CYCLICAL AND STRUCTURAL COMPONENTS OF CORPORATE TAX REVENUES IN JAPAN

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1 Introduction

In considering fiscal sustainability, it is very important to have an accurate forecast about the size of future tax revenues that can be obtained under the current tax system and economic structure. As is evident from the movement in tax revenues in recent years, the actual size of the tax revenue fluctuates wildly in Japan. When we verify long-term fiscal sustainability, we need to foresee precisely how much tax we can obtain removing effects of temporary economic fluctuation.

As a measure of changes in tax revenue, the size of the elasticity of tax revenue to changes of GDP has been regarded as important numbers. The amount of cyclical tax revenues caused by short-term economic fluctuation can be estimated by multiplying the size of GDP gap by the estimated number of constant tax elasticity, and the amount of structural tax revenues can be gained by subtracting this amount from the actual tax revenue, according to traditional methods shown in OECD.

It used to be natural to use such method before 1990 in Japan. However, recent movements in tax revenues are considerably unstable, and the actual value of the elasticity of tax revenue calculated has fluctuated sharply as a result. Therefore, calculating the size of structural tax revenues by using the certain number of elasticity is not always appropriate as a basis for discussion to consider medium-term fiscal sustainability.[1]

In this paper we will focus on the fluctuation of Japan's corporate tax revenue and its elasticity since 1980, quantitatively specify the factors which affected the fluctuation, and then discuss appropriate method for the estimation of structural corporate tax revenue. This paper is organized as follows: in Section 2 we will considers the actual corporate tax revenue and elasticity data, as well as the relation between actual tax revenue and Corporation Sample Survey data. In Section 3 and 4 we will carefully look at historical fluctuation of corporate tax revenue in Japan and specify several factors which largely affected it. In Section 5, we estimate the level of structural corporate tax revenues based on regression analysis. In Section 6, we mention some conclusions and needs for future research.

2 Corporate tax revenue and elasticity of tax revenue

2.1 Changes of corporate tax revenue to nominal GDP

Japan's corporate tax revenue data since FY 1980 (general account revenue of central government) (Figure 1) shows that it rose significantly during the economic expansion from 1986

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The content of this paper does not necessarily represent the views of the organizations we belong to.

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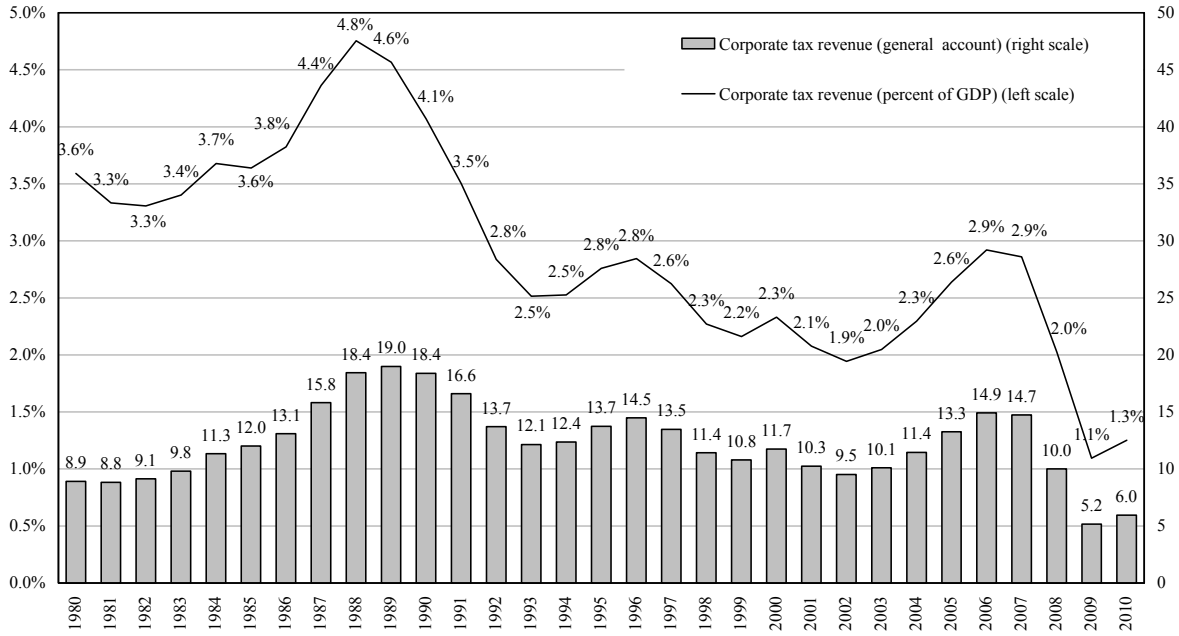
[1] As is not discussed in this paper, there proposed various methodology for measuring the size of the GDP gap. And it has been pointed out that a result of estimate based on the latest data available have large errors compared to estimate based on the data available in the future.

Figure 1

Corporate Tax Revenue in Japan's General Account Budget



Notes: Final budget until FY2008, revised budget in FY2009 and initial budget in FY2010.
Source: Cabinet Office, *SNA*; Ministry of Finance, *Fiscal Financial Monthly Report*.

through 1988 reaching a peak of 4.8 per cent to GDP in 1988, and fell sharply from 1989 with the subsequent collapse of the bubble economy. Since 1993 the sizes of tax revenue had been within a range of 2-3 per cent of GDP. In 2009 and 2010, with rapid economic downturn caused by the financial crisis, the revenue is expected to drop to a level of about 1 per cent of GDP.

In order to decompose and analyze corporate tax revenue, we use the data of Corporation Sample Survey data published by National Tax Administration Agency. Corporation Sample Survey is the extracted sample data with size 51,942 in 2007 (average extraction rate is 2.0 per cent and the companies with capitalization of more than 10 billion yen are exhaustive extraction). The comparison of tax revenue data in Figure 2 shows that the survey data have been below the actual tax revenue due to sampling errors. Therefore, it is necessary to consider the differences. In the following analysis we will use the average tax rate, the size of tax deduction and the distribution of taxable income based on Corporation Sample Survey data.

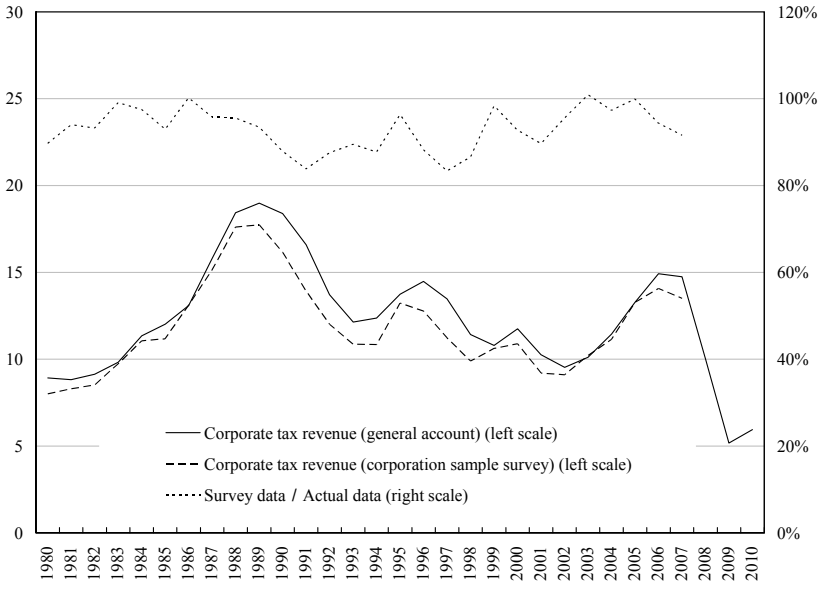
2.2 Elasticity of corporate tax revenue

Figure 3 shows the elasticity of total tax revenue (central and local government, SNA data) and its decomposition. It is obvious that after the 1990's the total elasticity numbers have been larger and more fluctuating than during the 1980's. We have to note that this variation includes the impact of tax reform, but, even without tax reform factors the relationship between growth rate of tax revenue and nominal GDP in recent years is unstable, especially in corporate tax revenue, as well as income tax.

Figure 4, actual elasticity numbers of corporation tax revenue to GDP, shows some negative numbers and extremely large numbers after the 1990's.

