deductibility model differs depending on whether the effective corporate tax rate is forward- or backward-looking.

This section highlighted that Japan's local corporate income tax system is unique from an international perspective. The subsequent sections examine the future reform of local corporate income taxes from an economic perspective by analyzing the impacts of the corporate inhabitant tax rate and corporate enterprise tax on the effective corporate tax rate.

3. Formulation of local corporate income tax rates into effective corporate income tax rates

The corporate enterprise tax, a prefectural tax, is levied on businesses conducted by corporations and is divided into four categories, including value-added, capital, income, and revenue.[6] This study focuses on income tax based on a corporation's income in each fiscal year. The standard tax rate for 2022 was 1%.[7]

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[4] Corporate enterprise tax is deductible from business income; however, according to the Basic Corporate Tax Instruction 9-5-1 (Timing of inclusion of taxes in deductible expenses), "National and local taxes payable by a corporation shall be included in the number of deductible expenses for the fiscal year specified below (omitted)."

[5] See Higashira (2005).

[6] The value-added and capitalization rates are levied only on ordinary corporations with capital exceeding ¥100 million.

[7] The tax rates for ordinary corporations with capital of hundred million yen or less, public corporations, and investment corporations are 3.5% for amounts of income of four million yen or less, 5.3% for amounts exceeding four million yen per year but not eight million yen per year, and 7.0% for amounts exceeding eight million yen per year. The tax rates for special corporations, such as agricultural cooperatives and other cooperatives and medical corporations, are 3.5% for amounts of income below four hundred yen per year and 4.9% for amounts exceeding four million yen per year. Electricity and gas supply businesses are taxed at the revenue.

The special corporate enterprise tax is a national tax that was the successor to the special local corporate enterprise tax introduced in the fiscal year 2008 to rectify the uneven distribution of tax revenues among local entities and ensure stable tax revenues, effective from 2019. A share of the corporate enterprise tax revenue is collected by the national government as a special corporate enterprise tax, and this is distributed as a concession tax based on the population and other factors of local organizations. For ordinary corporations with capital exceeding JPY 100 million, the tax base is the standard tax rate for corporate enterprise tax on income, which was 260% in 2022.[8] Considering a standard corporate enterprise tax rate of 1% on income, 2.6% (= 1% × 260%) corresponds to the tax rate on corporate income. Therefore, the combined tax rate of the corporate enterprise tax on income and the special corporate enterprise tax rate was 3.6% (= 1% + 2.6%).

The effective corporate tax rates used in this study can be divided into forward- and backward-looking effective tax rates.[9] The distinction between these effective tax rates is vital when incorporating corporate enterprise tax deductibility into the corporate effective tax rate.[10]

First, we examine how the deductibility of the corporate enterprise tax can be expressed in the backward-looking corporate effective tax rate using the Ministry of Finance-type effective tax rate as a case study. When the national corporate income tax rate is τ_C, the local corporate tax rate is τ_L and the corporate inhabitant tax rate (corporate tax rate) is τ_R. Subsequently, the composite of these three tax rates τ_N is formulated as follows:

$$\tau_N = \tau_C(1 + \tau_L + \tau_R) \quad (1)$$

where goods prices are standardized to 1, one type of capital stock is K, production function is $Q(K)$ and the corporate income tax rate is τ_V. Subsequently, the tax burden of national tax T_N and the tax burden of corporate enterprise tax T_V can be formulated; t is the subscript of time.

$$T_{N,t} = \tau_N\big(Q(K_t) - T_{V,t-1}\big) \quad (2)$$

$$T_{V,t} = \tau_B\big(Q(K_t) - T_{V,t-1}\big) \quad (3)$$

The tax burden on the corporate enterprise tax for the period $t-1$ is deductible. The total tax burden of national and enterprise taxes for the fiscal year t is:

$$T_{N,t} + T_{V,t} = (\tau_N + \tau_V)[Q(K_t) - \tau_V\{Q(K_{t-1}) - \tau_V(Q(K_{t-1}) - \tau_V \cdots)\}] \quad (4).$$

In other words, the deductibility of past enterprise taxes affects the total tax burden. When the pre-tax revenue $Q(K)$ is assumed to be constant,

[8] The tax rate for special corporations is 34.5%, and 37% for ordinary corporations with 100 million yen or less capital, public corporations, and investment corporations.
[9] A survey of the effective tax rates for both is provided in Uemura (2022b, 2022c).
[10] This study does not consider shareholder-level taxation; only firm-level taxation is included in the analysis.

$$T_N + T_B = (\tau_N + \tau_V)Q(K)\left(1 - \tau_V - \tau_V^2 - \tau_V^3 - \tau_V^4 - \tau_V^5 - \cdots\right) = \frac{\tau_N+\tau_V}{1+\tau_V}Q(K) =$$

$$\frac{\tau_C(1+\tau_L+\tau_R)+\tau_V}{1+\tau_V}Q(K) = \tau Q(K) \quad (5)$$

can be expressed as above. The combination of tax rates on the right side is the Ministry of Finance-type effective tax rate τ. This formulation is a backward-looking effective tax rate aggregated previously. The Ministry of Finance-type effective tax rate, which only comprises statutory tax rates, is not affected by corporate tax planning and is suitable for international comparisons; however, the concept of a tax base does not exist.

Second, we consider how the deductibility of corporate enterprise tax can be expressed under a forward-looking corporate effective tax rate by referring to the formulation of Tajika, Hayashi, and Yui (1987).

