Income Tax Reforms and Intra-Generational Redistribution: Evidence from Japan

Takeshi Miyazaki[a,1], Yukinobu Kitamura[b], and Taro Ohno[c]

[a] Department of Economics, Kyushu University, Fukuoka, Japan

[b] Institute of Economic Research, Hitotsubashi University, Tokyo, Japan

[c] Faculty of Economics and Law, Shinshu University, Nagano, Japan

Abstract

In the 1980s, tax policy changes mitigate the redistributive effect of income tax. This study attempts to explore how different the redistributive effect of the income tax reforms in Japan is among age groups, using Japanese household microdata for the period 1984–2009. The following results are obtained. First, overall redistributive effect was greatest for the elderly group, followed by the middle-age group, and then the young group. Furthermore, this trend increased steadily over time. Second, the difference in total redistributive effects between the young and elderly increased owing to a large reduction in the base effect for the young.

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[1] Corresponding Author. Address: 6-19-1 Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan. Tel.: +81-(0)92-642-4272; fax: +81-(0)92-642-4272; e-mail: tmiyazak@econ.kyushu-u.ac.jp.

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1. Introduction

In the 1980s, marginal income tax rates (particularly the top marginal income tax rate) decreased and income tax deduction thresholds changed through income tax reforms in the OECD (Organization for Economic Co-operation and Development) countries. In Japan in the 1980s and 1990s, income tax rates decreased, the number of tax brackets decreased, and the income tax deduction thresholds increased. In contrast, in the early 2000s the income tax deduction thresholds decreased and income tax rates increased. Nevertheless, the redistributive effects of Japanese income tax declined steadily over time with the various tax reforms.

Recently, it has been pointed out that inequality and redistribution vary across different age groups. Fukawa and Oshio (2007) examined income inequality in the 1980s and 1990s in Japan, and concluded that the increase in income inequality was caused mainly by increases in pretax income inequality among workers. They also show that income inequality will increase further because of Japan's population aging. Oshio (2006) argues that the increase in income inequality during the past 20 years in Japan can be explained by population aging, that the redistribution policy was more effective for the elderly, and that the inequality in disposable income across the younger generations increased in the same period. Accordingly, pre- and post-tax income inequality has been expanding over time, especially for the young, in Japan.

Although empirical studies have examined income inequality over age cohorts, very few studies have paid attention to the effect of the tax reforms on post-tax income inequality for different age groups. Several existing studies on OECD countries have decomposed the overall redistributive effects of income tax into redistributions from tax rate and tax base changes (e.g., Miyazaki and Kitamura, 2016; Verbist, 2014; Wagstaff and Doorslaer, 2001).

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They, however, have not addressed these redistributive impacts across different age groups. Because the size of inequality and effectiveness of redistribution emerge differently among generations, it is crucial to examine how, and to what extent, the redistributive effects through income tax reforms, specifically tax rates and deductions, differ across age groups. To the best of our knowledge, the present study is the first to address the redistributive effects of tax rates and deductions for different age groups.

We investigate the redistributive effects of the Japanese income tax system across age groups over a period of 25 years in order to evaluate the long-term effect of tax reforms. This study decomposes the redistributive effect into tax rate effect and tax base effect (redistribution via changes in deductions), and examines the decomposed redistributive effects across age groups. Our study takes into account redistribution by the special tax credit policy as well. It had been implemented over the years 1994–2005 (except 1997) in Japan in order to stimulate the economy, and it probably offsets the redistributive effect of income tax through large-sized deduction of tax liabilities for high income earners. We then test the redistributive effects of the tax credit by isolating them from those of tax rate and credit.

Our empirical results are as follows. First, overall redistributive effects were greatest for the elderly group, followed by the middle-aged group, and then lowest for the young group during the period 1984–2009. This trend strengthened steadily over time. Second, a larger reduction in base effect—the redistributive effect of changes in deduction—for the young than for the elderly increased the difference in total redistributive effect between the two groups. Third, the redistributive effect of income tax for the older elderly (aged 70 or over) group is smaller than that for the younger elderly (aged 60–69).

