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Abstract

Following generous tax deductions, Japan's income tax base is facing shrinkage. However, this trend has evolved not only due to changes to the system, but also due to changes to the income distribution and population composition. In this study we use household micro data from the National Survey of Family Income and Expenditure (NSFIE, 1994-2014) to explicate the state of deductions and trends in household distribution over a 20-year period while considering each factor's contribution to changes in the tax base, through their decomposition. Using a micro-simulation analysis, we also assess the effects of recent changes to the tax system on the tax base.

Based on a long-term perspective, while the tax base has been eroded mainly due to the effects of falling incomes and an aging population, the contribution of system changes in response to such pressures has been limited. The inclusion of both the expansion and contraction periods in the deduction system also has an effect. Based on a short-term perspective, changes to the system have had a certain impact because, particularly in the 2000s, the tax base was expanded by reducing deductions. However, this effect has eventually been offset by the changes in income distribution and population composition.

Following the ongoing effects of change such as falling incomes and population aging, it is necessary to fundamentally reform the income tax system so that it can have a greater effect, including restoring its fiscal funding and income redistribution functions, as well as the ideal form of the tax base.

JEL Classification: C15, H24
Keywords: Income tax, tax deduction, tax base, National Survey of Family Income and Expenditure

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1. Introduction

In order to sustain the Japanese social security system, it is necessary to review the tax burden on households, including demands to reexamine income tax which is a fundamental tax. Japan is facing a substantial erosion of the tax base due to generous tax deductions, which is tied not only to the degradation of the fiscal funding capability of the income tax, but also to its income redistribution effects. Income tax is considered a direct tax, implying that the taxpayer's circumstances can be considered. Deductions are important in achieving this. Adjusting the tax-paying capacity through these deductions is indispensable to demonstrating a redistributive function. However, when viewed in terms of the burden-reducing effects of deductions, because the tax reductions' benefits are greater for high-income earners, the extensive use of deductions may also reduce its redistributive function in some respects.

Tax expenditure has also been extensively studied overseas (Burman et al., 2008; Poterba 2011; Altshuler and Dietz 2011; Albarea et al., 2015; Avram 2018; Burman et al., 2017). Tax expenditures such as deductions, exclusions, credits and favorable rates are special taxations measures which provide tax relief to certain activities, industries and taxpayer segments (Burman et al., 2017, p.109); the tax expenditure's scope is broad. Contrastingly, in Japan, there have been many efforts to measure the scale of deductions, partly because income tax is a mechanism which commonly and extensively uses deductions (Morinobu and Maekawa 2001; Uemura 2008; Mochizuki et al., 2010; Morinobu and Nakamoto 2013; Uemura and Adachi 2015). This series of studies confirms that Japan has a shallow tax base due to its generous deductions compared to those of other countries (Nakamoto 2014). Additionally, the scale of deductions differs between taxpayers depending on factors such as income and household attributes Moreover, it has been confirmed that the taxable income rate is comparatively smaller for low-income and elderly earners (Tajika and Yashio 2006a, 2006b, 2008, 2010).

These results indicate that the trends in Japan's taxable income rate are also affected by changes in income distribution and population composition, such as population aging. Tanaka and Shikata (2019) stated that, in recent years, income distribution in Japan has been shifting towards lower income groups. This fall in incomes has prompted an increase in the proportion of households with low taxable income rates, which we refer to as (1) Income distribution factors here. Moreover, in the income tax system, elderly households are eligible for deductions for the public pension and for the elderly (note that this was abolished in 2005). Panel (a) in Figure 1 shows the scale of deductions for the employment income and public pension. Both deductions increase with income. However, fundamentally, the value of the deduction is greater for the public pension than for the employment income. This means that even where income is similar, the value of deductions will vary depending on the source of income, be it a salary or pension income. Therefore, because the deduction system is comparatively generous to older households, population aging also increases the proportion of households with lower taxable income rates, which we referred to as (2) Age Composition Factors in this study. Additionally, each group's

taxable income ratio (by income and age segment), including the low-income and elderly segments will also change. One reason for this is the effect of changes in the deduction system due to tax reform, which we termed (3) System Change Factors in this study. Another reason is the effect of changes to income and family composition, which we termed (4) Other Deduction Ratio Factors in this study

In this way, it is necessary to consider the effects of changes in income distribution and population composition when recording trends in the income tax base. However, that does not mean that previous research has not created awareness on this issue. For example, Yashio and Hachisuka (2014) examined the extent to which the aging population contributed to reductions in the income tax base over the period from 2000 through 2009. Moreover, based on future social insurance benefits' estimates, Matsuda et al. (2014) examined the extent to which the future income tax base would shrink due to the expansion of social insurance premium deductions accompanying population aging. In other words, in regards to deductions, it is evident that there is a certain degree of interest in the effects of these environmental changes, external to the system, on the tax base among analysts.

On the other hand, prior studies have not incorporated all of the above factors, (1) - (4), affecting changes in the tax base. This study aims to examine whether the change in the tax base is mainly due to changes to the system, falling incomes or an aging population. Moreover, it aims to investigate the extent to which the system change contributes to the continuance of the tax base in response to reductions in the tax base due to falling incomes and an aging population. These examinations necessitate the incorporation of all the above factors (1) - (4) into the analysis.

In light of the above, this study uses micro-data from the National Survey of Family Income and Expenditure, (NSFIE) (1994, 1999, 2004, 2009 and 2014) to clarify trends in household distribution and tax deductions over the past 20 years. Moreover, through factor decomposition, this study considers each factor's contribution to changes in the income tax base.[1] In this case, the use of micro-data (questionnaire data) is essential because it is necessary to consider the trends in the distribution of income and age when examining the income distribution and age structure factors. Additionally, in order to understand the system change and other deduction ratio factors, we used a micro-simulation method to estimate the value of deductions by applying the incomes and household attributes recorded in the questionnaire to the actual system. The system's change contribution is extracted from the changes in the tax base at each layer. Additionally, since 2014, Japan has been undergoing widespread tax reforms. The latest, in 2020, being a major tax reform from the perspective of promoting the work style reform and ensuring the inter and intra-generational fairness. This study therefore also assesses the impact of tax reforms from 2014 to 2020.

The rest of the paper proceeds as follows: Section 2 reviews the evolution of Japan's tax deduction

[1] Studies analyzing the Japanese tax and social security system using micro-data from the NSFIE include Tanaka and Shikata (2012), Tanaka et al., (2013), Kitamura and Miyazaki (2013), Miyazaki and Kitamura (2014), Ohno and Kodama (2017), Ohno et al., (2018), Kaneda (2018), Miyazaki et al., (2019), Tanaka and Shikata (2019) and Matsumoto et al., (2020).

system since 1994. Section 3 describes the data and methodology used for estimating the value of deductions and income tax liability. Section 4 identifies the trends in deductions and income distribution, while Section 5 quantitatively considers the each factor's contribution through the factor decomposition of changes in the tax base. We also considered the impact of tax reforms between 2014 and 2020. In conclusion, Section 6 discusses conclusions and their implications.

<Insert Figure 1>

2. Changes in the tax deductions system

This study focuses on seven primary personal deductions namely basic, spousal (including special spousal deductions), dependent, social insurance premium, employment income, public pension and elderly deductions all together. Table 1 shows the evolution of these deduction systems.

The basic deduction was uniformly ¥350,000 until 1994, but was raised to ¥380,000 in 1995. Moreover, from 2020 the maximum deduction will be ¥480,000. However, where the total income exceeds 24 million yen, the deduction gradually reduces, and where the total income exceeds 25 million yen, the deduction is zero.

Regarding the spousal deduction, until 1994, the income requirement for spouses eligible for the deduction was 350,000 yen or less. Therefore, the deduction value was 350,000 yen in general, and 450,000 yen for those aged 70 or older. From 1995, the deduction value was expanded by increasing the income requirement and various other deductions by 30,000 yen, respectively. From 2018 this changed such that although the income requirement remained unchanged and the maximum value of the deduction remained 380,000 yen, the deduction value would drop to 0 where the total income exceeded 10 million yen. From 2020, the income requirement for spouses eligible for the deduction will be expanded to 480,000 yen. However, the deduction value will remain unchanged. On the other hand, regarding the special spousal deduction, until 2003, spouses eligible for the spousal deduction were also eligible for an additional deduction of up to 380,000 yen. Contrastingly, in 2004, the additional deduction for the eligible spouses was abolished. From 2018, the income requirement for spouses eligible for deduction was increased from a maximum of 760,000 yen to 1.23 million yen, and then to 1.33 million yen in 2020.

Regarding the dependent deduction, until 1994, the income requirement for the dependent family members subject to deduction was 350,000 yen or less; the deduction value was generally 350,000 yen; 500,000 yen for specified dependents (those aged between 16 and 22), 450,000 yen for elderly dependents (70 years or older) and 550,000 yen for the cohabiting elderly dependents. From 1995 the income requirement and various deductions were increased by 30,000 yen respectively, expanding the scope and value of the dependent deduction. From 1998 the deduction for specified dependents was increased to 580,000 yen. From 1999 the deduction for young dependents (those under 16 years of

age) was increased from 380,000 to 480,000 yen, while that for specified dependents was increased from 580,000 to 630,000 yen. From 2000 however the deduction for young dependents was decreased from 480,000 to 380,000 yen, and was treated similar to that of the general public. Moreover, from 2010, the Japanese government's Democratic Party at the time introduced a child allowance providing monetary allowance to parents and guardians of children under the age of 16, accompanied with their exclusion from dependent deductions, from 2011. Moreover, the deductions for the eligible dependents aged between 16 and 18 were decreased from 630,000 to 380,000 yen, and were treated similar to those of the general public. In 2020 the deduction value remains unchanged However, the income requirement for dependents eligible for deductions was increased from 380,000 to 480,000 yen, expanding the scope of dependent deductions.