If one unit of corporate enterprise tax is paid in period 0, $(\tau_N + \tau_V)$ can be saved by deducting the corporate enterprise tax in period 1 and of the deductible $(\tau_N + \tau_V)$ in Period 1. Since τ_V of the Period 1's deduction $(\tau_N + \tau_V)$ is the amount of the corporate enterprise tax savings, the corporate enterprise tax deduction in the Period 2 is reduced by τ_V and the tax burden increases by $\tau_V(\tau_N + \tau_V)$. Of the increase in tax burden $\tau_V(\tau_N + \tau_V)$ in Period 2, τ_V^2 is the increase in corporate enterprise tax; hence, in Period 3, $\tau_V^2(\tau_N + \tau_V)$ is the amount of corporate enterprise tax saved. Considering this, the corporate enterprise tax burden for one unit in period 0 produces the following stream of future tax burdens, wherein ρ is the discount rate and the right side is the sum of infinite geometric series.

$$(\tau_N + \tau_V) - \frac{\tau_V(\tau_N+\tau_V)}{1+\rho} + \frac{\tau_V^2(\tau_N+\tau_V)}{(1+\rho)^2} - \frac{\tau_V^2(\tau_N+\tau_V)}{(1+\rho)^3} + \cdots = \frac{\tau_N+\tau_V}{1+\rho+\tau_V} \quad (6)$$

The above formulation is observed in Tajika, Hayashi, and Yui (1987) and numerous other studies dealing with the effective corporate enterprise tax rate; for example, Totani, Iwamoto, and Nakai (1989), Uemura and Maekawa (1999, 2000), Uemura (2001, 2004, 2022a), Hayashida and Uemura (2010), and Baba, Kobayashi, and Sato (2021). A distinct characteristic of the forward-looking effective tax rate is that it aggregates the permanent effects of deductibility of enterprise taxes over the future.

However, this formulation does not elucidate that the capital stock from one unit of investment increases the company's future earnings, the capital stock decreases in economic value due to capital depreciation, or the depreciation system has a tax-saving effect. This study examines the impact of tax deductibility on the effective corporate income tax rate by incorporating enterprise tax deductibility into a forward-looking effective tax rate model that considers the depreciation system.

Notably, the forward-looking effective tax rate of Devereux and Griffith (2003) cannot be used to model enterprise tax deductibility because it assumes a one-period perturbation, wherein

capital stock is increased by one unit of investment in Period 0 and subsequently, sold in Period 1. This model does not express the permanent effect of enterprise tax deductibility.

Therefore, this study uses the model presented by Klemm (2008, 2012), wherein a firm holds capital stock from one unit of investment in Period 0 until its economic value reduces to zero through capital depreciation.[11] Klemm's (2008, 2012) model allows us to consider the future impact of the inclusion of corporate enterprise tax deductions on the effective tax rate.

4. Forward-looking effective tax rate model by Klemm (2008, 2012)

We present a forward-looking effective tax rate model based on the work of Klemm (2008, 2012). When production function with one type of capital stock is $Q(K)$, the marginal productivity equals the sum of the pre-tax rate of return p and the economic capital depreciation rate δ.

$$dQ(K) = p + \delta \quad (7)$$

The capital stock accumulation equation is as follows:

$$\Delta K = I + \delta K \quad (8),$$

where Investment is I. As in Klemm (2008, 2012), assuming that capital stock is not sold but held until depleted, the average effective tax rate $EATR$ is as follows; r is the rate of return demanded by the shareholders.

$$EATR = \frac{R^* - R}{p/(r+\delta)} \quad (9)$$

Where R is the economic rent in the presence of taxation, which is formulated later; R^* is the economic rent in the absence of taxation and is as follows.[12]

$$R^* = \frac{p-r}{r+\delta} \quad (10)$$

In contrast, the marginal effective tax rate $EMTR$ is based on King and Fullerton's (1984) study and uses the cost of capital, $\tilde{p}$. The marginal effective tax rate is:

$$EMTR = \frac{\tilde{p}-r}{\tilde{p}} \quad (11).$$

The forward-looking effective tax rate is calculated using the current system whereby corporate enterprise tax is deductible in the following year, as the base case. Table 2 lists the concepts used for the base case.

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[11] Klemm (2008, 2012) extended the Devereux and Griffith (2003) model to allow the analysis of tax holidays wherein the effects of tax exemption persist. Suzuki (2014a, 2014b) analyzed tax holidays in Asian countries.

[12] In the one-period perturbation model by Devereux and Griffith (2003), it is expressed as $R^* = \frac{p-r}{1+r}$

If one unit of investment is made at the beginning of Period 0 using retained earnings as the source of funds $(I_0 = dK_0 = 1)$, corporate income will increase $(p + \delta)$ and the tax burden will increase $(\tau_N + \tau_B)\{(p + \delta) - \varphi\}$. Here, the depreciation system for depreciable assets is assumed to be the declining balance method and the statutory depreciation rate φ. In Period 1, if economic capital depreciation and inflation rate π are considered, there will be an increase in corporate income $(p + \delta)(1 - \delta)(1 + \pi)$ and an increase in tax burden $(\tau_N + \tau_B)\{(p + \delta)(1 - \delta)(1 + \pi) - \varphi(1 - \varphi)\}$, considering the deductibility of corporate enterprise taxes one period earlier.

When the above changes are aggregated to find the discounted present value to infinity, the economic rent for retained earnings R^{RE} is as shown in Table 2. According to the "total" in the bottom row of Table 2, the economic rent R^{RE} can be obtained.

$$R^{RE} = -1 + \frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)} - (\tau_N + \tau_V)\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)} + (\tau_N + \tau_V)A + (\tau_N + \tau_V)\tau_V \frac{(p+\delta)}{(\rho+\delta-\pi)} -$$

$$(\tau_N + \tau_V)\tau_V \frac{A}{1+\rho} = \left(1 - \tau_N - \tau_V + \frac{\tau_N\tau_V + \tau_V^2}{1+\rho}\right)\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)} - 1 + (\tau_N + \tau_V)\left(1 - \frac{\tau_V}{1+\rho}\right)A \quad (12)$$

The first term on the right side is the discounted present value of after-tax income from Period 0 to infinity for national and corporate enterprise taxes. The second term is the investment of one unit in period 0, and the third term is the discounted present value of tax savings from depreciation.