Figure 2

Comparison of Corporate Tax Revenue
(trillion yen)

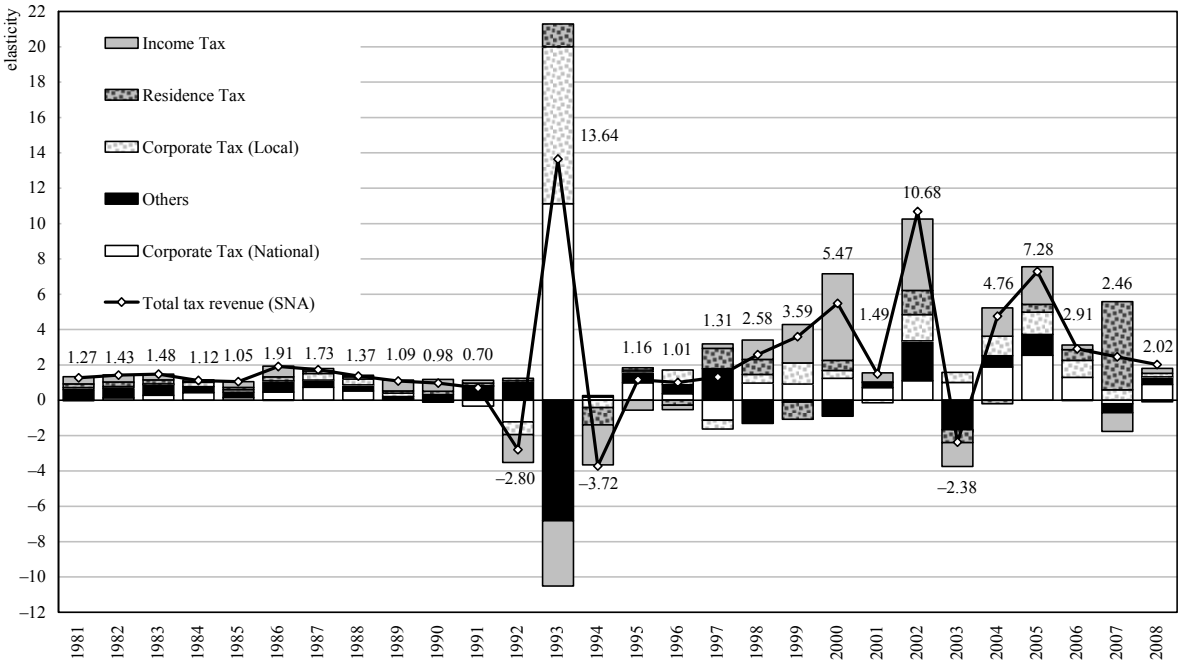


Source: Ministry of Finance, *Fiscal Financial Monthly Report*; National Tax Agency, *Corporation Sample Survey*.

In Japan, since corporate tax rate is almost flat, the cause of the time-varying elasticity is the fluctuation of taxable income to the variation of GDP. The relatively volatile fluctuation of taxable income has been mainly explained by the slower adjustment of compensation of employees than GDP, which causes the short-run large fluctuations of shares of labor income and capital income. Van den Noord (2000) calculates corporate tax base by subtracting wage from GDP, considering the slowly adjustment of labor share (Kitaura, 2009

Figure 3

The Elasticity of Total Tax Revenue and Its Decomposition

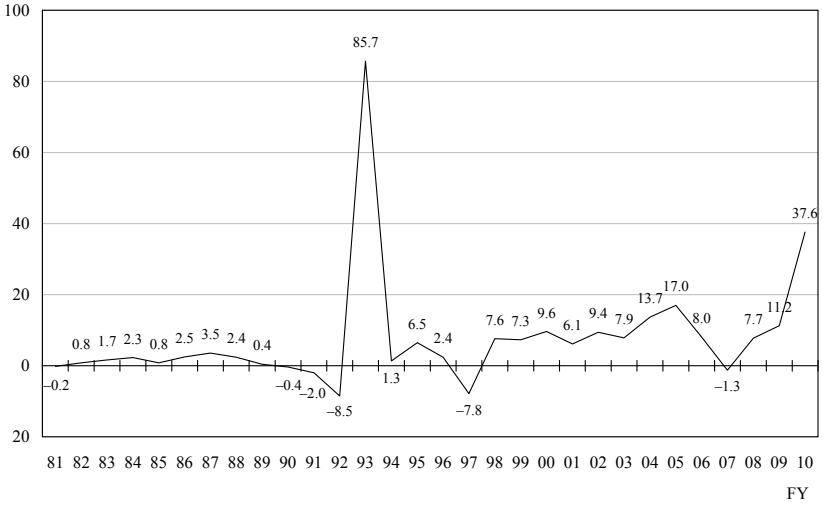


Sources: Cabinet Office, *SNA*; Ministry of Finance, *Fiscal Financial Monthly Report*.

as well). This paper tries to capture the other factors which affect the volatility and elasticity of corporate tax base, such as borrowing interest rate, extra profit and loss and distribution of corporate income[2] and try to estimate the size of structural corporate tax revenues.[3]

Figure 4

Actual Elasticity of the Corporate Tax Revenue
(growth rate of corporate tax revenue/growth rate of nominal GDP)



Sources: Cabinet Office, *SNA*; Ministry of Finance, *Fiscal Financial Monthly Report*.

As for the size of the elasticity of corporate tax revenue, many attempts to estimate the constant number have been done in previous studies, such as "Annual Economic and Fiscal Report" by Cabinet Administration Office in 2005 (CAO, 2005) which estimated 1.30. Cyclical corporate tax revenue is generally calculated by multiplying GDP gap and tax elasticity, and then structural corporate tax revenue is calculated by subtracting cyclical corporate tax revenue from the actual revenue. The example of structural revenue estimation by CAO (2009) using the number (1.30) shows that it can explain only a small fraction of the tax changes (Figure 5). However, if the elasticity of tax revenue is time varying, the estimated level of structural corporate tax revenue assuming single number elasticity will be biased.

3 Average corporate tax rate and tax deduction

In Section 3 and 4, we will analyze the past fluctuation of corporate tax revenue relative to GDP since 1980.This section focuses on the impact of past tax reforms (change of tax rate and deduction system) based on the figures of Corporation Sample Survey data.

The ratio of corporate tax revenue to nominal GDP can be divided into the ratio of "tax calculated" (taxable income multiplied by effective tax rate) to GDP and the ratio of tax deduction to GDP. Figure 6 shows the effective tax rate before deduction (ratio of tax calculated to pretax income of corporation in profit), and statutory corporate tax rate for large companies. The movement of effective tax rate is linked to the statutory rate, although there is a difference of level between the two, due to the reduced tax rate for small companies.[4] After 1999 when the current tax

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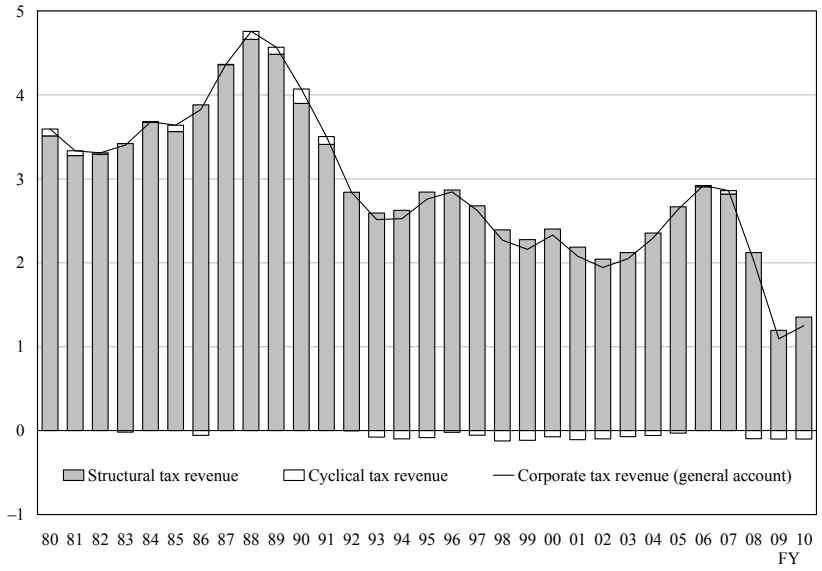
[2] Hayashi (1996) pointed out that fluctuation of dividends and interest payments of private corporations is larger than that of GDP, and Suzuki (2006) pointed out that the factor of changes in corporate tax revenue in recent years is largely affected by the change in the extra profit and loss.

[3] Nishizaki and Nakagawa (2000) acknowledge that the elasticity of entrepreneurial income to GDP can change over time, and tries to estimate the time-varying elasticity of tax revenue. The estimated elasticity is smaller in the boom and larger during recession, with negative correlation to GDP gap numbers.

[4] 22 per cent tax rate applies to the amount of less than 800 million yen of the income of the general corporation whose capital is less than 100 million yen and incorporated association and the total amount of income of public corporations (Law of corporate tax, Article 66).

Figure 5

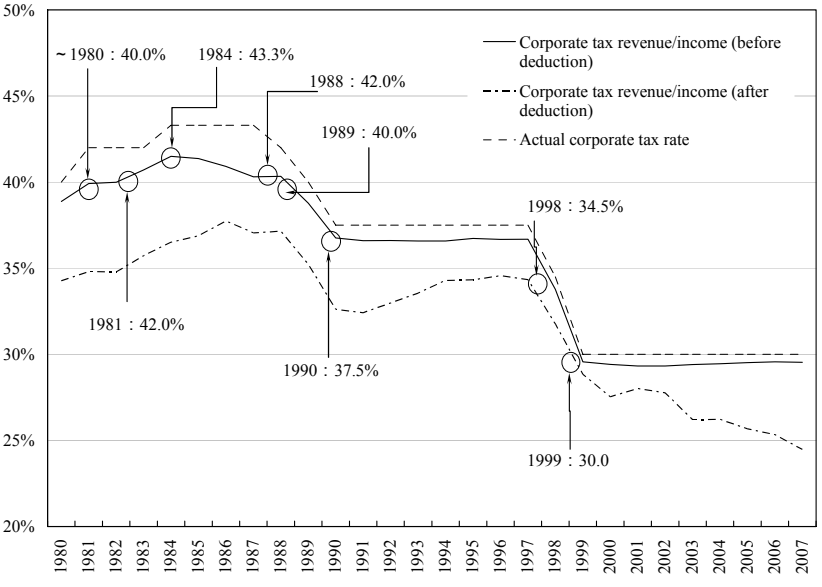
Cyclical and Structural Corporate Tax Revenue with Elasticity Fixed (=1.30)
(percent of GDP)



Notes: Final Budget until FY2008, Revised Budget in FY2009 and Initial Budget in FY2010.
Source: Ministry of Finance, *Fiscal Financial Monthly Report*, etc.