Regarding the employment income deductions, a fixed-rate deduction is applied to each bracket. From 2013, the value of deductions reached an upper limit to 2.45 million yen. However, this limit has since decreased, to 2.3 million yen in 2016, to 2.2 million yen in 2017 and to 1.95 million yen in 2020. Moreover, in 2020, the deduction value for employment income has reduced rather than increased the basic deduction value. These changes have expanded the tax base among high-income earners, reducing the tax-reducing effects of deductions.

Regarding the public pension deduction, the deduction value is set by combining each bracket's fixed and fixed-rate deductions. Until 2004, the minimum deduction was 1.4 million yen for those aged 65 and above, and 700,000 yen for those under 65 years old. From 2005 to 2019, the minimum deduction has been 1.2 million yen for those aged 65 years and above and 700,000 for those under 65 years old, easing the gap in deductions between these two age groups. In 2020, rather than increasing the basic deduction value, the public pension deduction value will be reduced. Panel (b) in Figure 1 shows the public pension deduction's structure in 2020. According to the figure, the reduction scale in the public pension deduction varies depending on the income level other than the public pension. Additionally, the deduction value was capped for pension income exceeding 10 million yen (deduction value of 1.95 million yen). Similar to the employment income deduction, these changes expanded the tax base among high-income earners, limiting the deductions' tax-reducing effects.

Regarding the deduction for the elderly, until 2004, the applicability requirement was to be 65 years of age or older with an income of 10 million yen or less and a deduction value of 500,000 yen. This system was however abolished in 2005.

<Insert Table 1>

3. Data and the Method used to Estimate Income and Tax Liability

3.1 Data Used

Household micro data (questionnaire data) from the NSFIE (1994 - 2014) was used. This survey is

conducted every five years, covering approximately 57,000 households across a survey period spanning September to November. At the start of the survey, each household member was questioned on their relationship status, age, gender, employment status among other attributes, income over the past year, and household savings at the time of the survey. In this study, we applied the real system to the household members' attributes and income data to estimate each household's annualized social insurance premiums and income tax liability. We also estimated the deductions value in the course of this series of tasks. The following types of households were excluded from the sample due to the inability to estimate their tax liability.

・Households with members whose age or gender are unknown
・Households where a member has been posted to a job away from the family
・Households with persons moving out
・Households with blanks, unknown codes or top codes for items in the survey

3.2 The method of estimating income and income tax liability[2]

3.2.1 The method for estimating income

Annual income data from the Annual Income and Savings Questionnaire was used for estimating income other than interest and dividend income. Annual income in the NSFIE breaks down to the following 10 items.

(1) Annual income from work
(2) Income from agriculture, forestry and fisheries
(3) Business income from sources other than agriculture, forestry and fisheries
(4) Annual income from side jobs etc.
(5) Annual income from rent and land rent
(6) Public pensions and government pensions
(7) Income from corporate and private pensions
(8) Interest and dividends
(9) Money sent from relatives etc.
(10) Other annual income

Each of income items surveys the income of the head of the household, spouse of the head of the household, other household members under 65 years and other household members 65 years old and above. However, only the total value of income of the household members who fall under the

[2] This paper employs the method used by Ohno et al., (2018) and Matsumoto et al., (2020) to estimate income, social security premiums and income tax liability. See Appendix A for details.

households with multiple persons in the other household members under 65 years and those aged 65 and above classifications, can be ascertained. For this reason, in those households, these members' income is apportioned as follows.

In the case of income items (1)(2)(3)(6)(7), the annual income may vary depending on the age and gender of household members. Therefore, the average income based on gender and age group is first obtained from the incomes of the heads of the household and their spouse, for whom individual income is known. The combined income of the members of the households with multiple persons in the other household members under 65 years of age or 65 years and older classifications, is prorated to each household member according to the ratio of the previous average income.

In the case of income items (4)(5)(9)(10), the annual income, where there is more than one person in the above mentioned classifications is prorated by the number of household members. Note however that household members under the age of 15 are excluded from this proration.

However, among the items that constitute the Annual Income and Savings Questionnaire, (8) interest and dividends is conspicuous in their underrepresentation. We therefore estimated the interest and dividend income using the asset balance from the questionnaire and by multiplying the balance of the financial assets held by the household by the market interest rate (annual interest rate). Note that because the financial assets can only be understood on a household basis, income from interest and dividends are estimated on a household basis.

3.2.2 The method for estimating income tax liability[3]

While estimating income tax liability, it is also necessary to estimate the value of social insurance premiums used in the social insurance premium deduction. This study assumes that the highest income earner is the head of the household (rather than the dependent relationship written on the household questionnaire), and designates the spousal and dependents relationships in the tax and social insurance system based on the situation of the head of the household and the relationship to the family, age, occupation and income of other household members.

Estimating the value of social insurance premiums requires that the social insurance system in which each family member is enrolled be identified. In this study, for the public pension, health insurance, nursing insurance and employment insurance systems, we first inferred to which system each

[3] In this study, we estimated the liabilities by applying the real system to the incomes and attributes of households listed in the questionnaire. The methodology is the same as that of micro-simulation, where new variables are constructed virtually by applying a social system to each household from the available variables; and while it is possible to estimate highly individual variables such as tax and insurance premiums for each household from limited information, it may also contain large measurement errors. However, Ohno et al., (2015) and Tada et al., (2016) verified its validity as a method for estimating tax liability and insurance premiums using the Comprehensive Survey of Living Conditions (CSLC), confirming that the estimate values had high accuracy. Additionally, the NSFIE can also be used for the variables required in estimating the value of household tax liabilities and insurance premiums. Sano et al., (2015) and Tada and Miyoshi (2015) confirmed that the CSLC and NSFIE are consistent in terms of household attributes and income data. Therefore, the method for estimating liability can also be applied to the NSFIE, and the validity of the estimates constructed are regarded as having the same degree of accuracy.

household member is enrolled and then applied the actual premium calculation to estimate the burden.

In the income tax estimation, the actual tax system is applied to data on household attributes and income to determine the value of the burden. The Income Tax Act classifies income into 10 categories. However, here we calculated the total income using the salary, business, miscellaneous and real estate incomes from the NSFIE. Taxable income is then calculated by subtracting various deductions from the total income. The deductions applied here are the basic, spousal (special), dependent, elderly (up to 2004), social insurance premium, employment income and public pension deductions. The social insurance premium deduction uses the paid social insurance premiums value calculated earlier.[4] Finally, the marginal income tax rate table is applied to taxable income to calculate the income tax liability for total taxable income. The fixed rate tax reduction (from 1994 to 2006) and special reconstruction income tax (from 2013) are also considered here.

Additionally, the income tax liability value also includes taxation of interest and dividends. We estimated the interest and dividends value of the income tax liability by applying the real tax system to the previously estimated interest and dividend income values. The taxation of the earned interest is estimated by applying the applicable income tax rates to the interest income under separate taxation. We also considered the minor savings tax exemption system for the elderly (until 2005). Additionally, because it is possible to choose between comprehensive and separate taxation for dividend taxation, the taxation system offering the smaller liability is chosen for each household. In so doing, we also considered the dividend tax credit where comprehensive taxation is chosen.

4. The state of and changes to tax deductions

In order to understand the state of and changes to the deductions, we reviewed the deduction (average values) and its ratio (the ratio of deductions to total income). Since this study also considers the deductions' breakdown, rather than the tax base we focused on the size of the deductions. Additionally, the sample is on a household basis, hence, the levels of income and deductions used an equivalent household basis.

4.1 Changes in the value and ratio of the tax deductions[5]

We focused on the levels of the deduction values and ratios, and their changes. Figure 2 shows each deduction's average value between 1994 and 2014 in a cumulative bar chart, and equivalent household total income and the ratio of deductions to total income in a line graph. Panel (a) in Figure 2 focuses on all the households; the ratio of the deduction is 65-73%, consistent with previous studies which state that Japanese households benefit from broad deductions. Focusing on trends in the past 20 years,

[4] Here, we do not consider deductions based on information not obtained from the questionnaire (disability deductions, medical expense deductions, special credits for home loans etc.).

[5] The value of deductions is estimated and obtained in this study. In so doing, depending on the household the value of deductions may exceed gross income and taxable income becomes negative; in such cases taxable income is treated as zero. Thus, no household will have a deduction ratio greater than 100%.

the value of deductions increased in the latter half of the 1990s. However, this has been decreasing since the 2000s. Additionally, after rising in the late 1990s, the deduction ratio has been almost consistent since the 2000s, partly due to the falling total incomes.

Behind this shift lies not only changes to the system, but also their effects in income distribution and population composition. One of the effects of changes to the system was the expansion of the deduction system in the latter half of the 1990s. In other words, this period saw a relaxation of requirements and expansion in the value of deductions for the basic, spouse and dependent deductions. Cutbacks to the deduction system since the 2000s can also be cited. For example, in the early 2000s, the spouse deduction was reduced through the abolition of the addition special spousal deduction. Moreover, in the first half of the 2010s, the dependent deduction was reduced accompanied by the introduction of the child allowance. On the other hand, the impact of changes in income distribution and population composition can be cited as population aging. In other words, the decrease in the proportion of working-age households and the increase in the share of aged households has resulted in a decrease in employment income deductions and an increase in public pension deductions. Additionally, while there is no significant change apparent in the social insurance premium deductions, this is likely to be caused by the interaction of the increase in social insurance premiums and the decline in the percentage of working-age households.