These findings provide insightful policy implications. First, population aging will deepen income inequality in Japan in the near future. Population aging would increase the

proportion of the elderly, particularly the older elderly, thus implying that less progressivity in the Japanese income tax for the older elderly accelerates post-tax inequality. Second, from a long-term perspective, post-tax income inequality is expected to expand. As mentioned above, the redistribution among the young through income tax is becoming negligible, and thus, the post-tax income inequality within this age group is growing rapidly compared with within other age groups. This will lead to severer inequality when the current young become the elderly, since inequality in a society usually accumulates and expands over time. These consequences could provide insightful suggestions for redistribution policies in other countries. As Japan is one of the most aging countries even among developed countries, it is anticipated that other countries—for example, the OECD and Asian countries—will experience population aging and similar issues on income inequality arising from aging in the near future.

The remainder of this paper is organized as follows. Section 2 introduces previous related literature. Section 3 discusses the Japanese income tax reforms from the early 1980s to the 2000s, focusing on the difference in tax treatments among generations. The data and the measurement of the redistributive effect of income tax are discussed in Section 4. Then, Section 5 provides empirical evidence of the redistributive effect of tax changes on different age groups and, lastly, Section 6 concludes the paper.

2. Related Literature

The 1980s and 1990s tax reforms in the OECD countries led to substantial cuts in marginal tax rates and changes in income tax deduction thresholds. A number of empirical studies have examined the relationship between tax reforms and the extent of the redistribution from

income taxation during this period, and found that progressivity is one of the important determinants of the redistributive effects (e.g., Verbist, 2014). Furthermore, several researches have tried to determine how each component of income taxation affects the redistributive effect, particularly the redistributive effects of tax rates, deductions, and tax credit, using the decomposition approach of redistributive effects pioneered by Pfähler (1990) and Lambert (2001). Studies in this literature have analyzed redistributive effects for Western countries, such as Iceland (Kristjánsson, 2013), and Spain (Onrubia et al., 2014), 15 EU countries (Verbist, 2014), and 15 OECD countries (Wagstaff and Doorslaer, 2001).

In Japan, a number of empirical studies since the 1980s have used household microdata to examine the redistributive effects of tax and social security systems (e.g., Abe, 2000; Ohishi, 2006; Tachibanaki and Urakawa, 2006; Tanaka and Shikata, 2012; Kitamura and Miyazaki, 2013; Uemura and Adachi, 2015). These showed that the redistributive effects are larger among the elderly and smaller among younger people (Kitamura and Miyazaki, 2013), and that the redistributive effects of the tax system have decreased from the 1990s onward (Ohishi, 2006; Tachibanaki and Urakawa, 2006; Kitamura and Miyazaki, 2013; Uemura and Adachi, 2015). In recent years, a few studies have used micro-simulation methods to examine the influence of tax reform proposals on the redistributive effect. Tajika and Yashio (2006) showed that because tax bases narrowed in Japan, it is possible to redistribute more to the poor by adopting tax credits that are refundable for those who did not pay taxes.[2] These studies have focused on the various elements for deepening and weakening

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[2] Besides, Kaneda (2015) conducted welfare analysis of Japanese income tax reforms in the 1980s and 1990s across generations, using a microsimulation approach.

income distribution, but not on redistribution through tax components such as tax rates, deductions, and tax credits.

Related empirical studies have also applied decomposition of the redistributive effects of tax and/or social security. Some decomposed the redistributive effects of the tax and social security systems into intra-age and inter-age redistributions (Oshio and Urakawa, 2008; Oshio, 2009). These studies showed that intra-age redistribution only has an effect among the elderly, and that inter-age redistribution decreases disparity among the elderly but increases disparity among younger people. Other studies decomposed the redistributive effect of personal income tax into tax rate and tax base effects (Mochizuki et al., 2010; Miyazaki and Kitamura, 2016). Using tax return macro data of reported income, Mochizuki et al. (2010) showed that a tax rate factor greatly enhances the redistributive effect of income tax, but that a tax base factor has scarcely any effect on distribution. Meanwhile, Miyazaki and Kitamura (2016) employed household microdata and examined the decomposed effects of changes in the tax rate and tax base. They showed that the redistributive effect of income tax declined over the period of 1984 to 2009, and that the income tax reforms—i.e., reduced tax rates and increased tax base—give rise to greater redistributive effects of tax rates and lower redistributive effects of tax bases. However, they did not mention the redistributive effects on different age groups. Kitamura and Miyazaki (2013) examined the redistributive effects of Japanese income tax reforms from 1984 to 2009 for different age groups, but did not conduct decomposition analysis of the redistributive effects.