Figure 6

Ratio of Actual Tax Revenue to Income and the Actual Corporate Tax Rate



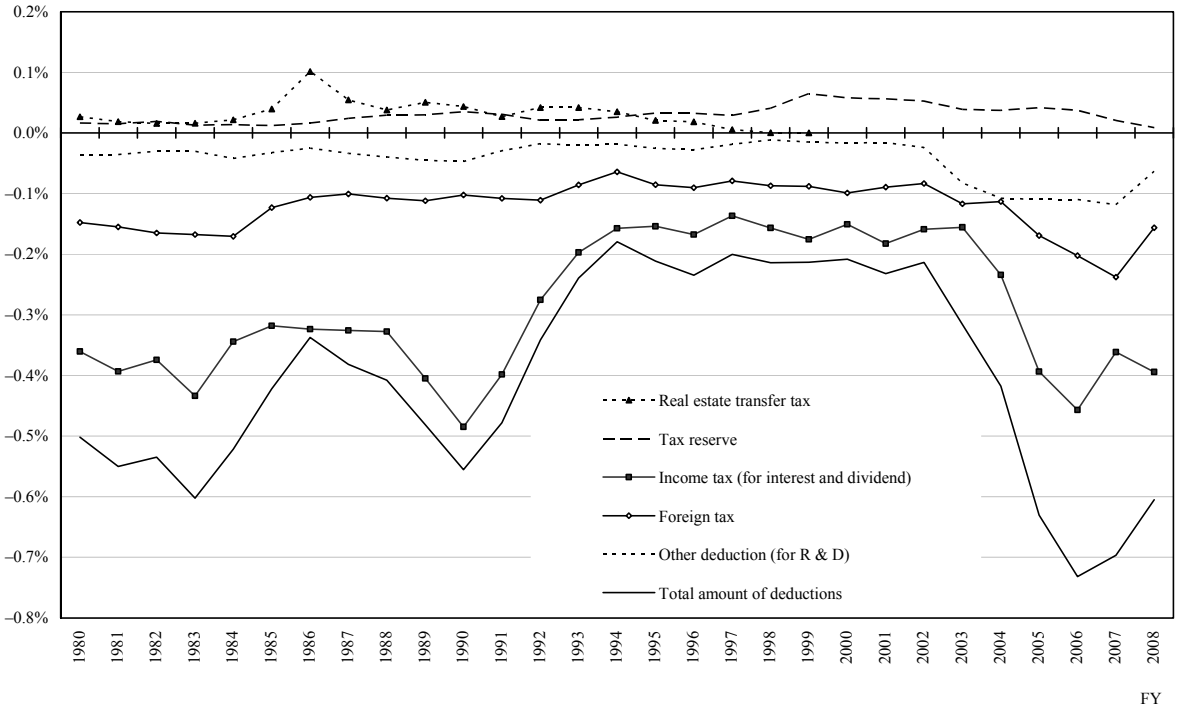
Source: National Tax Agency, *Corporation Sample Survey*, etc.

rate was adopted, the ratio tax of calculated to pretax income of corporation in profit on a macro view remained almost 29.5 per cent and the reduced tax rate is understood to have no significant impact on the movement of the average tax rate.

Difference between the effective tax rate before deduction and the ratio of actual tax revenue after deduction in Figure 6 indicates the amount of tax deduction, and its size has not been stable over time. The change of tax deduction size is shown in Figure 7. "Income tax deduction", which indicates the amount of withholding income tax paid by the corporate enterprises receiving interest and dividend income, has the greatest impact. Although this amount is not recorded as corporate tax, it is appropriate to consider it tax on corporate taxable income. The size of the deduction of income tax in fiscal 2007 counts 0.36 per cent of GDP. In recent years, "foreign tax deduction", "other deductions" (those pertaining to R&D expenses) has increased in size. The latter was introduced by the tax reform of 2003, and in FY2007 the size of tax deduction except income tax credit is 0.36 per cent of nominal GDP.

Figure 7

The Size of Tax Deductions
(percent of GDP)



Source: National Tax Agency, *Corporation Sample Survey*, etc.

4 Fluctuation of tax base

Then, we analyze the historical relationship between tax base (pretax income of corporations in profit) and GDP in detail for non-financial corporations, based on National Accounts (SNA) data and Corporation Sample Survey data. The relation can be shown in Figure 8 and following decomposed ratios are used in the following analysis:

$$\frac{\text{Tax base}}{\text{GDP}} = \frac{\text{Operating surplus}}{\text{GDP}} \times \frac{\text{Entrepreneurial income}}{\text{Operating surplus}} \times \frac{\text{Tax base}}{\text{Entrepreneurial income}} \qquad (1)$$

"Operating surplus" is SNA data, net of consumption of fixed capital, which corresponds to aggregate operating income of corporations. For "entrepreneurial income", we use SNA entrepreneurial income before dividend payment with adjustment of inventory valuation and interest expense.[5] For operating surplus and entrepreneurial income, the positive value of corporation in profit and the negative value of corporate in loss are offset either. "Tax base" is aggregate pretax income of corporation in profit and calculated from actual tax revenue (adding tax deduction and dividing by effective tax rate). The ratio of tax base to GDP and its decomposition from 1980 to 2008 is shown in Figure 9.

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[5] Entrepreneurial income of SNA adds up interest payment based on accrual basis, but regarding calculations of ordinary income, it should be based on actual interest payments. Therefore, we created a series of interest payments applying the interest rate calculated from Financial Statements of Corporation Industry data (interest payment divided by debt outstanding) replaced by interest rate SNA applies (interest payment divided by debt outstanding).

Figure 8

Relationship Between GDP and Taxable Income of Corporation, FY2008

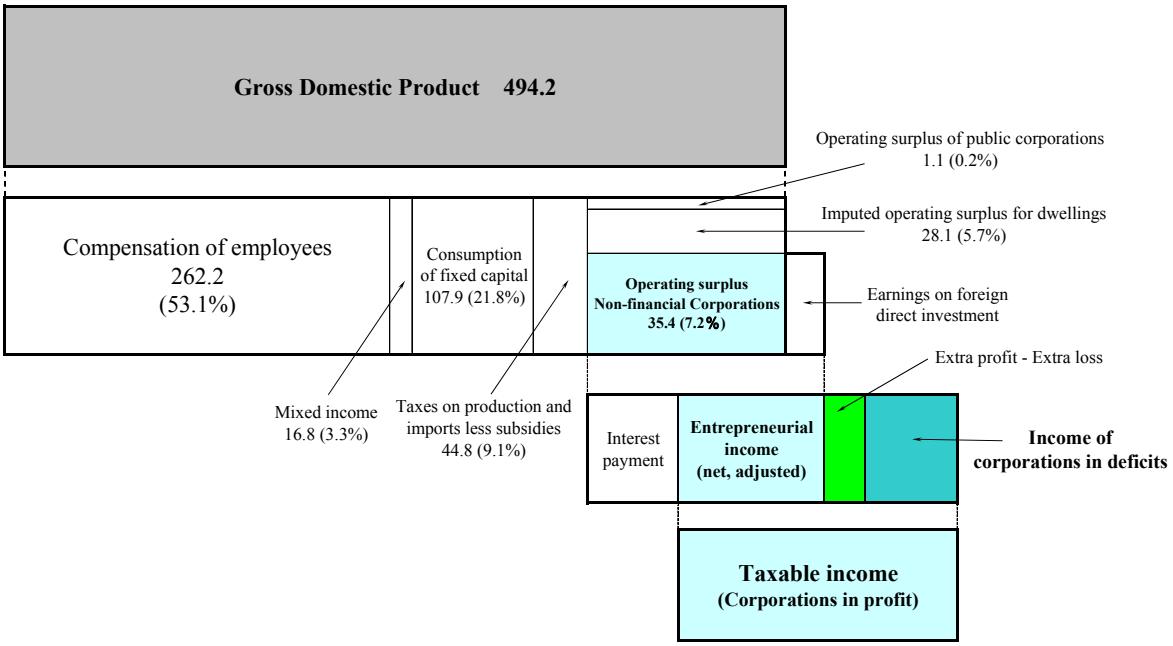
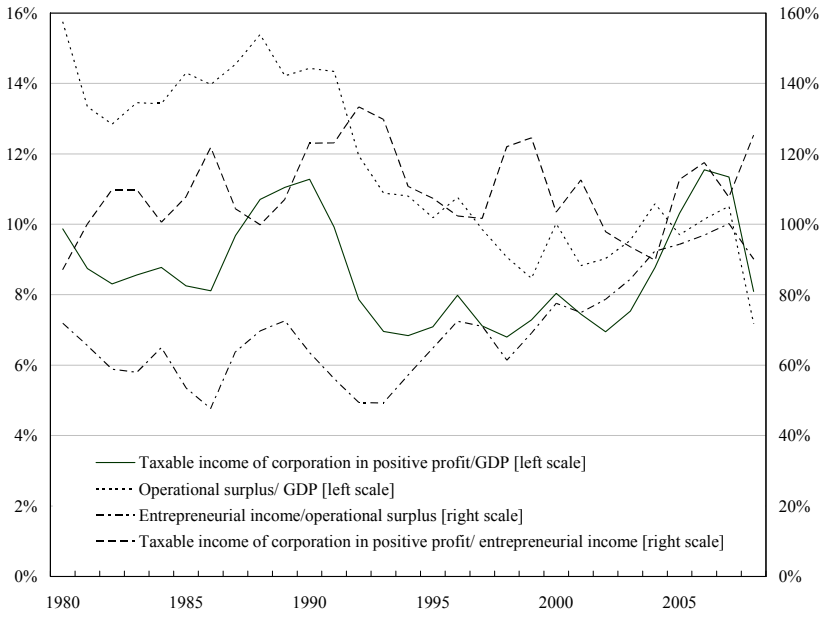