We further examined the sample by dividing it into working-age and retired households. Panel (b) in Figure 2 shows working-age households. However, regarding the trends over the past 20 years, a decrease in employment income deductions is not be confirmed. Thus, the decrease in employment income deductions across all households in Panel (a) is due to the effects of population aging, i.e., an increase in the percentage of elderly households (decrease in the percentage of working-age households). Moreover, Panel (c) in Figure 2 focuses on elderly households: the level of the deduction ratio is 80-87%, larger than of working-age households. Previous studies clearly show that elderly households benefit from greater deductions than working-age households. Although deductions were reduced in the late 2000s through the reduction of the public pension deduction and abolition of the deduction for the elderly, elderly households continue to benefit from the deductions to a comparatively large extent.

<Insert Figure 2>

We briefly reviewed the effects of changes to the system and of the economic and social changes on the income tax system. Table 2 shows the trends in the level of income, deduction and income tax liability ratios. First, in order to exclude the effects of changes in economic and social conditions, we measured the effects of changes to the system by fixing the year of the data and changing only the year of the income tax system. Panel (a) in Table 2 shows the measurement results

where the year of the data is fixed to 2014.[6] In terms of total households, in the late 1990s the tax base shrank as the deduction ratio rose, hence, the tax liability ratio fell accordingly. Since the 2000s, the tax base has subsequently expanded as the deduction ratio has declined, and tax liability ratios have increased. When viewed in terms of long-term changes over the 20-year period, the deductions and tax liability ratios have slightly increased and decreased respectively. This indicates that the tax base has shrunk and the ability to raise tax revenues has declined. Capturing the long-term changes by separating the working-age and retired households, the working-age households' deductions and tax liability ratios have increased and fallen respectively. The retired households on the other hand, have experienced a decrease in the deduction ratios and an increase in the tax liability ratios.

In order to exclude the effects of changes to the system, we measured the effects of the economic and social changes by fixing the income tax system year and change on only the year of the data. Panel (b) in Table 2 shows the measurement results in 2014, which was the year of the income tax system.[7] Regarding the total households, the gross incomes have consistently declined over the past 20 years. Against this backdrop, the deduction ratio has risen, the tax base has shrunk, and the tax liability ratio has fallen accordingly. This fact indicates that changes in the income distribution and population composition have reduced the tax base and the ability to raise tax revenues. The decrease in tax liability ratio also includes the impact of many households moving to a lower applicable tax bracket. Regarding the magnitude of change, the impact of changes in economic and social conditions shown in Panel (b) is greater than that of the system changes shown in Panel (a). Capturing the long-term change by separating the working-age and retired households, the same trend is observed in both cases as in the total households' case. However, the change is particularly greater for the retired households than it is for working-age households.

<Insert Table 2>

4.2 Deduction ratios and household ratios viewed by income bracket

We also reviewed the deduction ratios and household ratios in terms of income brackets. Figure 3 compares the deduction ratios and household ratios by the income group in 1994 and 2014. The number of income brackets is set at 10, and each bracket's thresholds were created from the income deciles based on equivalent household disposable income for all households in 1994.

Panel (a) in Figure 3 focuses on working-age households. In both 1994 and 2014, the low-income brackets' deduction ratio was higher. Comparing the two points in time, the low-income brackets' deductions ratio has fallen and increased for the high-income groups, slightly narrowing the difference

[6] Additionally, measurements were also made where the data years were fixed to 1994, 1999, 2004 and 2009, respectively. In each case, qualitatively similar results were obtained.

[7] In addition, measurements were also made where the income tax system years were fixed to 1994, 1999, 2004 and 2009, respectively. In each case, qualitatively similar results were obtained.

between the groups. Comparing the household ratios between the two points in time, the proportion of the households in all income brackets except the first income bracket have decreased due to the effects of population aging. Regarding the distribution for each year within this context, the proportion of the households in high income brackets was greater in 1994, while that of those in lower income brackets was greater in 2014. From these results it is evident that, in addition to the declining working-age household ratios due to the effects of population aging, their incomes are falling.

Moreover, Panel (b) in Figure 3 focuses on elderly households. However, in both 1994 and 2014, the low-income brackets' deduction ratio was higher. Comparing the two points in time shows that majority of the income brackets' deduction ratios has fallen, which is assumed to be the impact of the reduction in public pension deductions and the abolition of the deduction for the elderly. Moreover, comparing the household rates between the two points in time showed that the proportion of households in each income bracket has increased due to the effects of population aging. Regarding each year's distributions, the proportion of households was higher in the lower income brackets in 1994, and further increased in 2014. From these results it is clear that in addition to an increase in the proportion of elderly households, due to the effects of population aging, their incomes have fallen.

In this way, the Japanese changes in the deduction ratio are subject to influence not only from system changes but also from changes to the income distribution and population composition. In the next section therefore, we clarified the state of changes to the deduction ratio through the decomposition of four factors namely the system change, other deduction ratios, age structure, and income distribution.

<Insert Figure 3>

5. Decomposition of factors in the change in deduction ratios

5.1 Factor decomposition method

First we explained the factor decomposition method of changes in the deduction ratio. When the deduction ratio (average of all households) at time t is A^t, the following equation (1) holds.

$$A^t = \sum_{i=1}^{I} \sum_{j=1}^{J} a_{ij}^t \cdot m_{ij}^t \cdot r_i^t$$

Equation (1)

Here, i and j denote the income and age brackets respectively. Variable a_{ij}^t denotes the deduction ratio in income bracket i of age bracket j, m_{ij}^t denotes the ratio of the age structure of age bracket j in income bracket i (= the number of households in income bracket i and age bracket j / the number of households in income bracket i), and r_i^t denotes the proportion of households in income bracket i (=

the number of households in income bracket i / total number of households). Therefore, Equation (1) shows that deduction ratio (average value for all households) A^t is composed of each brackets deduction ratio, age structure ratio and the household ratio.

A comparison of the deduction ratio (average of all households) between different points in time can be expressed as follows: Here the base and comparison years are expressed as 0 and 1 respectively.

$$\Delta A = A^1 - A^0$$

Equation (2)

If equation (2) is transformed after including the relationship in Equation (1), the following Equation (3) is obtained;

$$\Delta A = \sum_{i=1}^{I}\sum_{j=1}^{J}\left(a_{ij}^1 - a_{ij}^0\right)\cdot\frac{m_{ij}^1\cdot r_i^1 + m_{ij}^1\cdot r_i^0 + m_{ij}^0\cdot r_i^0}{3}$$
$$+\sum_{i=1}^{I}\sum_{j=1}^{J}\left(m_{ij}^1 - m_{ij}^0\right)\cdot\frac{r_i^1\cdot a_{ij}^1 + r_i^1\cdot a_{ij}^0 + r_i^0\cdot a_{ij}^0}{3}$$
$$+\sum_{i=1}^{I}\sum_{j=1}^{J}(r_i^1 - r_i^0)\cdot\frac{a_{ij}^1\cdot m_{ij}^1 + a_{ij}^1\cdot m_{ij}^0 + a_{ij}^0\cdot m_{ij}^0}{3}$$

Equation (3)

Equation (3) is a factor decomposition of changes in the deduction ratio (average of all households) into three factors. Factor 1 on the right shows the effect of changes in the deduction ratio in individual brackets (deduction ratio factor), factor 2 shows the effect (age composition factor) of changes in the age composition ratio within a given income bracket, and factor 3 shows the effects of changes in the household ratio across all the income brackets (income distribution factor). Equation (4) is established by further separating the deduction ratio factor into the effects of the system change and other factors.

$$\Delta A = \sum_{i=1}^{I}\sum_{j=1}^{J}\left(a_{ij}^{1} - a_{ij}^{1(0)}\right)\cdot\frac{m_{ij}^{1}\cdot r_i^{1} + m_{ij}^{1}\cdot r_i^{0} + m_{ij}^{0}\cdot r_i^{0}}{3}$$

$$+\sum_{i=1}^{I}\sum_{j=1}^{J}\left(a_{ij}^{1(0)} - a_{ij}^{0}\right)\cdot\frac{m_{ij}^{1}\cdot r_i^{1} + m_{ij}^{1}\cdot r_i^{0} + m_{ij}^{0}\cdot r_i^{0}}{3}$$

$$+\sum_{i=1}^{I}\sum_{j=1}^{J}\left(m_{ij}^{1} - m_{ij}^{0}\right)\cdot\frac{r_i^{1}\cdot a_{ij}^{1} + r_i^{1}\cdot a_{ij}^{0} + r_i^{0}\cdot a_{ij}^{0}}{3}$$

$$+\sum_{i=1}^{I}\sum_{j=1}^{J}\left(r_i^{1} - r_i^{0}\right)\cdot\frac{a_{ij}^{1}\cdot m_{ij}^{1} + a_{ij}^{1}\cdot m_{ij}^{0} + a_{ij}^{0}\cdot m_{ij}^{0}}{3}$$

Equation (4)

Here, $a_{ij}^{1(0)}$ denotes the deduction rate where the deduction system of the base year is applied using the data of comparison years. Thus, factor 1 on the right hand side of Equation (4) indicates the effect of using data from comparison years while changing only the year of the deduction system, and thereafter measuring the true contribution that system changes have made to the deductions ratio. For example, this corresponds to the effects of an increase or decrease in the value of various deductions and an increase in the social insurance premium deductions value as a result of increases in premium rates. We termed this the system change factors. The second factor indicates the effect of using the base year's deduction system to change only the year of the data after which it measures the effect on the deduction ratio due to changes in income level and family structure supposing the absence of changes to the system. For example, this corresponds to the impact of the decline in the number of dependents due to family nuclearization and the declining birthrate. We termed this the other deduction ratio factors. Factor 3 measures the effects of changes in age composition. Under the Japanese deductions system, the value of deductions differs depending on the source of income, be it employment or pension income, even when the two are equivalent. Following the comparative generosity of the deduction systems to elderly households, population aging will increase the proportion of households with high deduction ratios. We termed this the age composition factors. Factor 4 measures the effects of changes in income distribution. Essentially, the lower the income bracket, the higher the deduction ratio. As such, falling incomes will increase the proportion of households with higher deduction ratios. We termed this the income distribution factors. Note that when an individual transition from employment to an unemployment (pensioner) due to retirement, the primary source of income changes from employment to pension income. At this point, not only does the type of income source change, but also usually results in a fall in income levels. Income distribution factors include the effects of the decline in incomes due to population aging.