The discounted present value of depreciation A depends on the depreciation method. In Table 2, the pure declining balance method (DB) is assumed to be the depreciation method. In this case, the discounted present value A is as follows:

$$A = A_{DB} = \varphi\left\{1 + \left(\frac{1-\varphi}{1+\rho}\right) + \left(\frac{1-\varphi}{1+\rho}\right)^2 + \cdots\right\} = \frac{\varphi(1+\rho)}{\rho+\varphi} \quad (13).$$

Regarding Japanese corporate income tax, the straight-line method (SL: Straight-Line method) is applied to buildings and intangible assets, while the declining-balance method with a switch to the straight-line (DBSL) method is applied to machinery. The formulations of each method are as follows:

$$A = A_{SL} = \varphi\left\{1 + \left(\frac{1}{1+\rho}\right) + \left(\frac{1}{1+\rho}\right)^2 + \cdots + \left(\frac{1}{1+\rho}\right)^{L-1}\right\} = \frac{\varphi(1+\rho)}{\rho}\left\{1 - \left(\frac{1}{1+\rho}\right)^{1/\varphi}\right\} \quad (14)$$

$$A = A_{DBSL} = \frac{\varepsilon}{1+\rho}\left\{1 + \left(\frac{1-\varepsilon}{1+\rho}\right) + \left(\frac{1-\varepsilon}{1+\rho}\right)^2 + \cdots + \left(\frac{1-\varepsilon}{1+\rho}\right)^{L^*-1}\right\} + \frac{(1-\varepsilon)^{L^*}}{L-L^*}\left\{\left(\frac{1}{1+\rho}\right)^{L^*+1} + \cdots + \left(\frac{1}{1+\rho}\right)^{L}\right\} \quad (15)$$

Table 2 Base Case: Current System (Deductible expenses are included in the following fiscal year)

Period	Investment	Corporate income	National and corporate enterprise taxes (excluding the deductible portion of corporate enterprise tax)	Deductible portion of corporate enterprise tax
0	-1	$+(p+\delta)$	$-(\tau_N+\tau_V)\{(p+\delta)-\varphi\}$	0 (The current year's corporate income tax burden is not deductible)
1	0	$+\frac{(p+\delta)(1-\delta)(1+\pi)}{1+\rho}$	$-(\tau_N+\tau_V)\frac{(p+\delta)(1-\delta)(1+\pi)-\varphi(1-\varphi)}{1+\rho}$	$+(\tau_N+\tau_V)\tau_V\frac{\{(p+\delta)-\varphi\}}{1+\rho}$
2	0	$+\frac{(p+\delta)(1-\delta)^2(1+\pi)^2}{(1+\rho)^2}$	$-(\tau_N+\tau_V)\frac{(p+\delta)(1-\delta)^2(1+\pi)^2-\varphi(1-\varphi)^2}{(1+\rho)^2}$	$+(\tau_N+\tau_V)\tau_V\frac{(p+\delta)(1-\delta)(1+\pi)-\varphi(1-\varphi)}{(1+\rho)^2}$
3	0	$+\frac{(p+\delta)(1-\delta)^3(1+\pi)^3}{(1+\rho)^3}$	$-(\tau_N+\tau_V)\frac{(p+\delta)(1-\delta)^3(1+\pi)^3-\varphi(1-\varphi)^2}{(1+\rho)^3}$	$+(\tau_N+\tau_V)\tau_V\frac{(p+\delta)(1-\delta)(1+\pi)-\varphi(1-\varphi)}{(1+\rho)^3}$
⋮	⋮	⋮	⋮	⋮
Total	-1	$+\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)}$	$-(\tau_N+\tau_V)\left\{\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)}+\frac{\varphi(1+\rho)}{(\rho+\varphi)}\right\}$ $=-(\tau_N+\tau_V)\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)}+(\tau_N+\tau_V)A_{DB}$	$+(\tau_N+\tau_V)\tau_V\frac{(p+\delta)}{(\rho+\delta-\pi)}-(\tau_N+\tau_V)\tau_V\frac{\varphi}{\rho+\varphi}$ $=+(\tau_N+\tau_V)\tau_V\frac{(p+\delta)}{(\rho+\delta-\pi)}$ $-(\tau_N+\tau_V)\tau_V\frac{A_{DB}}{1+\rho}$

Note: The depreciation system is shown for the pure declining balance method.

Here, the legally helpful life is L, the parameter that accelerates depreciation is ε, the period over which the declining-balance method is applied L^* $(0 \leq L^* \leq L)$, and the statutory depreciation rate for the period of the declining-balance method is $\varphi = 1/L^*$. The DBSL is a depreciation method that initially uses the declining-balance method; however, it switches to the straight-line method midway through the depreciation period, known as the "200% declining-balance method" in Japan. When the additional parameter a, which accelerates depreciation, is set to $\varepsilon = a\varphi$, it becomes $a = 2$ in the "200% declining balance method."

We assume three types of investment financing: retained earnings, new stock issuances, and debt. The economic rent R considering these financing costs, is as follows:

$$R = R^{RE} + F \tag{16}$$

where the financing cost of retained earnings F^{RE}, is the cost of raising new shares F^{NE} and is the debt financing cost F^{DE}.

$$F = F^{RE} = F^{NE} = 0 \tag{17}$$

$$F = F^{DE} = \frac{\rho - i(1-\tau_N-\tau_V)}{1+\rho} \tag{18}$$

As this study does not consider taxation at the shareholder level, the financing costs of retained earnings and new share issuances are zero.[13] The cost of debt financing, F^{DE} considers the deductibility of interest.