Figure 9

Decomposition of Taxable Income of Private and Non-financial Corporations
(percent of GDP)



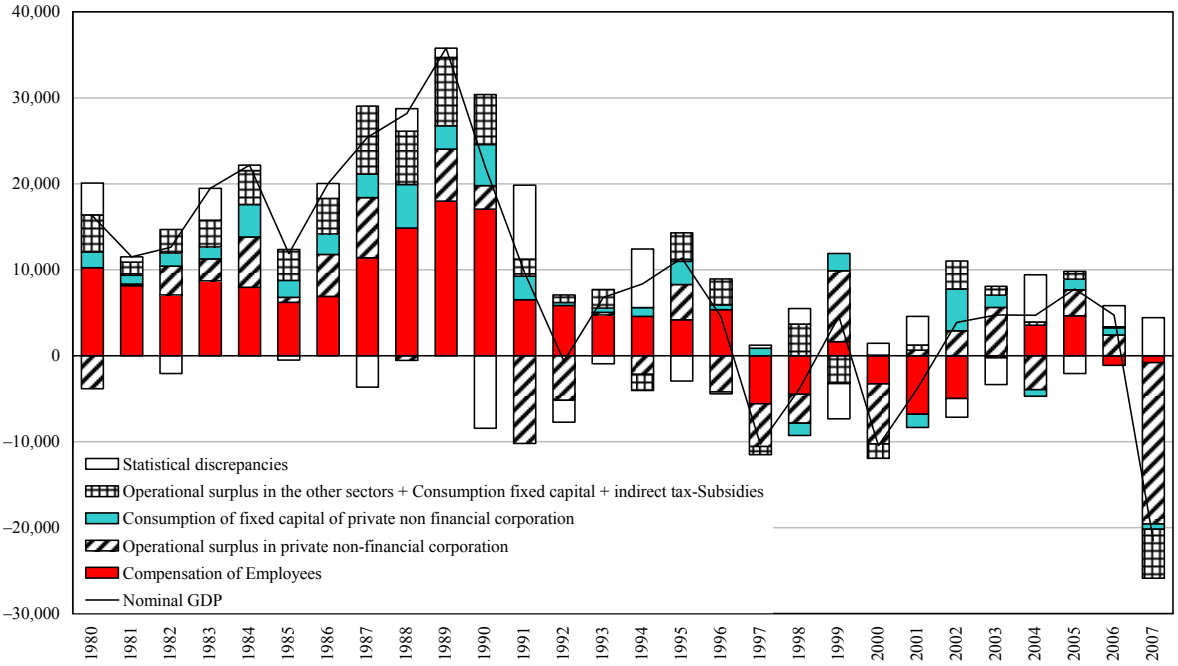
Source: Ministry of Finance, *Fiscal Financial Monthly Report*; National Tax Agency, *Corporation Sample Survey*; Cabinet Office, *SNA*.

4.1 Relationship between operating surplus and nominal GDP – changes in the distribution of GDP

The first factor, the ratio of operating surplus to GDP reflects the cyclical and structural changes in the distribution of GDP. The elasticity of operating surplus to GDP had been within the range of 0-2 in the 1980s, but after 1990s its volatility increased. It can be said that the unstable movement of operating surplus relative to GDP in recent years is a major factor to destabilize the elasticity of corporate tax revenue. When we look

Figure 10

The Breakdown of the Change in GDP
(relative to the previous year)



Source: Cabinet Office, *SNA*.

at the decomposition of marginal change of GDP every year in Figure 10, during 1980s the share of compensation of employees, operating surplus and consumption of fixed capital had been generally stable, but in the early 1990s it becomes unstable. The ratio of operating surplus sometimes rapidly decreased with the delay of the adjustment of employee compensation in downturn, and sometimes rapidly increased in economic expansion.

On the other hand, looking at Figure 8 again, there seems to be structural decline of the ratio of operating surplus to GDP from the late 1980s through the late 1990s apart from cyclical fluctuations. This change is due to increase of the ratio of consumption of fixed capital and increase of the ratio of operating surplus of owner-occupied dwellings. The share of consumption of fixed capital to GDP has increased by about 5 per cent from 1980 to 2008 (Figure 11), reflecting the accumulation of capital stock and abundance of the amount of capital.

If we assume one good model and a Cobb-Douglas production function with constant capital share, the ratio of gross operating surplus to GDP is expected to be constant over time in a steady state.[6] However, looking at historical data, it can not be ignored that the share of the corporate tax base to GDP, the past 30 years, has structurally declined. When we view the size of the corporate tax base for the future, it is important to consider the trend in labor share, return on capital and proportion of private corporations in total economy.

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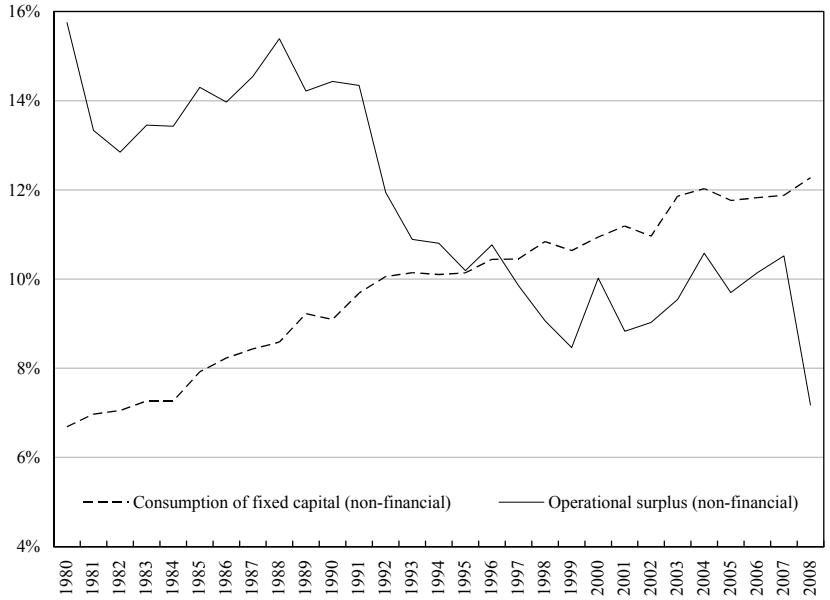
[6] Assuming CES type for the production function, capital share is not constant and varies depending on Y/K. Concretely, the elasticity of substitution of labor and capital as σ, if $0<\sigma<1$, capital share is an increasing function of Y/K, if $\sigma>1$, capital share is a decreasing function of Y/K. If $\sigma=1$, it returns to the Cobb-Douglas production function and capital share is constant.

4.2 Relationship between entrepreneurial income and operating surplus – impact of interest expense of corporations

The second factor, relation between entrepreneurial income and operating surplus is equivalent to the relation between operating profit and ordinary profit in corporate accounting, which affected the movement of non-operating income and loss. As most of their changes are attributed to the amount of interest expense that is not included in tax base of the corporate income tax, we will consider the changes of the size of interest payments from private non-financial firms to other sectors.

Figure 11

Consumption of Fixed Capital and Operational Surplus
(percent of GDP)



Source: Cabinet Office, *SNA*.

If the secondary distributional shares of operating surplus to interest, dividends and internal reserves are stable, the ratio of entrepreneurial income to operating surplus becomes constant, but Figure 8 shows the level of the ratio has changed dramatically. This reflects the decline of interest payments to other sectors (households and financial institutions) under low interest rate policy since late 1990s. We will verify the magnitude of the factors, such as rate of return, borrowing rate and capital ratio by using Financial Statements of Corporation Industry data.