5.2 Results of factor decomposition measurement

While measuring equation (4)'s factor decomposition, the income and age brackets' numbers are set at 10 and 2 respectively (those where the head of the household is under 65, and those where they are 65 years of age or older). Table 3 shows the results of the factor decomposition measurements.[8]

First, we considered the results of the long-term change. The deduction ratio has increased by 6% over the 20 years (from 1994 to 2014), indicating that the tax base has contracted. In the background to this, the income distribution factors have made the largest contribution, while the falling incomes are affecting both working-age and elderly households. The contribution made by the age composition factors is also large, and the increase in the deduction ratio can be explained primarily by these two factors. Conversely, the system change factors have had a negative contribution, but only to a limited extent. However, there was a trend expansion in the deduction system in the latter half of the 1990s and a trend contraction since the 2000s. Moreover, it is possible that these effects may have offset one another over the 20 years. Therefore, it is necessary to also consider the consequences of the short-term changes.

We thereafter, considered the consequences of short-term changes by dividing the period into 5-year intervals. Changes in the second half of the 1990s (from 1994 to 1999) saw the deductions ratio (average of all households) increase by 5.9% which indicates that the tax base had shrunk. In the background to this, the contribution of the system change factors was the largest. The deduction ratio for the working-age households particularly, increased significantly. Revisions to the system in the second half of the 1990s included an increase in the value of the basis, spouse and dependent deductions, as well as an expansion of the employment income deductions from low-income brackets to include the middle-income brackets.

The changes in the first half of the 2000s (from 1999 to 2004) were minor, with the deduction ratio (average of all households) falling by 0.1%. However, in the background to this, the system change factors made a negative contribution. Moreover, the working-age households' deduction ratio particularly decreased. Revisions to the system in the early 2000s included the abolition of the special spousal deduction additional payment and the reduction in the value of the deduction for under the 16 in the dependents deduction, indicating an expansion of the tax base. On the other hand, income distribution and age composition factors made a positive contribution. Consequently, although the tax base expanded in this period following the revisions to the system, the effect was offset by changes in income distribution and population composition.

Changes in the latter half of the 2000s (from 2004 to 2009) saw the deduction ratio (average of all households) fall by 0.8%. In the background to this, system change factors made a negative

[8] The contributions of each of the four factors in the factor decomposition were respectively measured by income bracket and age bracket. Since, with regards to age composition factors the contributions of working-age and elderly households essentially offset one another, both are totaled and recorded in the measurement results table.

contribution. Particularly, the deduction ratio of elderly households declined. Revisions to the system in the latter half of the 2000s included the reduction of the deduction value for persons aged 65 and above in the public pension deduction and the abolition of the deduction for the elderly, showing an expansion of the tax base. On the other hand, the income distribution and age composition factors made a positive contribution. As in the first half of the 2000s, although the tax base was expanded, this effect was offset by changes in income distribution and population composition.

The changes in the first half of the 2010s (from 2009 to 2014) saw the deduction ratio (average of all households) increase by 1.1%. In the backdrop to this, the system change factors made a negative contribution, and the working-age households' deduction ratio particularly decreased. Revisions to the system in the first half of the 2010s included the exclusion of those under 16 years of age from the dependent deduction, a reduction in the deduction value for those between 16 and 19 years old and the imposition of an upper limit on the cap on the employment income deduction, indicating an expansion of the tax base. On the other hand, the income distribution and age composition factors made a positive contribution. Consequently, the effects of changes in income distribution and population composition were dominant in this period, which resulted in a contraction in the tax base.

Based on a long-term perspective, while the tax base has been eroded mainly by the effects of the falling incomes and population aging, the contribution made by the changes to the system to respond to these pressures has been limited. The inclusion of both the expansion and contraction periods in the deduction system also has an effect. Based on a short-term perspective, changes to the system have had a certain effect because, particularly in the 2000s, the reduction of deductions expanded the tax base. However, this effect has eventually been offset by changes in income distribution and population composition.

<Insert Table 3>

5.3 Micro-simulation analysis of recent tax reforms

Since 2015, extensive revisions have been made to the Japanese deductions system, the most recent being the launch of a new system in 2020 based on promoting the work style reform and ensuring intra and inter-generational fairness. We estimated the value of household deductions by applying the 2020 tax system to the 2014 data to assess the effect of tax system reforms from 2014 to 2020. However, regarding the social insurance premiums, the 2014 premium rate remains unchanged hence, it does not reflect the effects of social insurance premium deductions.[9]

Panel (a) in Table 4 shows the changes in the deduction ratio due to the tax reform. Evidently, the deduction ratio for all households increased by 0.7% and the tax base has shrunk following the recent

[9] Here we capture only the effects of tax system reform by swapping the year of the system while holding the data years fixed. The effect of the trial calculation corresponds only to the "system change factors" in the earlier factor decomposition.

tax reform. Based on the age bracket, both the working-age and elderly households have experienced a deduction ratio. However, the increase is greater for working-age households. Moreover, based on the income bracket, while the deduction ratio has increased for the majority of the brackets, the deduction ratio fell for high income brackets. In the background to this are the deduction expansion factors including the increase in the value of the basic deduction and relaxation of income requirements for the spouse and dependent deductions. The deduction reducing factors include the reduction in the deductions value for employment income and public pension deductions respectively, and the imposition of a cap on the deduction value.

The breakdown of the effects of these individual deductions provides, clear results. Panel (b) in Table 4 shows the changes in the value of deductions following the tax reform. Evidently, through the recent reforms, both the working-age and elderly households have benefited from increased deductions in the basic, spousal and dependent deductions. On the other hand, the working-age households are experiencing the effects of a reduction in the employment income deduction while the elderly households are experiencing a reduction in the value of public pension deductions.

In light of the above, first, while the intergenerational disparity in deduction ratios has been decreased by the recent tax system reform, this gap remains wide even after the reform. Second, expense deductions such as employment income and public pension deductions are important factors that shrink the income tax base. These characteristics have persisted despite the tax reform. This intergenerational disparity in deduction ratios and the scale of expense deductions remains an important policy issue in reviewing the income tax base.

<Insert Table 4>

6. Conclusion

One of the issues facing Japan's income tax is the shrinking of the tax base due to generous deductions. However, this trend in the tax base is not only due to the changes to the system, but also is affected by changes in the distribution of income and population composition. In this study, using household questionnaire data from the NSFIE (1994-2014), we clarified the state of deductions over 20 years and trends in household distribution, and considered the contribution of various factors to changes in the tax base through factor decomposition. Moreover, since 2015, extensive revisions have been made to the Japanese deduction system, the most recent being the launch of a new system in 2020 based on promoting the work style reform and ensuring intra and inter-generational fairness. We therefore assessed the effects of recent tax system reforms on the tax base through a micro-simulation analysis.

The factor decomposition shows that while from a long-term perspective the erosion of the tax base is mainly due to falling incomes and population aging, the contribution of system changes in response

to these pressures has been limited. The inclusion of both the expansion and contraction periods in the deduction system also has an effect. From a short-term perspective, changes to the system have had a certain impact because, particularly in the 2000s, the tax base was expanded by reducing deductions. However, their effects have eventually been offset by changes in income distribution and population composition.

Japan's deduction for the employment incomes are characterized by large employment income and public pension deductions, as well as large intergenerational disparities in the deduction ratios. Up to 2020, a micro-simulation analysis of the tax reforms up shows that while some improvements have been made to these issues through reforms to the tax system in recent years, their effects have been limited and remain important policy issues.

Following the ongoing impact of changes such as falling incomes and population aging, a fundamental reform of the income tax system in future that can have a greater effect than before in order to demonstrate income redistribution while considering the individual taxpayers' tax-bearing capacity is necessary.

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Appendix A: The methods used to estimate income, social insurance premiums and income tax liability

In this addendum, we explained the respective methods used to estimate the income, social insurance premiums and income tax referred to in Section 3.

A.1 The method for estimating income

A.1.1 Estimating income other than interest and dividend income

We used the annual incomes listed in the Annual Income and Savings Survey Questionnaire of the NSFIE for income data. Income is broken down into the following forms of income.

(1) Annual income from work
(2) Income from agriculture, forestry and fisheries
(3) Business income from sources other than agriculture, forestry and fisheries
(4) Annual income from side jobs etc.
(5) Annual income from rent and land rent
(6) Public pensions and government pensions
(7) Income from corporate and private pensions
(8) Interest and dividends
(9) Money sent from relatives etc.
(10) Other annual income

The Annual Income and Savings Questionnaire surveys the annual incomes of the head of the household, spouse of the head of the household, other household members under 65 years of age and those 65 years of age or older. However, for households with multiple persons in the other household members under 65 years of age and those 65 years of age or older, only the total value of income of all the household members in the respective categories can be known. For this reason, in these households, income from the above mentioned categories is prorated according to the following rule:

First, In the case of income items (1)(2)(3)(6)(7), the annual income differs depending on the age and gender of the household member. Therefore, from the income of the head of the household and their spouse, for whom individual incomes are known, the average income is calculated by gender (male / female) and age bracket (15-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70+ years of age). Where there is more than one individual in the above mentioned categories, the combined income is prorated to each household member according to the ratio of the average income calculated previously.