The rate of return p when the economic rent R is zero is the cost of capital (user cost of capital) $\tilde{p}$ of financing and assets.

$$\tilde{p} = \frac{(\rho+\delta-\pi)\left\{1-(\tau_N+\tau_V)\left(1-\frac{\tau_V}{1+\rho}\right)A\right\}}{\left(1-\tau_N-\tau_V+\frac{\tau_N\tau_V+\tau_V^2}{1+\rho}\right)(1+\rho)} - \delta - \frac{(\rho+\delta-\pi)}{\left(1-\tau_N-\tau_V+\frac{\tau_N\tau_V+\tau_V^2}{1+\rho}\right)(1+\rho)}F \tag{19}$$

Economic rents R above and the cost of capital $\tilde{p}$ are obtained, and the average effective tax rate $EATR$ in Equation (9) and the marginal effective tax rate $EMTR$ in Equation (11) can be obtained.

Spengel et al. (2020) consider industrial buildings ($k = 1$), intangible assets ($k = 2$), machinery ($k = 3$), financial assets ($k = 4$), inventories ($k = 5$), retained earnings ($f = 1$), new share issuance ($f = 2$), and debt ($f = 3$), which are followed in this study. Here, the subscripts k for assets, the subscript f of financing, the asset share α_k, and the funding share β_f of a representative firm. The sum of the asset and financing shares is 1.

$$\sum \alpha_k = \sum \beta_f = 1 \tag{20}$$

From the above, the composite cost of capital $\tilde{\tilde{p}}$, composite average effective tax rate $\overline{EATR}$ and composite marginal effective tax rate $\overline{EMTR}$ can be formulated as follows:

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[13]See Devereux and Griffith (2003), Spengel et al. (2020), and Uemura (2023).

$$\bar{\tilde{p}} = \sum \alpha_k \beta_f \, \widetilde{p_{k,f}} \tag{21}$$

$$\overline{EATR} = \sum \alpha_k \beta_f \, EATR_{k,f} \tag{22}$$

$$\overline{EMTR} = \frac{\bar{\tilde{p}} - r}{\bar{\tilde{p}}} \tag{24}$$

Until now, the base case is modeled assuming the current system, under which the inclusion of corporate enterprise tax-deductible expenses is implemented in the next period. For comparison with the base case, we assume Case 1, wherein corporate enterprise tax-deductible expenses are not included, and Case 2, wherein corporate enterprise tax-deductible expenses are included in the current period. Table 3 shows the deductible portion of the corporate enterprise tax for Cases 1 and 2. Here, Case 1 does not implement the deductible portion of enterprise tax; therefore, the deductible portion for each period is zero.

Table 4 summarizes the economic rent for each case R and the cost of capital $\tilde{p}$ summarizes the results. Each case shows differences in the combination of statutory tax rates. Effective corporate tax rates can be calculated by assigning various parameters to these models.

Table 3 Case 1 and Case 2

	Case 1: Abolishment of deductible expenses	Case 2: Deductible in the current period
Period	Deductible portion of corporate enterprise tax	Deductible portion of corporate enterprise tax
0	0	$+(\tau_N+\tau_V)\tau_V\{(p+\delta)-\varphi\}$
1	0	$+(\tau_N+\tau_V)\tau_V\dfrac{(p+\delta)(1-\delta)(1+\pi)-\varphi(1-\varphi)}{1+\rho}$
2	0	$+(\tau_N+\tau_V)\tau_V\dfrac{(p+\delta)(1-\delta)^2(1+\pi)^2-\varphi(1-\varphi)^2}{(1+\rho)^2}$
3	0	$+(\tau_N+\tau_V)\tau_V\dfrac{(p+\delta)(1-\delta)^3(1+\pi)^3-\varphi(1-\varphi)^2}{(1+\rho)^3}$
⋮	⋮	⋮
Total	0	$+(\tau_N+\tau_V)\tau_V\dfrac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)}-(\tau_N+\tau_V)\tau_V\dfrac{\varphi(1+\rho)}{\rho+\varphi}$ $=+(\tau_N+\tau_V)\tau_V\dfrac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)}-(\tau_N+\tau_V)\tau_V A_{DB}$

Note: The depreciation system is shown for the pure declining balance method.

Table 4 Economic Rents R and Cost of Capital $\tilde{p}$ for each case

	Economic Rent R	Cost of Capital $\tilde{p}$
Base case: Current system (Deductible expenses are included in the following fiscal year)	$R = \left(1 - \tau_N - \tau_V + \frac{\tau_N\tau_V + \tau_V^2}{1+\rho}\right)\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)} - 1 + (\tau_N + \tau_V)\left(1 - \frac{\tau_V}{1+\rho}\right)A + F$	$\tilde{p} = \frac{(\rho+\delta-\pi)\left\{1-(\tau_N+\tau_V)\left(1-\frac{\tau_V}{1+\rho}\right)A\right\}}{\left(1-\tau_N-\tau_V+\frac{\tau_N\tau_V+\tau_V^2}{1+\rho}\right)(1+\rho)} - \delta - \frac{(\rho+\delta-\pi)}{\left(1-\tau_N-\tau_V+\frac{\tau_N\tau_V+\tau_V^2}{1+\rho}\right)(1+\rho)}F$
Case 1: Abolishment of deductible expenses	$R = (1-\tau_N-\tau_V)\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)} - 1 + (\tau_N+\tau_V)A + F$	$\tilde{p} = \frac{(\rho+\delta-\pi)\{1-(\tau_N+\tau_V)A\}}{(1-\tau_N-\tau_V)(1+\rho)} - \delta - \frac{(\rho+\delta-\pi)}{(1-\tau_N-\tau_V)(1+\rho)}F$
Case 2: Deductible in the current period	$R = (1-\tau_N-\tau_V+\tau_N\tau_V+\tau_V^2)\frac{(p+\delta)(1+\rho)}{(\rho+\delta-\pi)} - 1 + (\tau_N+\tau_V)(1-\tau_V)A + F$	$\tilde{p} = \frac{(\rho+\delta-\pi)\{1-(\tau_N+\tau_V)(1-\tau_V)A\}}{(1-\tau_N-\tau_V+\tau_N\tau_V+\tau_V^2)(1+\rho)} - \delta - \frac{(\rho+\delta-\pi)}{(1-\tau_N-\tau_V-\tau_N\tau_V-\tau_V^2)(1+\rho)}F$