Operating surplus and entrepreneurial income can be theoretically decomposed to the following:

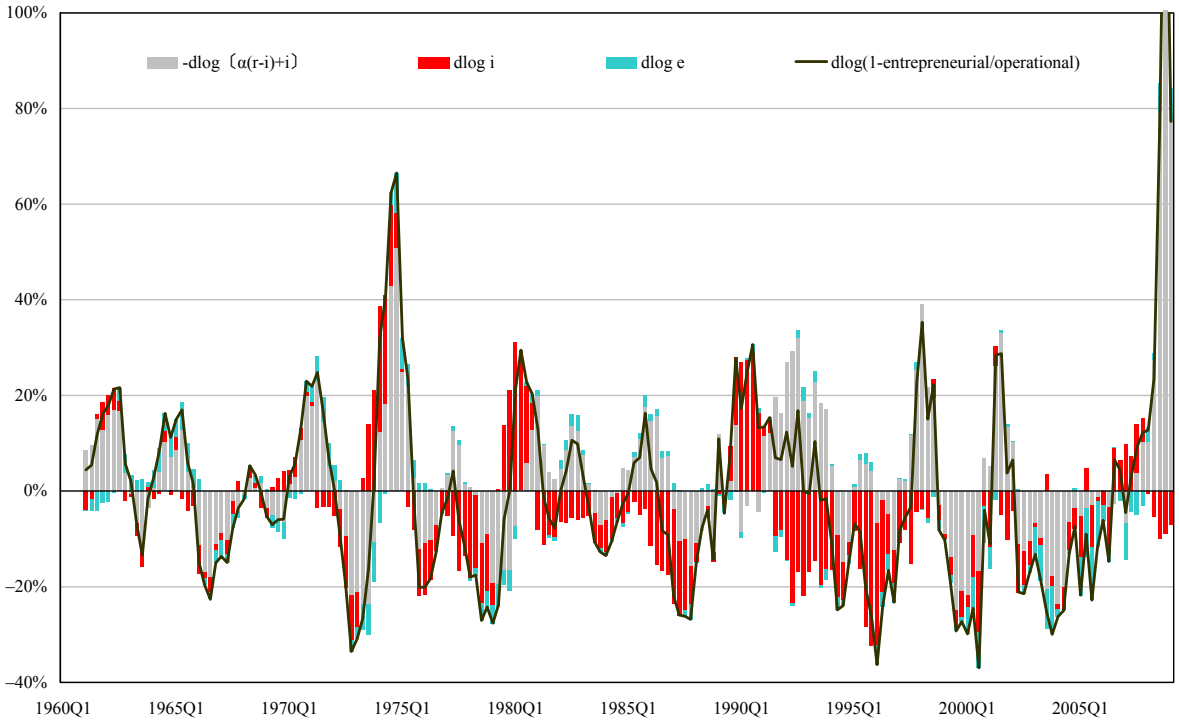
$$\begin{aligned} \text{Operating Surplus} &= \mathrm{rK} + \mathrm{iF} = \mathrm{r}\alpha\mathrm{A} + \mathrm{i}(1-\alpha)\mathrm{A} \\ &= [\alpha r + (1-\alpha)i]A \\ &= [\alpha(\mathrm{r}-\mathrm{i}) + \mathrm{i}] \quad A \end{aligned} \tag{2}$$

$$\begin{aligned} \text{Entrepreneurial Income} &= \mathrm{rK} + \mathrm{iF} - \mathrm{ieA} \\ &= r\alpha A + i(1-\alpha)i - ieA \\ &= [\alpha r + (1-\alpha)i - ie]A \\ &= [\alpha(\mathrm{r}-\mathrm{i}) + (1-\mathrm{e})\mathrm{i}]A \end{aligned} \tag{3}$$

where A is asset of private non-financial corporate, K is real assets, F is financial asset, α is ratio of real assets to total assets, e is debt ratio, r is return on capital rate of real asset, and i is borrowing

Figure 12

Factor Decomposition of the Ratio of Operational Surplus to Entrepreneurial Income



Source: Ministry of Finance, *Financial Statements of Corporation Industry*.

rate for debt. The ratio between the two (entrepreneurial income ratio) is affected by the borrowing rate i, debt ratio e, and difference between r and i:

$$\frac{\text{Entrepreneurial Income}}{\text{Operating Surplus}} = \frac{\alpha(r-i)+(1-e)i}{\alpha(r-i)+i}$$

$$= 1-\frac{ie}{\alpha(r-i)+i}$$

To see the size of the contribution of each factor, we expand the following:

$$1-\frac{\text{Entrepreneurial Income}}{\text{Operating Surplus}} = \frac{ie}{\alpha(r-i)+i}$$

$$d\log\left(1-\frac{\text{Entrepreneurial Income}}{\text{Operating Surplus}}\right) = d\log i + d\log e - d\log[\alpha(r-i)+i] \tag{4}$$

Figure 12 shows the impact of the contribution of three terms to its left-hand side. The first term represents the effect of loan rate (rising interest rates reduced the entrepreneurial income ratio), the second term the debt ratio (rising debt ratio reduced entrepreneurial income ratio), and the third term difference between borrowing rate and return on capital (rising return on capital rate higher than the borrowing interest rate increased entrepreneurial income ratio). Until 1980s, no major changes in the level of debt ratio, and only the large economic fluctuations such as oil shock

Figure 13

Average Interest Rate and Return on Capital

Source: Ministry of Finance, *Financial Statements of Corporation Industry*.

had made the difference between borrowing rate and return on capital fluctuate. But economic cycles had canceled out such fluctuation in the long-run and there has not been significant change in entrepreneurial income ratio. In the 1990s the stable relationship between rates of return and borrowing rates has changed. After the surge of the borrowing rates in 1990 and rapid decline, low interest rates continued since 1995. As a result, after the mid-1990s the variations in real rate of return directly lead to the changes in entrepreneurial income ratio.

While the level of interest rates is theoretically expected to be parallel to the real rate of return, actual level of interest rate is strongly influenced by monetary policy. Since 2000,continuing monetary easing has kept borrowing rates much less than real rate of return (Figure 13). In the background, corporate sector has taken the action retaining internal reserves to recover their equity damaged by falling asset prices since the 1990s. Under such circumstances, the recent level of entrepreneurial income ratio has been historically high. This is another factor which has affected recent volatile corporate tax base in Japan.

Considering the analyses in (1) and (2), we conducted a regression analysis which explains the trend of entrepreneurial income by GDP gap and borrowing rates. The result is shown as follows:

$$\log\left(\frac{SNA\_INCOME\_ADJ}{NDPV}\right) = \underset{(-22.96)}{-1.49} + \underset{(8.29)}{10.93}\times GAP - \underset{(-7.32)}{11.08}\times LOAN\_RATE \qquad \text{[reg.1]}$$

[R^2_adj=0.805, sample period: 1990-2008, *t*-value in parentheses]

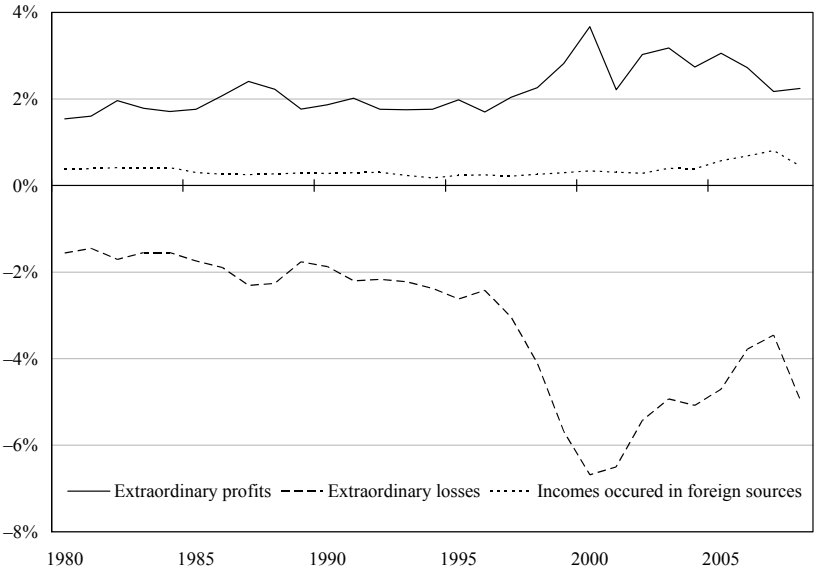
where *SNA_INCOME_ADJ* is entrepreneurial incomes before dividend payments in the SNA, in which inventory valuation and interest payments are adjusted, *NDPV* is GDP (in the SNA) excluding capital depreciation, operating surplus and mixed incomes in the household and public corporation sectors, *GAP* is GDP gap calculated from the Cobb-Douglass production function and *LOAN-RATE* is the loan interest rate calculated as the ratio of interest payment to loan outstanding in the Financial Statements of Corporation Industry.

4.3 Relation between tax base and entrepreneurial income

Then, we discuss the relation between tax base (incomes of corporations in profit) and entrepreneurial income. Looking at Figure 8, the ratio of the taxable incomes to the corporate incomes fluctuates in the range of 80 to 130 per cent, and the elasticity does not seem stable. The discrepancy is mainly attributed to three factors. The first is the difference in the concept between the taxable incomes and the corporate incomes. While the taxable incomes include value-added produced abroad and the capital gains or losses stemming from asset prices fluctuations, the corporate incomes in SNA data is based on the aggregate of the flows of value-added created in the domestic corporate sector. The second is the influence of the amount of losses of the corporations in deficit (incomes of corporations in deficit). The taxable incomes can be obtained by adding the incomes of corporations in deficit (which is now defined to be positive) to the net aggregate incomes of all corporations. If the distribution of income depends on business cycles and incomes of corporations in deficit show irregular movements, the relationship between the two becomes unstable. The third is the effects of the deductions of operating losses carried forward.

Figure 14

Extraordinary Profits and Losses and Incomes Accrued in Foreign Sources
(percent of GDP)



Source: Ministry of Finance, *Fiscal Financial Monthly Report*, National Tax Agency, *Corporation Sample Survey*.