In the case of income items (4)(5)(9)(10), where there are multiple individuals in the two categories, the annual income is prorated based on the number of members in the household. However, household members under the age of 15 are excluded from proration.

A.1.2 Estimating income from interest and dividends

Since the Annual Income and Savings Questionnaire underestimates interest and dividends, we used the savings information from the Annual Income and Savings Questionnaire, and estimated the income by multiplying the financial assets held by households by the market interest rate (annual interest rate). Note that since financial assets can only be understood on a household basis, interest and dividend income is estimated on household basis. The breakdown of the savings information used is as follows;

- Cash-based savings at the Japan Post Bank etc. (herein termed ordinary savings)
- Periodic savings at the Japan Post Bank (Herein termed fixed-term savings)
- Cash deposits at ordinary banks (herein termed ordinary deposits)
- Periodic deposits at ordinary banks (herein termed fixed-term deposits)
- Stocks and stock investment trusts (Herein termed stocks)
- Bonds and corporate bond investment trusts (herein termed bonds)
- Loan and money trusts (herein termed trusts)
- Other deposits such as company internal deposits for employees (herein termed internal deposits)

Among these items, income earned from ordinary and fixed-term savings, ordinary, fixed-term and, bonds, trusts and internal deposits are termed "interest income.” Meanwhile, income earned from stocks is classified as "dividend income.” This study treats the sum of interest and dividend income as income from interest and dividends.

The interest rates published in the Ministry of Finance's Monthly Report of Fiscal and Monetary Statistics and on the Japan Post Bank's website are used for ordinary and fixed-term savings. Of these, the fixed-term savings’ interest rate (3 years or more) is applied to fixed-term savings. The interest rates published in the Monthly Report of Fiscal and Monetary Statistics were also used for ordinary and fixed-term deposits, stocks, and dividends. The average interest rate for fixed-term deposits (average interest rate for new deposits of less than 3 million yen for more than one year and less than two years) is applied to fixed-term deposits. Regarding stocks, the average yield of stocks of companies listed on the First Section of the Tokyo Stock Exchange is applied, and the 10-year government bond interest rate is applied to bonds. Regarding trusts, the five year expected dividend rates published in the Monthly Report of Fiscal and Monetary Statistics for 1994-2004 is applied. For the period from 2009 through 2014, we applied the expected five-year dividend rate at the Mitsubishi UFJ Trust Bank as of 2015. In conclusion, the same interest rate applied to the fixed-term savings is applied to internal deposits.

A.2 The method for estimating social insurance premiums

In estimating social insurance premiums, we must first specify to which social insurance system each household member is enrolled. Regarding the public pension, health insurance, nursing insurance and employment insurance systems, we first inferred to which system each household member is enrolled and then applied the actual premium calculation to estimate the burden.

A.2.1 Estimating public pension premiums

Regarding the system of enrollment, household members whose annual income from work is greater than the average wage of a part-time worker multiplied by 30 hours and 52 weeks are considered enrolled in the employees' pension insurance (No. 2 insured persons), those whose annual income is below a certain amount, (For example, less than 1.3 million yen in 2014) whose spouse is a No.2 insured person are No.3 insured persons, and all others are considered enrolled in the state pension (No.1 insured persons). Additionally, household members under the age of 19 or over the age of 60 are principally not required to make pension contributions. However, those aged 70 and below that satisfy the income requirements to be No.2 insured persons are considered enrolled in the employees' pension insurance.

In terms of premiums, No.1 insured persons pay a fixed premium (for example, 15,250 yen per month in 2014, on an annual basis), and persons meeting the income criteria of the exemption system (full, three quarters, half or one quarter) always apply the exemption. For the No.2 insured persons, the average premium rate for the No.1 insured persons and the employees' pension listed on the home page of the Japan Pension Service is split between the employer and the insured, and the annual income from work is multiplied by the premium rate after that split. We also considered the standard monthly value of employees' pensions and the maximum value of standard bonuses.

A.2.2 Estimating health insurance premiums

Regarding the system of enrollment, household members aged 75 years and above are considered enrolled in the latter-stage of the elderly healthcare system (Only in 2009 and 2014 following the introduction of the system). Those aged 74 and below enrolled in the employee's pension were considered enrolled for health insurance (employee insurance), while all others were considered enrolled in the national health insurance system. Additionally, where annual income is less than a certain amount (e.g. less than 1.3 million yen in 2014) and there are relatives cohabiting with a person enrolled in the health insurance (employee insurance), those household members are considered dependent on that health insurance (employee insurance).

Regarding the health insurance, the premiums for health insurance (employee insurance) are considered the insurance premiums of the Japanese Health Insurance Association listed on their website, split between the employee and employer, and the annual income from work is multiplied by the premium rate following the split. The National Health Insurance premiums are calculated using

the national average of levy on income, asset rate, per-capita rate, and per-household rate from the National Health Insurance Survey. We also considered the limit on the value of the national insurance premiums imposed, as well as the reduction system corresponding to the benefit rate. The premiums for the latter-stage of the elderly healthcare system used the national averages for per-capita income and income-based levies listed on the Ministry of Health, Labor and Welfare website. We also considered the upper limits on payments in the latter-stage of the elderly healthcare system, as well as the reduction system for the income-based levy and per capita rate.

A.2.3 Estimating nursing care insurance premiums

The national average (weighted average) of base premiums for each prefecture listed in the Ministry of Health, Labour and Welfare website are applied to the insurance premiums for the No.1 insured persons (65 years or older). The premiums for the No.2 insured persons (aged 40-64 years) are separated into those enrolled in the national health insurance system and those enrolled in employee health insurance. The national average for the income-based and asset-levy, per-capita rate and household rate for nursing care premiums from the National Health Insurance Survey were applied to persons enrolled under the National Health Insurance. (However, due to the characteristics of the statistics used, this method was applied only to years 2009 and 2014. Years previous to 2009 were estimated based on the sum of the health insurance premiums.) We also considered the limit on the value of the national insurance premiums imposed, as well as the reduction system corresponding to the benefit rate. For those enrolled in the employee health insurance, the national average premium rate recorded on the National Japan Health Insurance Association website was split between employee and employer, and the annual income from work multiplied by the premium rate following the split. We also considered the upper limit of the standard monthly income category and maximum standard bonus value for the employee health insurance.

A.2.4 Estimating employment insurance premiums

Regarding the enrollment in employment insurance, employees whose annual income from work exceeds a certain amount (e.g., in 2014, the average wage for part-time workers multiplied by 20 hours and 52 weeks) were considered enrolled.

Regarding the insurance premiums, we applied the worker contribution rate for general businesses listed in the Ministry of Health, Labor and Welfare website (e.g., 0.5% in 2014), and multiplied the contribution rate by the annual income from work.

A.3 The method for estimating income tax liability

A.3.1 Estimating the income tax liability (excluding interest and dividend income taxation)

To estimate income tax, we applied the actual tax system to the data on household attributes and

income to calculate the value of the tax burden. Although the Income Tax Act classifies income into 10 categories, we used income available from the NSFIE, that is, the salary, business, miscellaneous and real estate income. Specifically, the income categories were classified as follows, and total income calculated.

Salary income = [(1) Annual income from work] - employment income deductions
Pension income = [(6) Public pensions and government pensions]
+ [(7) Income from corporate and private pensions]
- Public pension deductions
Business income = [(2) Income from agriculture, forestry and fisheries]
+ [(3) Business income from sources other than agriculture, forestry and fisheries]
+ [(4) Annual income from side jobs etc.]
Real estate income = [(5) Annual income from rent and land rent]
Total income = Salary income + Pension income + Business income + Real estate income

Taxable income is then calculated by subtracting various deductions from the total income. The deductions applied here are the basic, spousal (special), dependent, elderly (up to 2004) and the social insurance premium deductions. The social insurance premium values estimated earlier were used for social insurance premium deductions. Note that deductions based on information not obtained from the questionnaire (e.g., disability deductions, medical expense deductions, special credits for home loans etc.) were not considered. Specifically, we calculated this as follows;

Provisional taxable income 1 = Total income - basic deduction
- social insurance premium deduction – deduction for the elderly
Provisional taxable income 2 = Provisional taxable income 1 - Spousal deduction
- Special spousal deduction
Taxable income = Provisional taxable income 2 - Dependent deduction

First, the value after subtracting the basic, social insurance premium and elderly deductions from the total income is considered a provisional taxable income 1. The (special) spousal deduction is applied to the household member whose provisional taxable income 1 is higher within the couple, which is considered provisional taxable income 2. The dependent deduction is applied to the member with the highest provisional taxable income 2 in a household where there are members subject to the dependent deduction. This is then considered taxable income. In conclusion, the marginal income tax rate table is applied to that taxable income to estimate the income tax liability. We also considered the fixed-rate tax reductions (from 1994 to 2006).