5. Parameter settings

This study set the parameters based on the Japanese case of international comparative study of Spengel et al. (2020); however, they were modified to fit the Japanese tax system. [14] The parameter sets used are listed in Table 5. Economic depreciation rate δ, real interest rate r, inflation rate π, pre-tax rate of return p, statutory useful life (38 years for industrial buildings, 8 years for intangible assts, and 10 years for machinery), statutory useful life, asset share parameters, and financing share parameters are similar to Spengel et al.'s (2020).

Table 5 Parameter Settings (Base Case)

Economic capital depreciation rate		
Industrial buildings ($k = 1$)	δ_1	3.1%
Intangibles ($k = 2$)	δ_2	15.35%
Machinery ($k = 3$)	δ_3	17.5%
Real rate of interest	r	5%
Inflation rate	π	2%
Pre-tax rate of return	p	20%.
Statutory corporate income tax rate		
National corporate tax rate (large companies)	τ_C	23.2%
Local corporate tax rate	τ_L	10.3%
Corporate inhabitant tax rate (corporate tax rate)	τ_R	7.0% (=prefectural tax rate 1.0% + municipal tax rate 6.0%)
Corporate enterprise tax rate (on income)	τ_V	1.0%
Special corporate enterprise tax		260% (standard tax rate 1% * 260% = 2.6%)
Ministry of Finance-type effective tax rate	τ	29.74%
Statutory depreciation rate		
Industrial buildings ($k = 1$)	φ_1	2.7% ($L = 38$) SL
Intangibles ($k = 2$)	φ_2	12.5% ($L = 8$) SL
Machinery ($k = 3$)	φ_3	20% ($L = 10$) DBSL ($a = 2,\ L^* = 5$)
Asset Share Parameters		
Industrial buildings ($k = 1$)	α_1	20%.
Intangible assets ($k = 2$)	α_2	20%.
Machinery ($k = 3$)	α_3	20%.
Financial assets ($k = 4$)	α_4	20%.
Inventory ($k = 5$)	α_5	20%.
Financing Share Parameters		
Retained earnings ($f = 1$)	β_1	55%.
New shares ($f = 2$)	β_2	10%
Debt ($f = 3$)	β_3	35%.

Note: DBSL, declining-balance method with a switch to the straight-line method

The depreciation and tax rate parameters are set to fit the Japanese system. Under the Japanese depreciation system, buildings and intangible assets depreciate using the straight-line method, and machinery depreciates using the 200% declining balance method, DBSL; hence, the

[14] The Japanese case of Spengel et al. (2020) was reproduced to confirm the movement of the model for this study.

additional parameter to accelerate depreciation a = 2. Following the "Ministerial Ordinance Concerning the Useful Life of Depreciable Assets," the period in which the declining-balance method is applied to machinery L^* is set to five years.

Statutory corporate income tax rates are based on the Japanese corporate income tax rate for the year 2022. The national corporate income tax rate τ_C is 23.2%, assuming large corporations, the local corporate tax rate τ_L is 10.3%, and the corporate inhabitant tax rate (corporate tax rate) τ_R. The corporate enterprise tax rate, was 7.0%. The corporate enterprise tax rate, which is the subject to this analysis, is the sum of the standard corporate enterprise tax rate of 1% on income and a special corporate enterprise tax rate of 260%. The special corporate enterprise tax rate is the standard corporate enterprise tax rate of 1% × 260% = 2.6%, which is the total statutory corporate enterprise tax rate τ_V, is set at 3.6%. The resulting Ministry of Finance-type effective tax rate τ is 29.74%.

6. Simulation analysis of excess taxation and deductibility

Table 6 presents the simulation case classifications. The cases were classified according to whether the standard or excess tax rate was applied or whether the corporate enterprise tax was deductible in the next period, the current period, or abolished.

The left side of Table 7 shows the cost of capital by financing and by assets, effective marginal tax rate (EMTR), and effective average tax rates (EATR) for the base case when the parameters in the previous section are included in the model. The base case is the standard tax rate and assumes that corporate enterprise tax is deductible in the following year. In this case, the composite cost of capital was 6.085%, composite EMTR was 17.830%, and composite EATR was 23.292%. Because the model in this study focuses on the effective corporate tax rate at the firm level rather than at the shareholder level, the cost of capital and the effective tax rate for retained earnings and new share issuances remains the same, while the cost of capital and the effective tax rate for debt is lower because of the deductibility of interest expenses. The difference in effective tax rates for different assets is due to differences in depreciation systems.