4.3.1 The effects of the difference in the concept

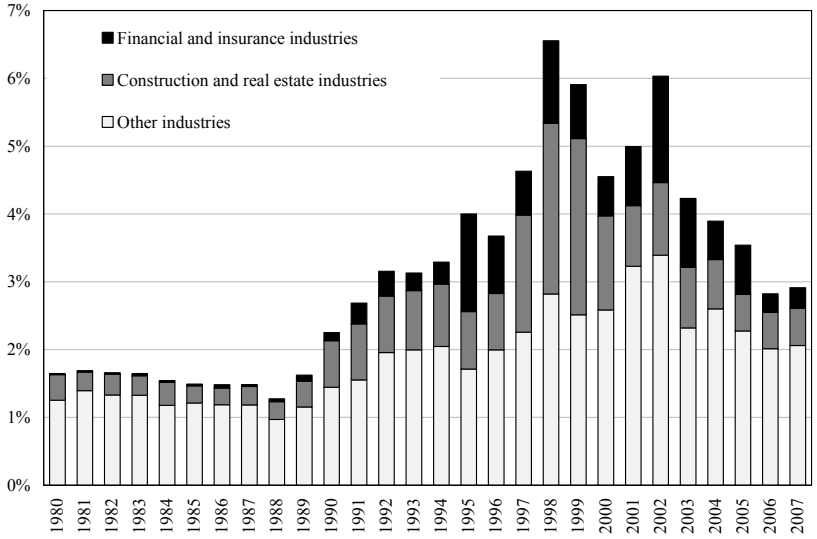
First, as a source of discrepancies between the taxable incomes and the corporate incomes, we can consider the factor of asset prices fluctuations. Specifically, we will analyze them by using the data of extraordinary profits and losses in Financial Statements of Corporation Industry. The transition of the extraordinary profits and losses is shown in Figure 14.

Value-added produced abroad (incomes generated by overseas branches) are not included in entrepreneurial income, but in the taxable incomes.[7] It is of course difficult to identify the amount

[7] The taxable incomes here are the values before tax deductions. The incomes of residents and domestic corporations are taxed worldwide, and the amounts of taxes payable are calculated. After that, deductions of foreign-levied taxes are applied.

Figure 15

Incomes of Corporations in Deficit
(percent of nominal GDP)



Source: National Tax Agency, *Corporation Sample Survey*.

of incomes generated overseas, however, we try to calculate the amount of incomes accrued in foreign sources by dividing deductions of taxes levied overseas by a certain tax rate, which is also shown in Figure 14. The calculated incomes accrued in foreign sources begin to increase gradually since the early 2000s.

4.3.2 Effects of incomes of corporations in deficit

If the competition among companies can replace the old firms with the new ones or can make differences in their performance, it seems that a constant fraction of the companies will be in deficit even when the GDP gap is zero. If the ratio of incomes of corporations in deficit to overall corporate incomes is stable over time, we can expect that the overall corporate incomes and the incomes of corporations in positive profit (taxable incomes) may move together. However, in reality, decrease of overall corporate incomes will lead to increase of incomes of corporations in deficit (the mean effect in the distribution), and if shocks of macro economy or of business cycles given to each company are not uniform, it will lead to increase of incomes of corporations in deficit (the variance effect in the distribution). In both cases, the ratio of incomes of corporations in deficit to overall corporate incomes may not be stable.[8]

Looking at the movements of the ratio of incomes of corporations in deficit to nominal GDP (except finance and insurance industry) (Figure 15), incomes of corporations in deficit and entrepreneurial income does not necessarily move in parallel. Since 1990s, incomes of corporations in deficit increased sharply, which can be attributed to three industries; finance and insurance, construction and real estate industries.

4.3.3 Effects of deductions of operating losses carried forward

Under Japan's corporation tax system, tax deduction of operating losses carried forward is

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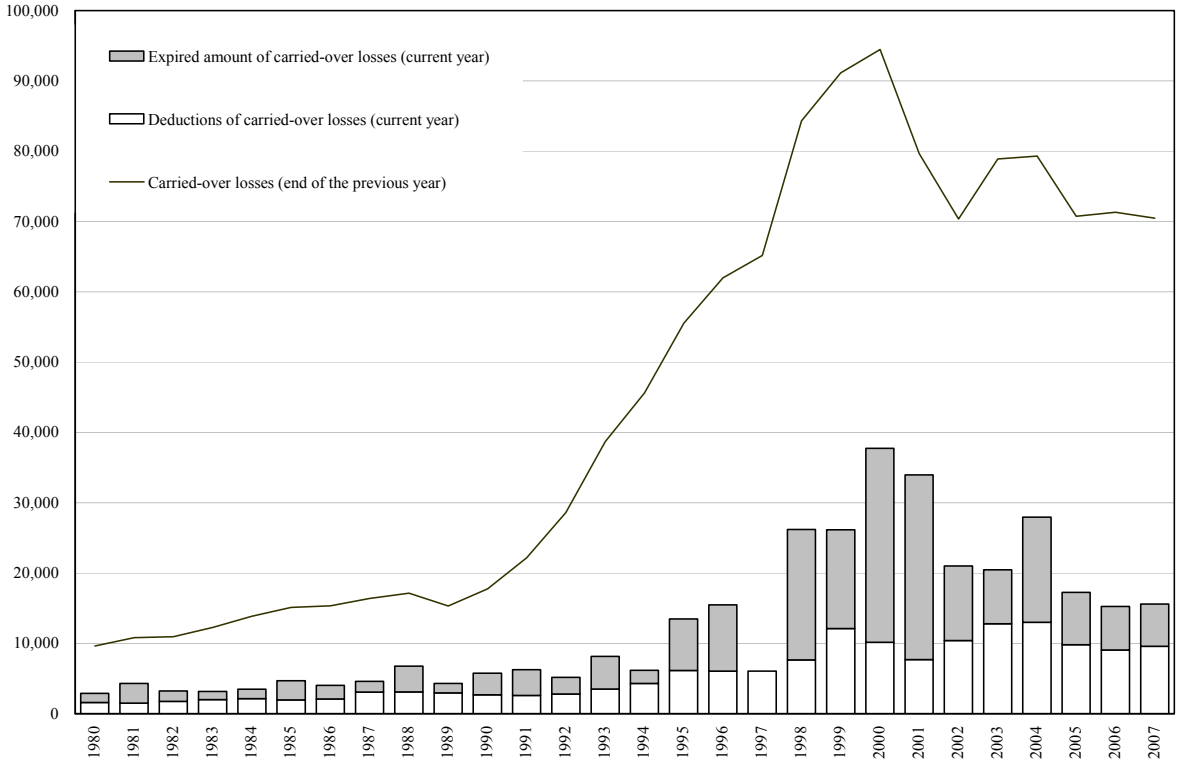
[8] Explicitly considering the effects of incomes of corporations in deficit, Hori, Suzuki and Kayasono (1998) estimated corporate tax revenues in Japan. In their paper, the relation between the ratio of corporate incomes to nominal GDP (ycv/gdpv) and the ratio of incomes of corporations in deficit to taxable incomes (prl/prb) is modeled as the following exponential function (*a*: constant), in which a decrease in corporate incomes leads to an increase in incomes of corporations in deficit.

$$\frac{prl}{prb} = a^{-\frac{ycv}{gdpv}}$$

Figure 16

Amount of Deductions and Expired Amount of Carried-over Losses



Source: *Corporation Sample Survey* (National Tax Agency)

allowed as an exception of the single-year principle in accounting. It enables companies in deficit to carry forward their losses to the periods of 7 years from the subsequent year, in order not to curb capital accumulations.[9]

Figure 16 shows the carried-over losses outstanding and the amount of deductions in every year (except finance and insurance industry). Increase of incomes of corporations in deficit since 1990s has led to the expansion of the carried-over losses outstanding and the amount of deductions afterward. On the other hand, in the recent years, the carried-over losses outstanding and the amount of deductions begin to decrease because incomes of corporations in deficit tend to decrease and the carried-over losses begin to expire.[10]

Since the size of deduction of each year depends on the past deficits and level and distribution of the positive profits made in subsequent years, it is difficult to make accurate predictions on the future deductions of operating losses carried over. We conducted a regression analysis that explains how the deficit in a certain year can be deducted in 7 years from the subsequent year by using past actual data.