A.3.2 Estimating tax liability for interest and dividends

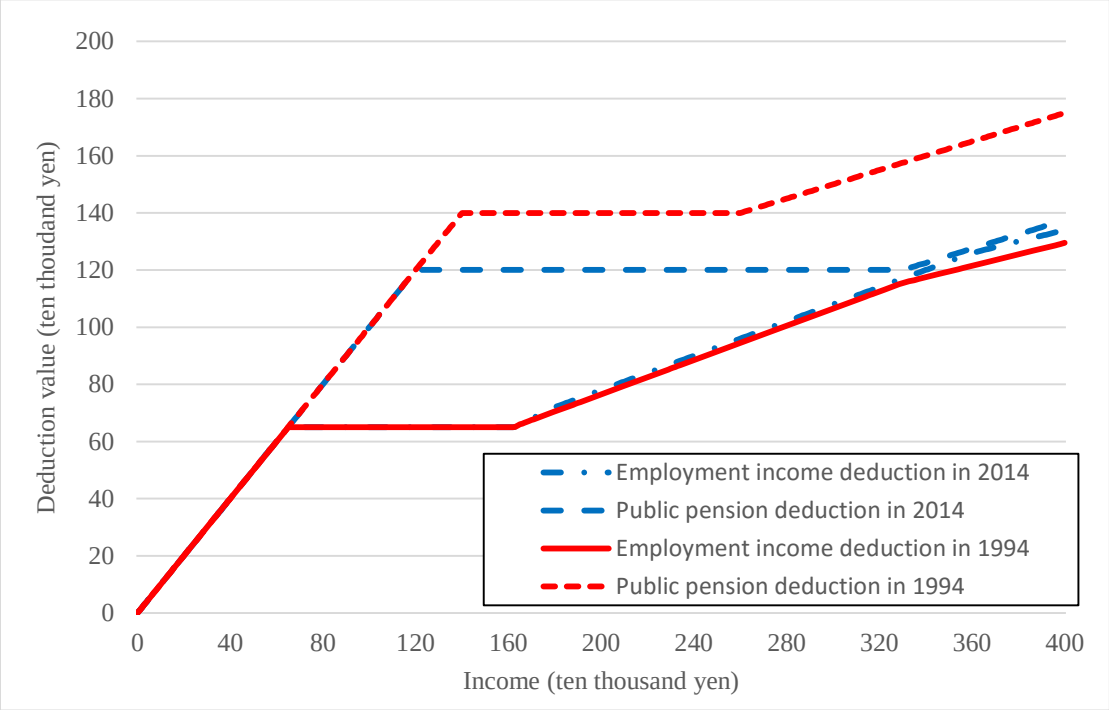
We calculated the value of income tax liability for the interest and dividends income by applying the real tax system to the values estimated for the interest and dividend income.

The taxation of earned interest is estimated by applying the applicable tax rates to interest income under separate taxation. Additionally, we also assumed that until 2005, household members aged 65 and above made maximum use of the tax exemption under the tax-free small deposit system for the elderly (maruyu). Specifically, first we took the maximum applicable maruyu value per person multiplied by the number of household members aged 65 and above as the household maruyu limit. The maruyu is then applied up to the household maruyu limit while prioritizing assets with higher interest rates. The earned interest from maruyu-eligible assets is exempted from taxation. In 2014 we also considered the special reconstruction income tax.

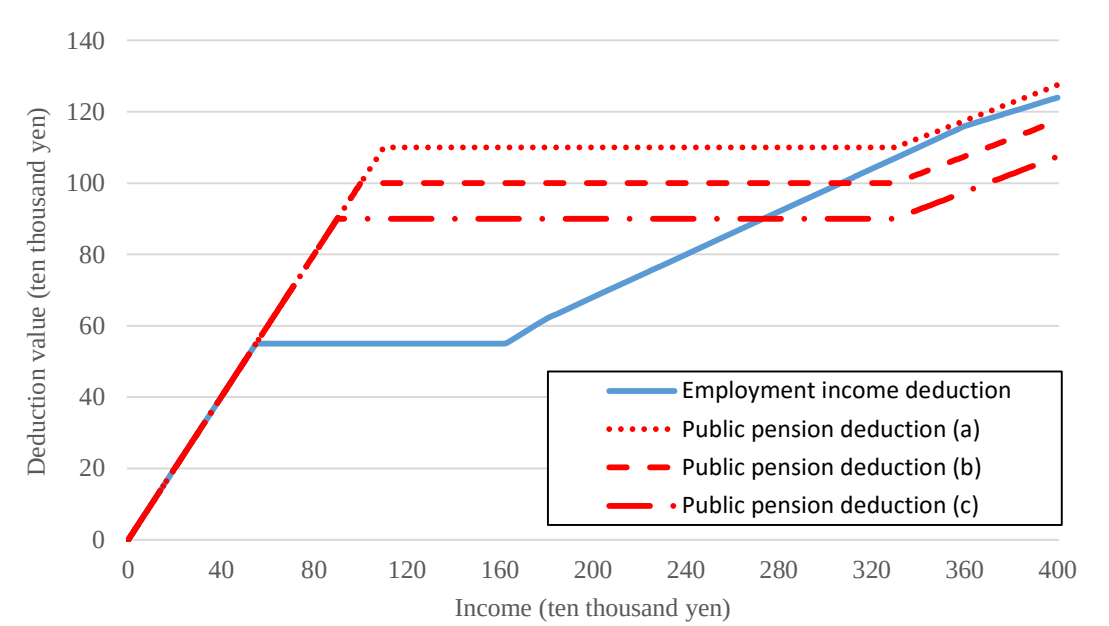
Regarding dividend taxation, because it is possible to choose between comprehensive and separate taxation (taxed at the source or through declaration), we applied the method of taxation with the lowest tax liability for each household. In so doing, we also considered dividend tax credit. Assuming the maximal use of the dividend tax credit, the highest earner is assumed to be the head of the household (rather than a dependent relationship entered on the questionnaire), and the head of the household is considered to earn all the dividend income. In other words, all the dividend income estimated on a household basis is regarded as the income of the head of the household.

Figure 1: Employment income and public pension deductions

(a) Deduction values in 1994 and 2014



(b) Deduction values in 2020

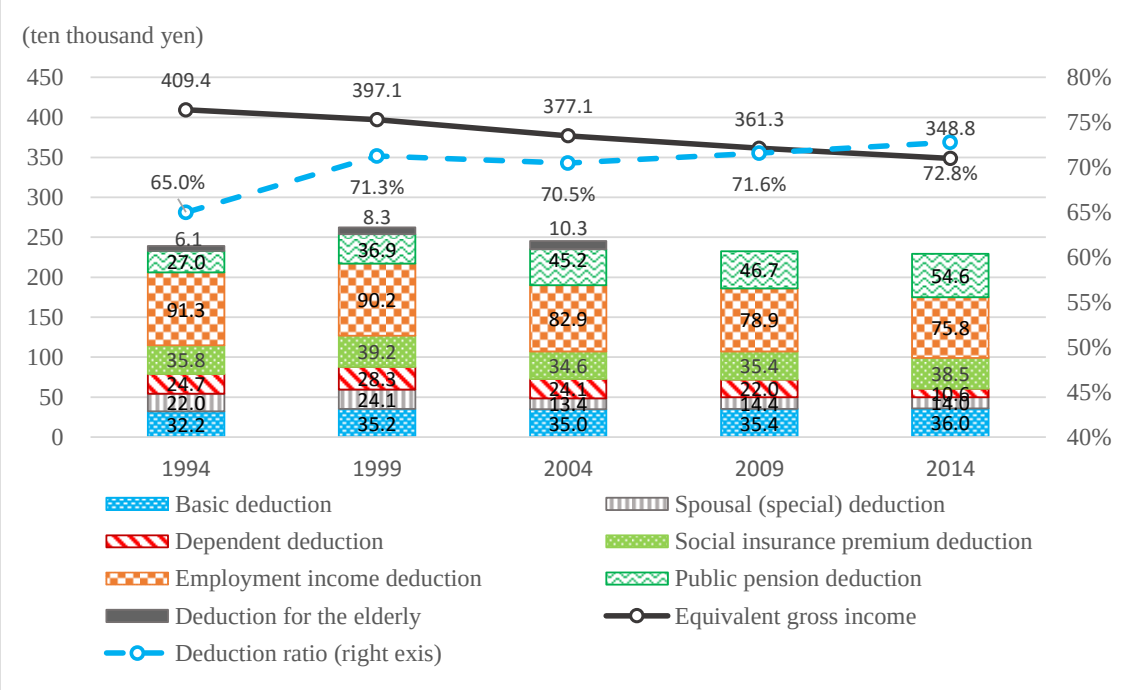


(a): Income other than public pension is 10 million yen or less.
(b): Income other than public pension is over 10 million yen, but not exceeding 20 million yen.
(c): Income other than public pension is over 20 million yen.

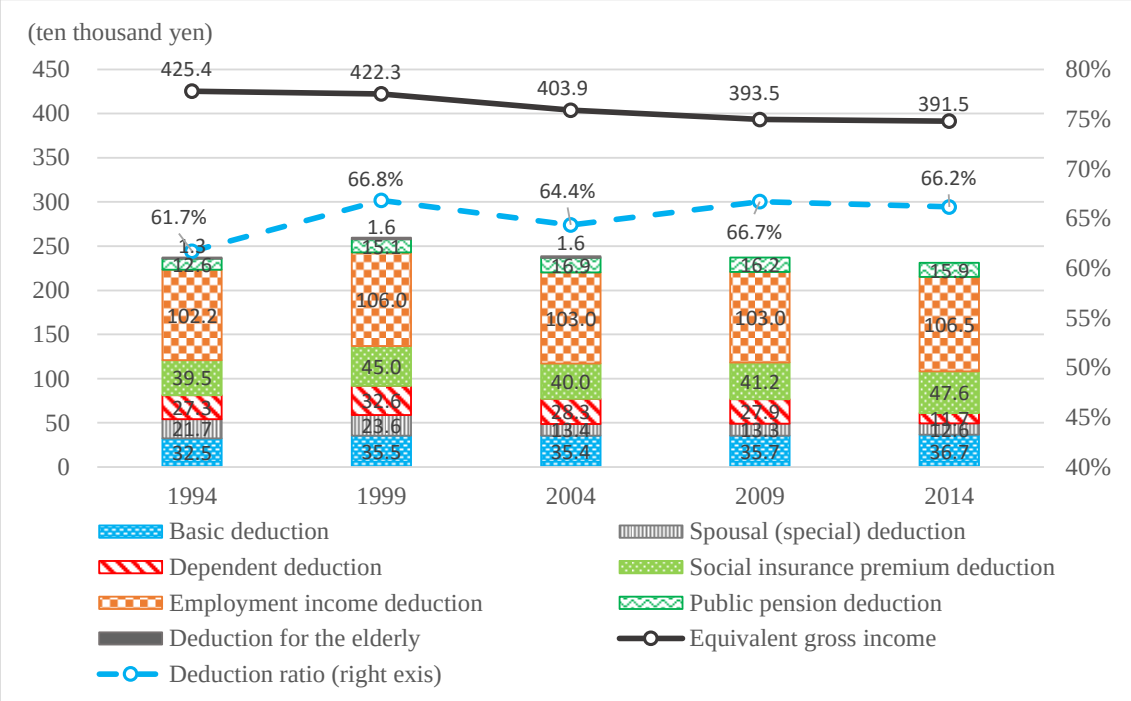
(Reference) Policy Research Institute, Ministry of Finance, “Ministry of Finance Statistics Monthly”