The first analysis considers the excessive taxation of corporate inhabitant and enterprise taxes. Case A(i) sets the statutory tax rate of the corporate inhabitant tax rate as $\tau_R = 10.2\%$ and the total statutory tax rate of corporate enterprise tax and special corporate enterprise tax as $\tau_V = 3.6\%$. Case B(i) sets the statutory corporate inhabitant tax rate as $\tau_R = 10.4\%$ and the total statutory tax rate of corporate enterprise tax and special corporate enterprise tax as $\tau_V = 3.78\%$. According to Figure 2 and Table 1, Case A(i) was the most prevalent, applied to 777 municipalities, while Case B(i) was the case for large cities, applied to 68 municipalities in Tokyo and Osaka.

Table 6 Simulation Case Classification

	Standard rate or Excess taxation	Corporate enterprise tax deductible	Analysis Assumptions
Base Case	standard rate	Deductible in the following fiscal year (current system)	-
Case A(i)	Excess taxation: 10.2% corporate tax rate + 3.6% corporate enterprise tax and special corporate enterprise tax	Deductible in the following fiscal year (current system)	-
Case B(i)	Excess taxation: 10.4% corporate tax rate + 3.78% corporate enterprise tax and special corporate enterprise tax	Deductible in the following fiscal year (current system)	-
Case A(ii)	Excess taxation: 10.2% corporate tax rate + 3.6% corporate enterprise tax and special corporate enterprise tax	Deductible in the following fiscal year (current system)	Same as EMTR in Case A(i) Real interest rate is endogenous
Case B(ii)	Excess taxation: 10.4% corporate tax rate + 3.78% corporate enterprise tax and special corporate enterprise tax	Deductible in the following fiscal year (current system)	Same as EMTR in Case A(ii) Real interest rate is endogenous
Case 1(i)	Standard rate	Abolishment of deductible expenses (Reform)	-
Case 2(i)	Standard rate	Deductible in the current period (Reform)	-
Case 1(ii)	Standard rate	Abolishment of deductible expenses (Reform)	Same as EATR in Case 1(i) Tax rate is endogenous
Case 2(ii)	Standard rate	Deductible in the current period (Reform)	Same as EATR in Case 2(i) Tax rate is endogenous

Both cases A(i) and B(i) would increase taxes. The Ministry of Finance-type effective tax rates τ is obtained as 30.46% and 30.62% for the former and latter, respectively. Thus, considering the excess taxation of local corporate income, the effective corporate income tax rate based on the Japanese statutory tax rate exceeded 30%. Excess taxation increases the cost of capital, EMTR and EATR, thereby discouraging corporate capital investment.

To examine the impact of these cases on how they discourage firms from investing in plants and equipment, the real interest rates in Cases A(2) and B(2), without any excess taxation, are such that the same composite EMTR as in Cases A(1) and B(1) is achieved; r is obtained. This analysis allows us to measure the impact of excess taxation on EMTR considering the real interest rate. Table 7 shows that the actual interest rate is similar for Case A(ii) [$r = 4.041\%$] and Case B(ii) [$r = 3.837\%$]. Considering the difference between the actual interest rate in the base case $r = 5\%$ and the difference between the two, excess taxation in Case A(ii) would have an impact of 0.959%, while the excess taxation in Case B(ii) of 1.163%.

The second analysis concerns the deductibility of corporate enterprise taxes. The upper section of Table 8 shows the simulation results when the total statutory corporate enterprise tax rate τ_V are equal in the simulation results. Case 1(i) is the result of abolishing deductibility, similar to the German business tax reform. Compared to the base case, the costs of capital, EMTR, and EATR would increase. This is because abolishing deductibility broadens the tax base.

Case 2(i) is the result when the deductible period is the current year, similar to the German operating tax before the 2008 reform. Compared with base case 1, the costs of capital, EMTR, and EATR are lower. The change in the timing of deductibility affects the discounted present value of the deductible portion of corporate enterprise taxes. The impact would reduce the economic rent R and the cost of capital $\tilde{p}$. Therefore, it is challenging to examine the qualitative impact of changing the timing of deductibility in the subsequent period; however, the simulation in Table 8 confirms the effect on the cost of capital and the effective tax rate.

The top section of Table 8 shows the total statutory corporate enterprise tax rate τ_V are equal in the base case, while the lower section shows the simulation analysis results that adjusts the total statutory tax rate to equal the composite EATR for the base case.

In Case 1(2), the composite EATR is held constant, the inclusion of gains and losses is abolished, and the total statutory tax rate is calculated as 2.6%. Compared to the base case, a total statutory tax rate of 3.6% has a negative impact of 1%. The composite cost of capital and composite EMTR increased; however, the movements varied with financing. For retained earnings and new share issuance, a reduced tax rate decreases the composite cost of capital and EMTR. However, for debt financing, the impact of the abolishment of deductibility is more significant than reducing the tax rate; in contrast, the composite cost of capital and composite EMTR increases.

In Case 2(2), the composite EATR is held constant, the timing of deductibility changes to the current period, and the total statutory tax rate is 3.7%. Compared to the base case's total statutory tax rate of 3.6%, the impact is -0.1 percentage points, less impactful than abolishing deductibility in Case 1(ii). Contrary to Case 1(ii), the composite cost of capital and the composite EMTR increased; however, these also varied by financing. For retained earnings and new share issuances, the composite cost of capital and composite EMTR increase, contrasting to debt. As shown in the base case and Case 2 in Table 4, the change in the timing of deductibility is determined by whether the discount rate enters the numerator and denominator of the capital cost.