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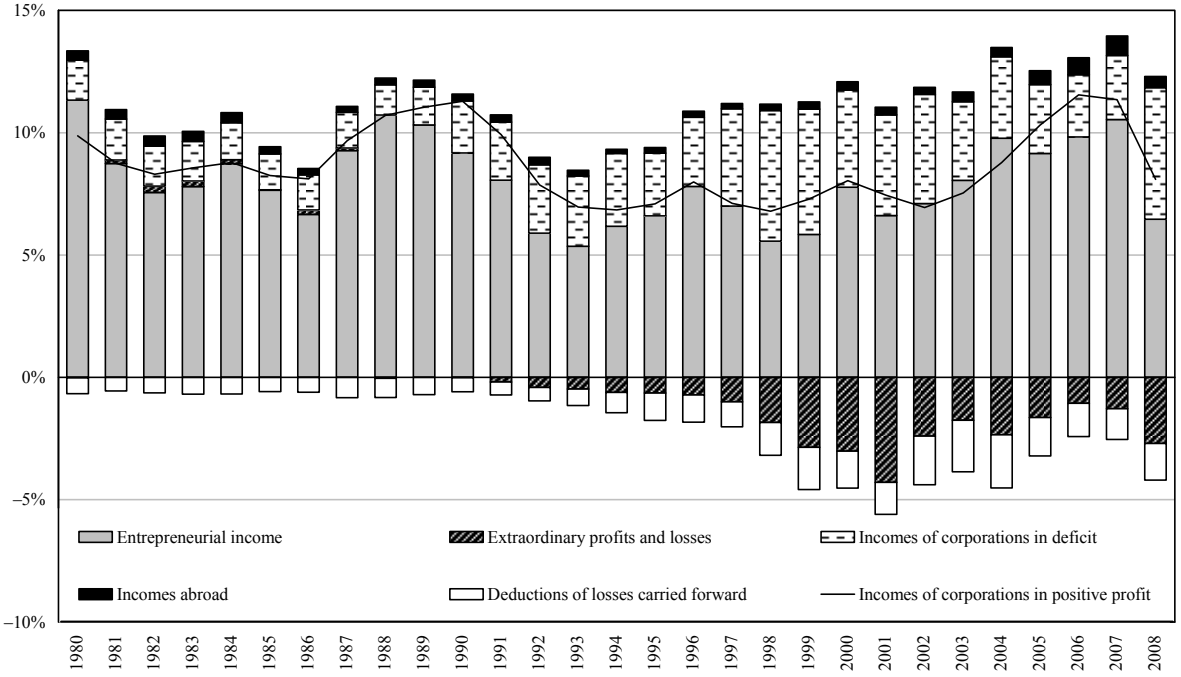
[9] It is stipulated in the Corporation Tax Law, Article 57. The periods in which deductions of carried-over losses are allowed have been extended from 5 years to 7 years in the tax reform in 2004. The 7-year rule applies to the losses after 1st April, 2001 (Corporate Tax Reform Act in 2004, Additional Rule 13.)

[10] Carried-over losses can not be deducted unless the firms earn positive profits that can be offset in the specified periods. Therefore, not all the cumulative amount of losses in the past are offset in future.

Figure 17

Taxable Incomes of Corporations in Profit and Entrepreneurial Incomes



Source: Ministry of Finance, *Financial Statements of Corporation Industry*; National Tax Agency, *Corporation Sample Survey*; Cabinet Office: *SNA*.

$$DCO\_EXF = \underset{(-4.79)}{-0.230} \times INRED\_ADJ(-1) - \underset{(-3.80)}{0.037}\left[\sum_{j=2}^{5} INRED\_ADJ(-j) + D01 \times \sum_{j=6}^{7} INRED\_ADJ(-j)\right] \quad \text{[reg.2]}$$

[R^2_adj=0.580, sample period: 1987-2008, *t*-value in parentheses]

where *DCO_EXF* is deductions of operating losses carried forward in the Corporation Sample Survey (except for finance and insurance industries), *INRED_ADJ* is a proxy variable of incomes of corporations in deficit, which can be inferred from the difference between incomes of corporations in positive profit (which is calculated from general account revenues) and the sum of entrepreneurial incomes, extraordinary profits (losses) and incomes abroad and *D01* is a dummy variable that is on after 2001. The number of observations is 30 years, and the result implies that on average 20 per cent of the carried-over losses are deducted in the next year, and roughly half of the losses are deducted for 7 years from the subsequent year, and the remaining losses are expired.[11]

Graphical representation of each factor (a)–(c) is given in Figure 17. The gap between incomes of corporations in positive profit (taxable incomes) and overall corporate incomes can be largely explained by these three factors. It is expressed as follows:

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[11] Using the data of Corporation Sample Survey from 1990 to 2007, we calculate the cumulative amount of the expired losses carried forward (carried-over losses in the previous period – deductions in current period + deficit in current period – carried-over losses in the current period). It is roughly the half of the accumulative amount of the deficit in the same period.

Incomes of corporations in positive profit (taxable incomes)
= entrepreneurial income
± extraordinary profits and losses, incomes abroad
+ incomes of corporations in deficit
– deductions of losses carried forward

Looking at Figure 17, it can be seen that a fall in asset prices in the Japan's economy in 1990s led to the expansion of extraordinary losses, which reduced taxable incomes. However, as those effects hit intensively on specific industries (such as real estate industry), not only the expansion of extraordinary losses but also increase in deficit have occurred at the same time. As a result, taxable incomes as a whole did not shrink too much. Since the impact of the decrease of incomes (including the negative effects of asset price) in a macroeconomic level has occurred in the specific sectors, it can be said that the variance of corporate incomes became larger and incomes of corporations in deficit increased.

The regression result of incomes of corporations in deficit is as follows:

$$\frac{INRED\_ADJ}{GDPV} = \underset{(1.73)}{0.012} + \underset{(2.10)}{0.246} \times \left|\Delta GAP\right| - \underset{(-0.98)}{0.073} \times \left(\frac{SNA\_INCOME\_ADJ}{GDPV}\right) + \underset{(9.19)}{1.017} \times \left(\frac{EXTRA\_LOSS - EXTRA\_PROF}{GDPV}\right) + \underset{(2.50)}{0.0073} \times D1990C \qquad \text{[reg.3]}$$

[R^2_adj=0.894, sample period: 1981-2008, *t*-value in parentheses]

where *EXTRA_LOSS* and *EXTRA_PROF* are extraordinary losses and profits in the Financial Statements of Corporation Industry, *D1990C* is a dummy variable that is on after 1990 and other variables are defined in the previous regression results. In order to quantify the movements of incomes of corporations in deficit, we adopt the mean effects (if entrepreneurial income decreases, incomes of corporations in deficit increase), the variance effects (if the GDP gap widens in both directions, incomes of corporations in deficit increase) and factor of extraordinary profits and losses as explanatory variables. As the level of dependent variable (incomes of corporations in deficit) is significantly different before and after 1990, we added the dummy variable that is on after 1990. The regression result implies that extraordinary losses generated in the estimation period increased incomes of corporations in deficit by raising variance of the distribution of corporate incomes, which in fact did not lower the taxable incomes in the current period. If the GDP gap was zero, the ratio of incomes of corporations in deficit to GDP on average after 1990 would be 1.31 and 1.45 per cent with the ratio of corporate incomes to GDP 9 and 7 per cent respectively.

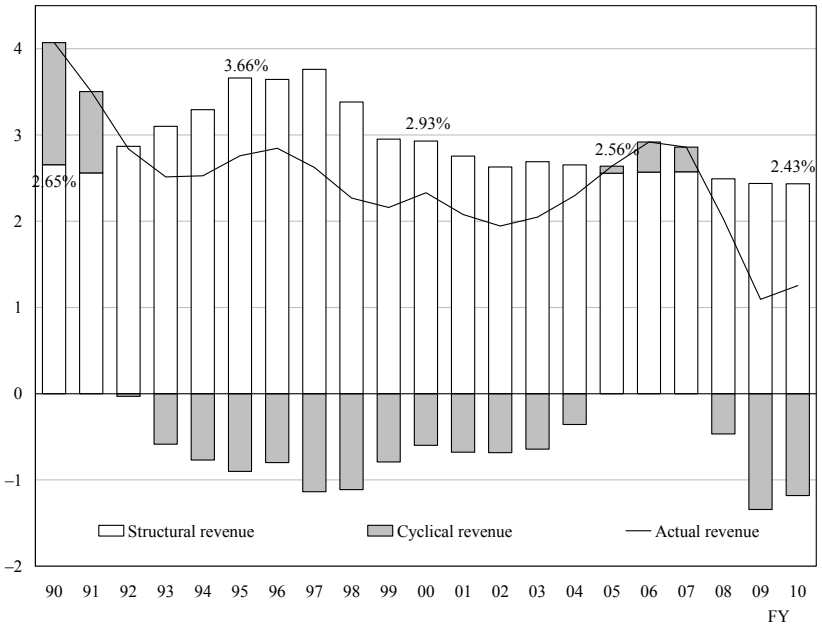
4.4.4 Summary of the discussions in this section

As discussed in this section, there are mainly five factors that can explain the movement of taxable incomes of private non-financial corporations; (1) structural and cyclical changes of the distribution of value-added in the Japanese economy, (2) the relationship between interest rates and return on capital, (3) asset price movements and return on foreign investment, (4) the divergence of economic fluctuations among sectors, and (5) deductions of carried-over losses. In particular, since 1990, due to the changes in these factors, tax revenues and its elasticity to GDP largely fluctuated every year. It should be noted that these factors did not necessarily affect the taxable incomes in only one way.

As for factor (1), in the long run, the declining trend of return on capital resulted in the fall in the ratio of the taxable incomes to GDP. However, in the short run, taxable incomes were largely

Figure 18

Estimation of the Structural Revenue of Corporate Tax
(baseline scenario, percent of GDP)



affected by business cycles. In particular, taxable incomes were temporarily enlarged by economic recoveries.

As for factor (2), under the low interest rate policy regime, the level of taxable incomes in recent years has been historically high. Because a nexus between return on capital and interest rates has not worked well since the mid-1990s, we need to pay attention to the fact that the changes in return on capital have the direct impact on the corporate tax base.

As for factors (3)-(5), as massive shocks of the bubble burst in the 1990s hit specific sectors, such as construction, retail and real estate industries, the influences of the negative shocks on the corporate tax base was rather limited although the size of the shocks was unprecedentedly large.

It is expected that the global economic downturn triggered by the global financial crisis since 2008 will drive down corporate tax revenues. The primary factor in the short run is a sharp decline of the capital share with the economic downturn; as the negative shocks hit whole of the economy uniformly, sectors with large positive incomes are most affected. Since interest rate is already at very low level, there would be no buffer of abating the burden of interest payments.