Figure 2: Deduction value and ratio

(a) Total households



(b) Households whose head is under 65 years old



(c) Households whose head is 65 years old or over

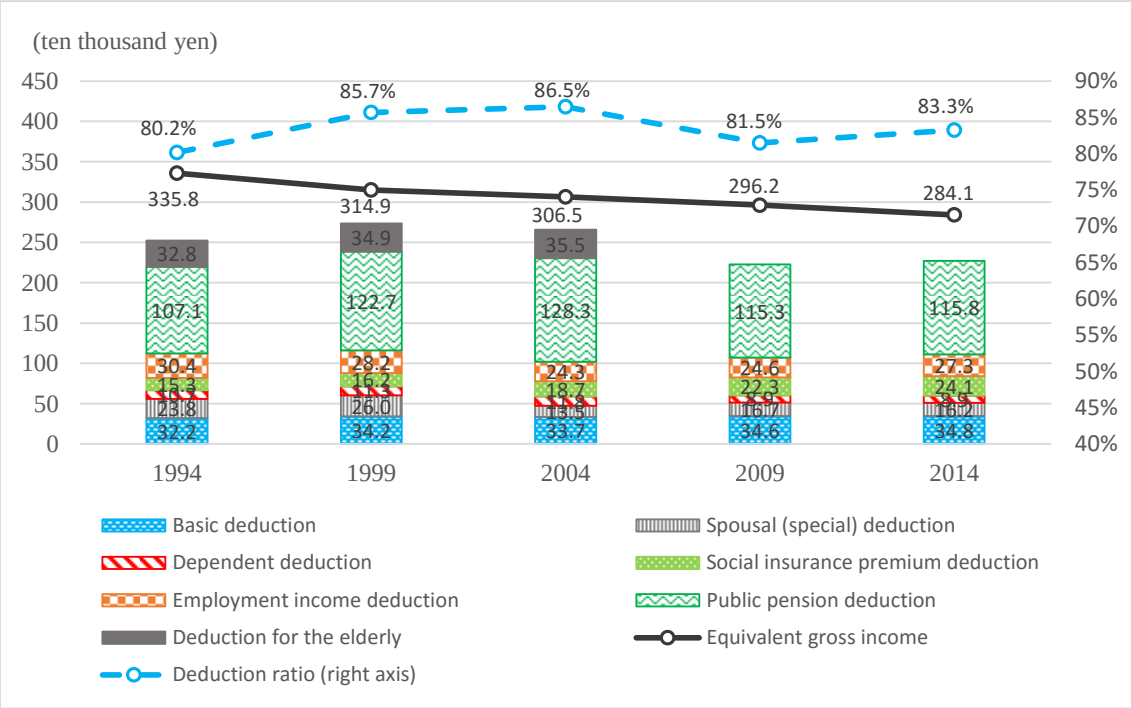
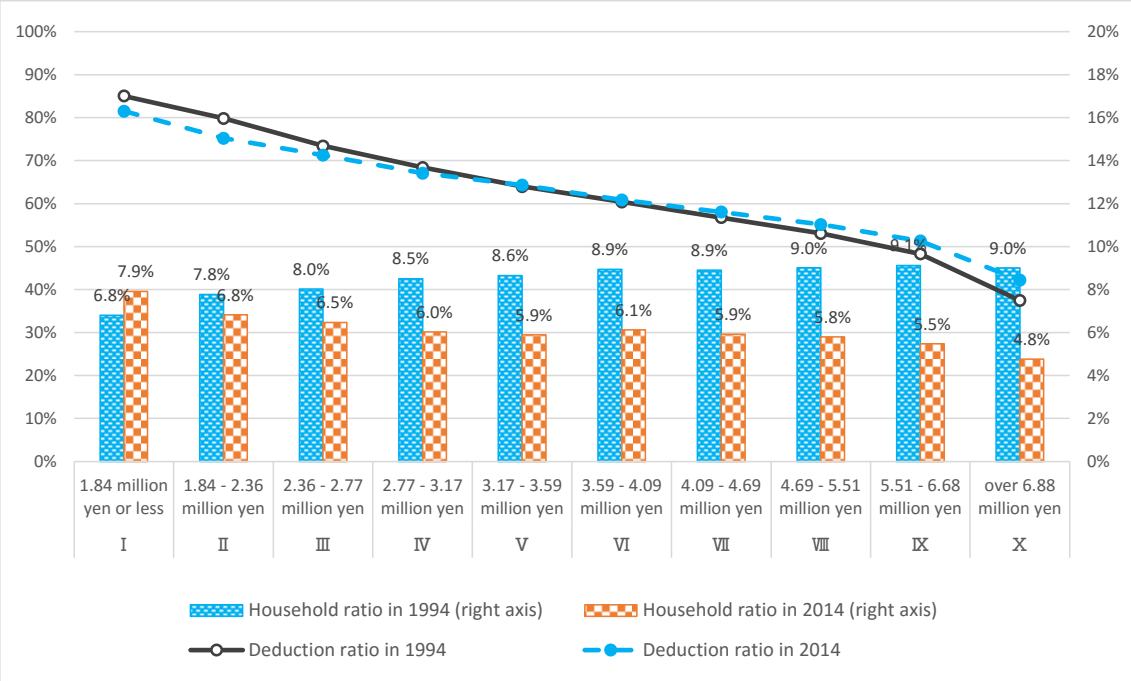