Table 7 Simulation Results on Excess Taxation

	Base case (%)			Case A(i) (%)			Case B(i) (%)		
	Current: $\tau_R = 7.0\%,\ \tau_V = 3.6\,\%$ $\tau = 29.74\,\%,\ r$ =5%			$\tau_R = 10.2\%(\uparrow),\ \tau_V = 3.6\,\%$ $\tau = 30.46\,\%(\uparrow),\ r$ =5%			$\tau_R = 10.4\%(\uparrow),\ \tau_V = 3.78\ \%(\uparrow)$ $\tau = 30.62\,\%(\uparrow),\ r$ =5%		
	Cost of capital	*EMTR*	*EATR*	Cost of capital	*EMTR*	*EATR*	Cost of capital	*EMTR*	*EATR*
Retained Earnings	6.202	19.378	23.728	6.268(↑)	20.233	24.496	6.284(↑)	20.430	24.673
New equity	6.202	19.378	23.728	6.268(↑)	20.233	24.496	6.284(↑)	20.430	24.673
Debt	5.868	14.792	22.483	5.923(↑)	15.581	23.221	5.935(↑)	16.755	23.389
Industrial buildings	6.582	24.031	25.157	6.652(↑)	24.832	25.924	6.668(↑)	25.015	26.101
Intangibles	5.627	11.136	21.214	5.692(↑)	12.154	22.006	5.707(↑)	12.383	22.187
Machinery	4.751	-5.234	17.913	4.791(↑)	-4.359	18.644	4.800(↑)	-4.165	18.811
Financial assets	6.733	25.736	26.088	6.801(↑)	26.482	26.837	6.817(↑)	26.653	27.009
Inventories	6.733	25.736	26.088	6.801(↑)	26.482	26.837	6.817(↑)	26.653	27.009
Composite	6.085	17.830	23.292	6.147(↑)	18.664	24.049	6.162(↑)	18.854	24.223
	Base case (%) (reprint)			Case A(ii) (%)			Case B(ii) (%)		
	Current: $\tau_R = 7.0\%,\ \tau_V = 3.6\,\%$ $\tau = 29.74\,\%,\ r$ =5%			$\tau_R = 7.0\%,\ \tau_V = 3.6\,\%$ $\tau = 29.74\,\%(\downarrow),\ r$ =4.041% (↓)			$\tau_R = 7.0\%,\ \tau_V = 3.6\,\%$ $\tau = 29.74\,\%(\downarrow),\ r$ =3.475% (↓)		
	Cost of capital	*EMTR*	*EATR*	Cost of capital	*EMTR*	*EATR*	Cost of capital	*EMTR*	*EATR*
Retained Earnings	6.202	19.378	23.728	5.063(↓)	20.181(↓)	24.766	4.819(↓)	20.368(↓)	24.988
New equity	6.202	19.378	23.728	5.063(↓)	20.181(↓)	26.564	4.819(↓)	20.368(↓)	24.988
Debt	5.868	14.792	22.483	4.793(↓)	15.688(↑)	23.768	4.562(↓)	15.885(↑)	24.040
Industrial buildings	6.582	24.031	25.157	5.390(↓)	25.031(↑)	25.960	5.135(↓)	25.276(↑)	26.131
Intangibles	5.627	11.136	21.214	4.606(↓)	12.254(↑)	22.664	4.387(↓)	12.530(↑)	22.975
Machinery	4.751	-5.234	17.913	3.854(↓)	-4.850(↓)	19.851	3.662(↓)	-4.785(↓)	20.265
Financial assets	6.733	25.736	26.088	5.496(↓)	26.473(↓)	26.804	5.230(↓)	26.629(↓)	26.956
Inventories	6.733	25.736	26.088	5.496(↓)	26.473(↓)	26.804	5.230(↓)	26.629(↓)	26.956
Composite	6.085	17.830	23.292	4.968(↓)	18.664(→)	24.417	4.729(↓)	18.854(→)	24.656

Note: The arrows for Cases A(i) and B (i) are comparisons with the base Case A arrows for Cases A(ii) and B(ii) are comparisons with Cases A(i) and B(i); EMTR: effective marginal tax rate; EATR: effective average tax rates.

Table 8 Simulation Results on Deductibility of Corporate Enterprise Tax

	Base case (%)			Case 1(i) (%)			Case 2(i) (%)		
	Current: Deductible period is the following fiscal year $\tau_V = 3.6\,\%$			Abolishment of deductible expenses $\tau_V = 3.6\,\%$			Deductible period is the current period. $\tau_V = 3.6\,\%$		
	Cost of capital	$EMTR$	$EATR$	Cost of capital	$EMTR$	$EATR$	Cost of capital	$EMTR$	$EATR$
Retained Earnings	6.202	19.378	23.728	6.298(↑)	20.612	24.836	6.195(↓)	19.291	23.649
New equity	6.202	19.378	23.728	6.298(↑)	20.612	24.836	6.195(↓)	19.291	23.649
Debt	5.868	14.792	22.483	5.959(↑)	16.098	23.591	5.862(↓)	14.699	22.404
Industrial buildings	6.582	24.031	25.157	6.686(↑)	25.219	26.275	6.574(↓)	23.946	25.077
Intangibles	5.627	11.136	21.214	5.728(↑)	12.710	22.382	5.619(↓)	11.023	21.132
Machinery	4.751	-5.234	17.913	4.817(↑)	-3.805	18.996	4.747(↓)	-5.335	17.836
Financial assets	6.733	25.736	26.088	6.834(↑)	26.831	27.176	6.726(↓)	25.658	26.011
Inventories	6.733	25.736	26.088	6.834(↑)	26.831	27.176	6.726(↓)	25.658	26.011
Composite	6.085	17.830	23.292	6.180(↑)	19.088	24.401	6.078(↓)	17.741	23.213
	Base case (%) (reprint)			Case 1(ii) (%)			Case 2(ii) (%)		
	Current: Deductible period is the following fiscal year $\tau_V = 3.6\,\%$			Abolishment of deductible expenses $\tau_V = 2.6\,\%(\downarrow)$			Deductible period is the current period. $\tau_V = 3.7\,\%(\uparrow)$		
	Cost of capital	$EMTR$	$EATR$	Cost of capital	$EMTR$	$EATR$	Cost of capital	$EMTR$	$EATR$
Retained Earnings	6.202	19.378	23.728	6.201(↓)	19.362	23.713	6.202(↑)	19.380	23.729
New equity	6.202	19.378	23.728	6.201(↓)	19.362	23.713	6.202(↑)	19.380	23.729
Debt	5.868	14.792	22.483	5.878(↑)	14.939	22.510	5.867(↓)	14.776	22.480
Industrial buildings	6.582	24.031	25.157	6.583(↑)	24.045	25.152	6.581(↓)	24.029	25.157
Intangibles	5.627	11.136	21.214	5.632(↑)	11.219	21.224	5.626(↓)	11.126	21.213
Machinery	4.751	-5.234	17.913	4.758(↑)	-5.091	17.926	4.751(↓)	-5.249	17.911
Financial assets	6.733	25.736	26.088	6.733(↑)	25.739	26.080	6.733(↓)	25.735	26.089
Inventories	6.733	25.736	26.088	6.733(↑)	25.739	26.080	6.733(↓)	25.735	26.089
Composite	6.085	17.830	23.292	6.088(↑)	17.867	23.292	6.085(↓)	17.826	23.292