5 Structural components of the corporate tax revenues

In this section, based on the regression results, we will estimate the level of structural corporate tax revenues in relation to the size of the economy under the current tax system. Estimation results are shown in Figure 18. Concrete estimation procedures are as follows:

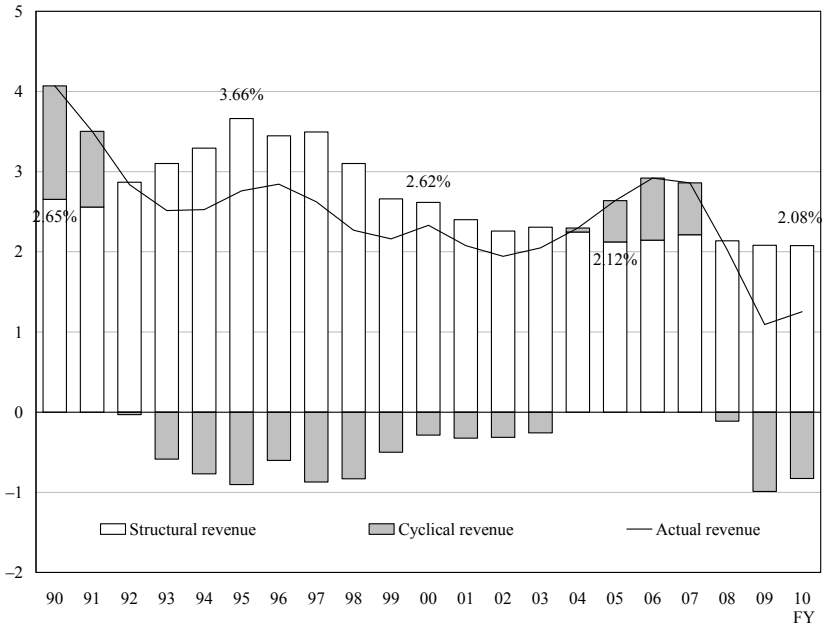
1) Using [reg.1], the potential series of entrepreneurial income when GDP gap is zero is calculated in each year, with the adjustment of extraordinary profits and losses and incomes accrued in foreign sources.[12]
2) Using [reg.3], the potential series of the incomes of corporations in deficit when the GDP gap was zero is calculated.

[12] Extraordinary profits and losses, until 2008, are taken from the actual values in the Financial Statements of Corporation Industry (we assume that the values after 2009 are equal to those in 2008). Incomes accrued in foreign sources, until 2007, are assumed to be equal to the amount of the tax deductions (taken from the Corporations Sample Survey) divided by the average tax rate. Incomes accrued in foreign sources, after 2008, are extended by using the average ratio to tax revenues in 2003-07 (5 years).

3) Using [reg.2] and the estimated series of the incomes of corporations in deficit (obtained in (2)), the potential series of the tax deductions for the carried-over losses is calculated.
4) Adding the incomes of corporations in deficit in (2) to the adjusted entrepreneurial income in (1), and subtracting the tax deductions for the carried-over losses in (3), we can obtain the potential series of the incomes of corporations in positive profit (taxable incomes).
5) The taxable incomes in (4) are multiplied by the actual average rate of corporate tax. Subsequently, the tax deductions (including the deductions for income taxes, etc.) and corporate tax revenues from financial institutions are adjusted.[13]

Figure 19

Estimation of the Structural Revenue of Corporate Tax
(alternative scenario in which the interest rate of debt had been kept constant after 1995, percent of GDP)



The result implies that the potential size of the structural corporate tax revenue in FY 2010 is estimated to be 2.43 per cent of GDP. When we assume the interest rate was constant after 1995 level (without extraordinary low interest rate policy), the structural corporation tax revenue is estimated to be 2.08 per cent of GDP (Figure 19).

Figure 20 shows the virtual series of the structural corporate tax revenues when huge extraordinary losses were zero in the 1990s[14]. Under the current tax system and the level of interest rates at FY1995, the structural corporate tax revenue in FY 2010 is estimated to be 2.39 per cent of GDP, in which we do not consider the effects of tax deductions for carried-over losses generated by the huge extraordinary losses.

Compared with the potential series of the structural corporate tax revenues calculated above, it seems that the actual level of corporate tax revenue in 2006-07, 2.9 per cent of GDP, may exceed the structural level, reflecting a temporal high capital share in the phase of economic recovery. On the other hand, the actual (expected) level of corporate tax revenue in 2010, 1.1-1.3 per cent of GDP, is considerably lower than the level of the structural corporate tax revenue.

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[13] The average tax rate, the amount of tax deductions etc. and the corporate tax revenues from the financial institutions, until 2007, are taken from Corporation Sample Survey data. The average tax rate, the corporate tax revenues from the financial institutions, and the income tax deductions, after 2008, are assumed to be equal to those in 2007. The tax deductions excluding the income tax deductions, after 2008, are extended by using the ratio to tax revenues in 2007.

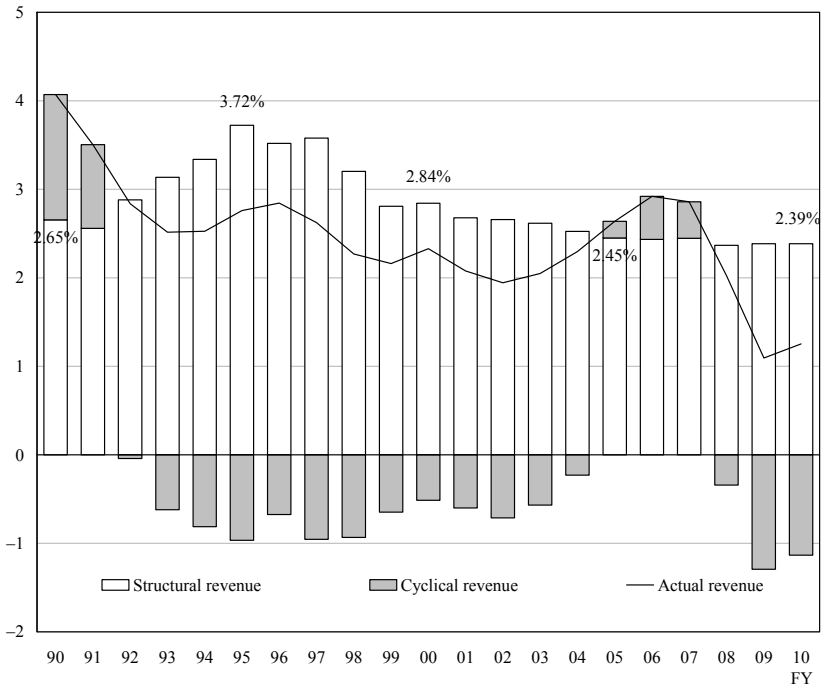
[14] Extraordinary profits and losses (extraordinary profit – extraordinary losses) is virtually assumed to be zero.

6 Conclusions

In recent years, the elasticity and the level of corporate tax revenue have fluctuated widely every year because of the sticky movements of compensation of employees, adhesive movements of interest rates compared with the return on capital, economic shocks stemming from asset price fluctuations and macroeconomic shocks given to sectors unevenly. As we have seen in the previous sections, because the magnitude of the impact of each factor greatly varies over time, it is unreasonable to adopt a methodology of estimating the structural corporate tax revenue under the assumption that the elasticity is fixed at a certain level.

Figure 20

Estimation of the Structural Revenue of Corporate Tax
(alternative scenario in which the huge amount of extraordinary losses had been zero in the 1990s)



In considering fiscal sustainability, it is essential to have a good knowledge on the structural revenue under the current tax system. Structural corporate tax revenue in the long run is largely determined by the trends in labor and capital share, the trends in the return on capital and interest rates, and the trends in incomes of corporations in deficit. Therefore, it is necessary to assume specific scenarios in the future, to calculate correctly the structural tax revenues obtained under those scenarios, and in the long run to implement appropriate and flexible fiscal management in anticipating the structural tax revenues.

In this paper, under the current tax system and the current structure of economy in Japan, if we assume that interest rates got on normal paths and the effects of the tax deductions for carried-over losses due to large-scale extraordinary losses vanished, potential level of the structural corporate tax revenue is estimated to be 2.4 per cent of GDP. In addition, if we assume that interest rates continued to be extremely low and the effects large-scale extraordinary losses in the past were counted, potential level of the structural corporate tax revenue is calculated to be almost the same level as the previous case.

However, it is also necessary for us to be aware that, with fluctuations of the economy, the actual tax revenues can temporarily swing up as in 2006-07, can swing down as in 2009-10, or could continue to be below the calculated level of the structural tax revenue if large tax deductions of carried-over losses were realized due to huge extraordinary losses.

This paper has not discussed how tax revenues can fluctuate in the short run. Although there is a limitation to make accurate estimates, it is possible to run a simulation in which we can estimate the structural level of tax revenue in a macro econometric model where GDP gaps and interest rates are endogenously determined and we can also control the speed of convergence to the potential level of tax revenues by adjusting the factors of extraordinary profits and losses. Based on alternative scenarios with a variety of concepts reflecting the Japan's current economic situation and evolution, we can also make a long-term outlook of the structural tax revenues and the economic structures of production and distribution. These are interesting subjects in the future research.

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