Figure 3, Dedction and household ratio by income bracket

(a) Households whose head is under 65 years old



(b) Households whose head is 65 years old or over

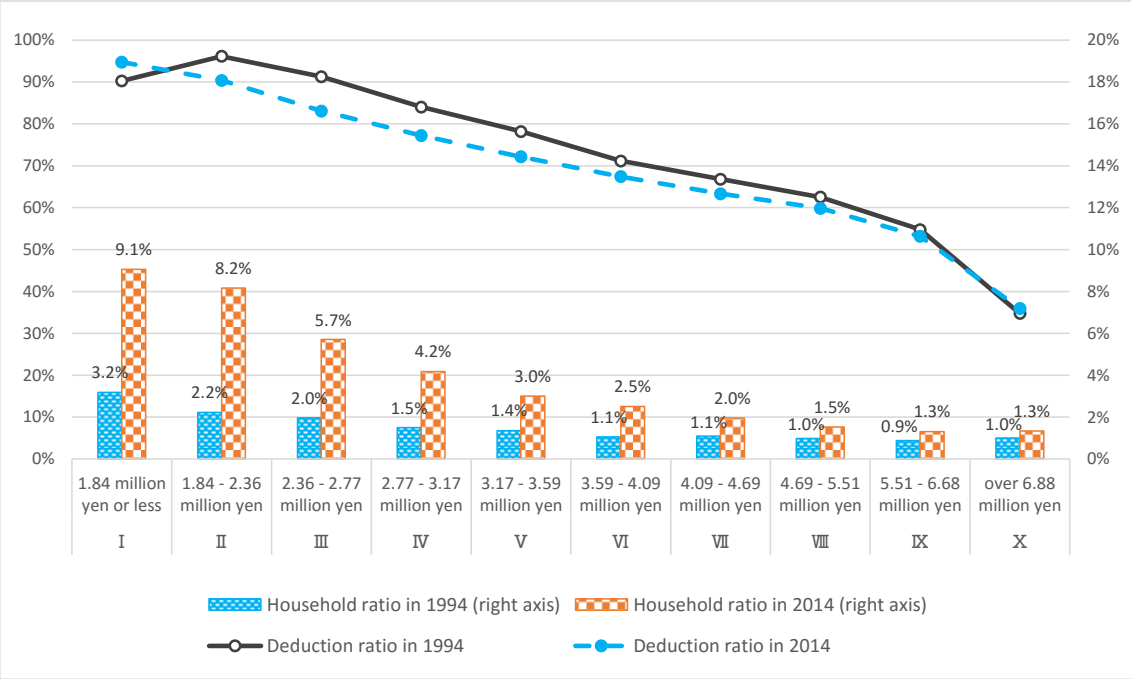


Table 1, Income tax system

	1994	1999	2004
Deduction for salaries	Fixed rate deduction Minimum deduction: 650 thousand yen	(Same as on the left)	(Same as on the left)
Deduction for public pensions	Sum of fixed amount and fixed rate deduction Minimum deduction 65 y/o or over: 1.4 million yen 64 y/o or undeer 700 thousand yen	(Same as on the left)	(Same as on the left)
Basic deduction	350 thousand yen	380 thousand yen	(Same as on the left)
Deduction for spouses	Deduction General: 350 thousand yen 70 y/o or older: 450 thousand yen Income requirement for spouses 350 thousand yen or less	Deduction General: 380 thousand yen 70 y/o or older: 480 thousand yen Income requirement for spouses 380 thousand yen or less	(Same as on the left)
Special deduction for spouses	Maximum deduction: 350 thousand yen (Existence of additional application)	Maximum deduction: 380 thousand yen (Existence of additional application)	Maximum deduction: 380 thousand yen (No existence of additional application)
Deduction for dependents	Deduction General: 350 thousand yen 16-22 y/o: 500 thousand yen 70 y/o or older: 450 thousand yen who live together: 550 thousand yen Income requirement for dependents 350 thousand yen or less	Deduction General: 380 thousand yen 15 y/o or under: 480 thousand yen 16-22 y/o: 630 thousand yen 70 y/o or older: 480 thousand yen who live together: 580 thousand yen Income requirement for dependents 380 thousand yen or less	Deduction General: 380 thousand yen 16-22 y/o: 630 thousand yen 70 y/o or older: 480 thousand yen who live together: 580 thousand yen Income requirement for dependents 380 thousand yen or less
Social insurance premium deduction	Same as social insurance premium burdens	(Same as on the left)	(Same as on the left)
Deduction for the elderly	500 thousand yen	(Same as on the left)	(Same as on the left)
Tax Rate	5 brackets (10, 20, 30, 40, 50%)	4 brackets (10, 20, 30, 37%)	(Same as on the left)
Temporary tax cut	Tax cut of 20% up to 2 million yen	Tax cut of 20% up to 250 thousand yen	(Same as on the left)
Interest tax and dividend tax	Interest tax: separate taxation (Existence of exemption for the elderly) dividend tax: comprehensive or separate taxation (Existence of dividend tax credit)	(Same as on the left)	(Same as on the left)

(Reference) Policy Research Institute, Ministry of Finance, “Ministry of Finance Statistics Monthly”

Table 1, Income tax system (continued)

	2009	2014	2020
Deduction for salaries	(Same as on the left)	Fixed rate deduction Minimum deduction: 650 thousand yen Maximum deduction: 2.45 million yen	Fixed rate deduction Minimum deduction: 550 thousand yen Maximum deduction: 1.95 million yen
Deduction for public pensions	Sum of fixed amount and fixed rate deduction Minimum deduction 65 y/o or over: 1.2 million yen 64 y/o or undeer 700 thousand yen	(Same as on the left)	Sum of fixed amount and fixed rate deduction Minimum deduction 65 y/o or over: 0.9-1.2 million yen 64 y/o or undeer 400-700 thousand yen Maximum deduction 1.75-1.95 million yen
Basic deduction	(Same as on the left)	(Same as on the left)	maximum deduction: 480 thousand yen
Deduction for spouses	(Same as on the left)	(Same as on the left)	Deduction General: 380 thousand yen 70 y/o or older: 480 thousand yen Income requirement for spouses 480 thousand yen or less
Special deduction for spouses	(Same as on the left)	(Same as on the left)	Maximum deduction: 130-380 thousand yen (No existence of additional application)
Deduction for dependents	(Same as on the left)	Deduction General(16 y/o or older): 380 thousand yen 19-22 y/o: 630 thousand yen 70 y/o or older: 480 thousand yen who live together: 580 thousand yen Income requirement for dependents 380 thousand yen or less	Deduction General(16 y/o or older): 380 thousand yen 19-22 y/o: 630 thousand yen 70 y/o or older: 480 thousand yen who live together: 580 thousand yen Income requirement for dependents 480 thousand yen or less
Social insurance premium deduction	(Same as on the left)	(Same as on the left)	(Same as on the left)
Deduction for the elderly	(No existence)	(No existence)	(No existence)
Tax Rate	6 brackets (5, 10, 20, 23, 33, 40%)	(Same as on the left) (Existence of special reconstruction tax)	7 brackets (5, 10, 20, 23, 33, 40, 45%) (Existence of special reconstruction tax)
Temporary tax cut	(No existence)	(No existence)	(No existence)
Interest tax and dividend tax	Interest tax: separate taxation dividend tax: comprehensive or separate taxation (Existence of dividend tax credit)	(Same as on the left)	(Same as on the left)

Table 2, Gross income, deduction ratio and tax liability ratio

(a) the year of data is fixed to 2014

year of data	2014	2014	2014	2014	2014	
year of tax system	1994	1999	2004	2009	2014	2009→2014
Total households						
Gross income (ten thousand yen)	348.8	348.8	348.8	348.8	348.8	0.0
Deduction ratio	72.5%	77.7%	75.5%	74.1%	72.8%	0.3%
Tax liability ratio (to gross income)	3.8%	3.4%	3.6%	3.3%	3.4%	-0.4%
Working-age households						
Gross income (ten thousand yen)	391.5	391.5	391.5	391.5	391.5	0.0
Deduction ratio	64.2%	69.2%	65.7%	66.9%	66.2%	2.0%
Tax liability ratio (to gross income)	4.5%	3.9%	4.2%	3.5%	3.7%	-0.8%
Retired households						
Gross income (ten thousand yen)	284.1	284.1	284.1	284.1	284.1	0.0
Deduction ratio	85.1%	90.6%	90.2%	84.9%	83.3%	-1.9%
Tax liability ratio (to gross income)	2.4%	2.3%	2.3%	2.8%	2.8%	0.5%

(b) the year of income tax system is fixed to 2014

year of data	1994	1999	2004	2009	2014	2009→2014
year of tax system	2014	2014	2014	2014	2014	
Total households						
Gross income (ten thousand yen)	409.4	397.2	377.1	361.4	348.8	-60.6
Deduction ratio	61.4%	64.6%	67.8%	70.2%	72.8%	11.4%
Tax liability ratio (to gross income)	4.3%	4.3%	3.9%	3.5%	3.4%	-0.9%
Working-age households						
Gross income (ten thousand yen)	425.4	422.4	403.9	393.5	391.5	-33.9
Deduction ratio	59.4%	60.9%	63.3%	64.3%	66.2%	6.8%
Tax liability ratio (to gross income)	4.4%	4.3%	4.0%	3.7%	3.7%	-0.7%
Retired households						
Gross income (ten thousand yen)	335.9	315.0	306.5	296.2	284.1	-51.8
Deduction ratio	70.5%	76.6%	79.6%	82.1%	83.3%	12.7%
Tax liability ratio (to gross income)	4.1%	3.6%	3.4%	3.0%	2.8%	-1.3%

Table 3, Decomposition of changes to deduction ratio

	System change factors		Other deduction ratio factors		Income distribution factors		Age composition factors	Changes to deduction ratio
	Working-age households	Retired households	Working-age households	Retired households	Working-age households	Retired households		
1994 → 2014	-1.48%	0.20%	1.60%	-1.15%	1.01%	3.47%	2.37%	6.02%
1994 → 1999	4.16%	0.61%	-0.09%	0.23%	0.08%	0.26%	0.60%	5.85%
1999 → 2004	-2.99%	-0.17%	0.17%	0.10%	0.76%	1.53%	0.50%	-0.11%
2004 → 2009	0.29%	-3.19%	0.08%	0.20%	0.32%	0.94%	0.54%	-0.81%
2009 → 2014	-1.56%	0.23%	0.29%	0.80%	0.05%	0.78%	0.50%	1.08%

Table 4, Changes to deduction ratios and values from 2014 to 2020

(a) Deduction ratio

	Deduction ratio in 2014 (A)		Deduction ratio in 2020 (B)		Changes to deduction ratio (C) = (B) - (A)	
	Working-age households	Retired households	Working-age households	Retired households	Working-age households	Retired households
Income brackets						
Ⅰ 1.84 million yen or less	81.5%	94.7%	82.5%	95.0%	1.0%	0.3%
Ⅱ 1.84 - 2.36 million yen	75.2%	90.4%	76.0%	90.6%	0.8%	0.2%
Ⅲ 2.36 - 2.77 million yen	71.3%	83.1%	72.1%	83.5%	0.8%	0.4%
Ⅳ 2.77 - 3.17 million yen	67.1%	77.2%	67.7%	77.9%	0.6%	0.7%
Ⅴ 3.17 - 3.59 million yen	64.3%	72.1%	65.0%	72.9%	0.7%	0.8%
Ⅵ 3.59 - 4.09 million yen	60.9%	67.4%	61.5%	68.2%	0.7%	0.7%
Ⅶ 4.09 - 4.69 million yen	58.1%	63.3%	58.6%	63.8%	0.5%	0.5%
Ⅷ 4.69 - 5.51 million yen	55.1%	59.9%	55.4%	59.9%	0.2%	0.1%
Ⅸ 5.51 - 6.68 million yen	51.3%	53.2%	51.3%	53.2%	0.0%	0.1%
Ⅹ over 6.88 million yen	42.2%	36.0%	41.7%	35.6%	-0.5%	-0.4%
Average	66.2%	83.3%	67.3%	83.8%	1.1%	0.5%
Average (total households)	70.3%		71.0%		0.7%	

(b) Deduction value

(ten thousand yen)

	Deduction ratio in 2014 (A)		Deduction ratio in 2020 (B)		Changes to deduction ratio (C) = (B) - (A)	
	Working-age households	Retired households	Working-age households	Retired households	Working-age households	Retired households
Basic deduction	36.7	34.8	47.4	45.8	10.6	11.0
Spousal (special) deduction	12.6	16.2	13.8	17.1	1.2	0.9
Dependent deduction	11.7	8.9	12.1	9.4	0.4	0.5
Social insurance premium deduction	47.6	24.1	47.6	24.1	0.0	0.0
Employment income deduction	106.5	27.3	97.2	24.3	-9.3	-3.0
Public pension deduction	15.9	115.8	14.6	108.7	-1.2	-7.0
Total	230.9	227.0	232.7	229.5	1.7	2.5