Note: The arrows indicate comparison with the base case; EMTR: effective marginal tax rate; EATR: effective average tax rates.

We evaluate the simulation results in Table 8 for funding neutrality, highlighting that the cost of capital and the EMTR should be equal for any financing. Considering this perspective, Case 1(ii) shows a decrease in the cost of capital and EMTR for retained earnings and the new share issuance and an increase for debt financing, resulting in a more minor difference. Considering this, Case 1(i) may be a reform that improves financing neutrality. In contrast, in Case 2(ii), the cost of capital and EMTR for retained earnings and new share issuances increase, while these decrease for debt financing, widening their gap. Therefore, Case 1(2) may be considered a reform that impedes financing neutrality.

7. Conclusion

This study examines Japan's local corporate income tax, which is considered unique from an international perspective. Japan relies heavily on local corporate income tax revenues; however, few countries have local corporate income taxes. Although corporate income tax rates have been reduced worldwide, countries with local corporate income taxes have maintained higher effective corporate income tax rates based on statutory tax rates than those without and may have less flexibility in corporate income tax reform. Japan's effective corporate tax rate, based on statutory tax rates, is higher than the average of countries with corporate income taxes. Furthermore, Japan's local corporate income tax system, which allows for excess taxation and the deductibility of losses, is unique from an international perspective. Reforms may be crucial for countries such as Japan, where local corporate income tax revenues account for a significant share of total tax revenues. Furthermore, Japan's corporate enterprise tax system, which allows for deductibility in the subsequent year, is unique from an international perspective. Germany's business tax rate was reduced in 2008 by abolishing its deductibility.

Therefore, this study examines the economic effects of excess local corporate income taxation and analyzes how the effective corporate income tax rate would change if the deductibility of corporate enterprise tax was abolished and the timing of deductibility were changed to the current year with reference to the 2008 business tax reform in Germany.

The analysis used Klemm’s (2008, 2012) forward-looking effective tax rate model, wherein capital stock acquired through investment is held until fully depleted. The study also shows that incorporating the deductibility of enterprise taxes into a forward-looking effective tax rate model requires analytical innovations that differ from those used in previous studies. Subsequently, we conducted a simulation analysis, wherein the parameters were applied to the model considering Spengel et al.’s (2020) study.

The following are the simulation results and policy implications of this study.

First, this study analyzes the impact of excess taxation on the corporate inhabitant tax rate and corporate enterprise tax rate on the effective corporate tax rate. We assume Case A, the

most common excess taxation rate applied, and Case B, applied in Tokyo and Osaka prefectures. Because excess taxation is an increase in taxes, the cost of capital, EMTR, and EATR will increase, and corporate capital investment will be discouraged (Cases A (1) and B (1)). Finding the real interest rate that achieves the same EMTR as when excess tax is not implemented, and the implemented excess tax reduces the real interest rate by 0.9 to 1 percentage point [Case A(ii), Case B(ii)].

Second, if the abolishment of deductibility as a reform of the corporate enterprise tax is not accompanied by a reduced tax rate, the cost of capital and the EMTR will increase, negatively impacting corporate capital investment [Case 1(i)]. If the statutory tax rate is reduced so that the EATR is equalized, a reduction of approximately 1% in the tax rate can be achieved, reducing the cost of capital and the EMTR and positively impacting capital investment [Case 1(ii)]. The 2008 reform of Germany's business tax also abolished deductibility and simultaneously reduced the tax rate; thus, if Japan abolished the deductibility of corporate enterprise tax, it may ensure the neutrality of financing for capital investment. In Japan, if the deductibility of the enterprise tax is abolished, the statutory tax rate must be lowered to ensure the neutrality of financing for capital investment.

Third, if the timing of deductibility is changed from the following year to the current year as a reform of the corporate enterprise tax, it will positively impact capital investment by lowering the cost of capital and the EMTR unless accompanied by a tax rate change [Cases 2(i) and 2(ii)]. However, the impact was less than that of the abolition of deductibility. If the statutory tax rate is increased to equalize the total EATR, the cost of capital and EMTR of retained earnings and new share issuances will increase, while debt financing will decrease, impeding financing neutrality. Considering the cost of capital, EMTR, and funding neutrality, this reform should be adopted with caution.

Excess taxation may negatively impact the effective corporate income tax rate; hence, the abolition of the corporate enterprise tax must be considered rather than allowing its deductibility in the current year. Future reforms of Japan's local corporate income taxes should be implemented while considering their current impact on the effective corporate income tax rate.

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