As stated above, some empirical studies have addressed income inequality, redistribution, and population aging in Japan.[3] Ohtake and Saito (1998) found that the young can face a more unequal distribution from birth, and that half of the rapid increase in inequality is attributed to population aging in the 1980s. Fukawa and Oshio (2007) and Oshio (2006) primarily examined the trend of income inequality and redistribution policies, paying attention to intergenerational transfers between the young and the elderly.[4] These studies show that income inequality has been increasing since the 1980s, principally owing to population aging, and the young generation has faced and will face severe post-tax income inequality.

Overall, income inequality in Japan has been growing rapidly.[5] Specifically, the extent of income inequality appears more severe for the young partly because the Japanese government has recently opted for less progressive redistribution policies. It is expected that

[3] Besides, a vast number of studies have attempted to explore intergenerational fairness of each cohort in terms of lifetime income, using generational accounting (e.g., Auerbach et al., 1991, 1993). Pertile et al. (2015) examine the redistributive impact of fiscal policies across generations in Italy over the period 1990–2008, by adopting a methodology developed in the generational account literature, and find that fiscal consolidation brings about a heavier fiscal burden for the young.

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[5] Heller (2016) examines the policies and experiences of Japan, which is characterized by an aged and shrinking population, in terms of economy, government finance, and aging, and draws some lessons applicable for other industrial countries, most of which will follow a similar trend.

income inequality and redistribution will become severer in the future. In the light of the above, it is important to analyze the impact of income tax on post-tax income distribution for different generations, since the redistributive impacts could vary across generations. The present study attempts to explore the redistributive impact of income tax, specifically tax rates and deductions, across age groups.

3. Japanese Income Tax Reforms

Since 1949, when a tax mission headed by Carl S. Shoup established the modern Japanese tax system, the system has rested on direct taxes, mainly income taxes from individuals and corporations. In the 1970s and 1980s, the tendency to depend on income as a tax source was stronger than it was after the 1990s. However, the fundamental tax reforms in 1987 and 1989 altered this heavy dependence on income. This tax reform introduced a general consumption tax for the first time in Japan. At the same time, the reform reduced income tax liabilities by lowering marginal tax rates and by broadening and creating tax deductions and exemptions in order to keep the total tax liabilities of consumption and income taxes constant. Introducing the general consumption tax reduced the share of income tax revenues in total revenue. In addition, this tax reform was aimed at correcting issues such as bracket creep, caused by inflation, and horizontal inequality in taxation on interest receipts.[6]

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[6] At that time, Japan experienced a rapid growth in income stemming from an economic boom, called the "Bubble Economy." This booming economy highlighted drawbacks of the Japanese income tax system, such as large number of brackets and the unequal taxation of interest income.

Insert Tables 1 and 2 around here

Table 1 summarizes the content of Japanese income tax reforms from the late 1980s to the 2000s. Closely related to our analysis, the bottom row of this table represents the effects of changes in deductions and exemptions on the tax liabilities of each generation. The tax reforms in the late 1980s reduced tax rates and increased tax deductions and exemptions, which decreased the tax base. On the one hand, the tax rates in every income bracket have decreased, particularly those of the highest income bracket. On the other hand, there was broader increase in deductions for salaries and pensions, basic exemptions and exemptions for spouses, dependents, and the elderly. These reforms decreased the tax base of all households, and in particular, decreased the tax base of elderly households owing to wider exemptions for the elderly.

The feature of the tax reforms in the early 1990s was an increase in tax deductions and exemptions. There were increases in deductions for pensions, exemptions for dependents, and a special deduction for business revenue. Similar to the late 1980s, these reforms decreased the tax base of all households, and particularly that of elderly households owing to the increased deduction for pensions. In addition, tax credits to stimulate the economy were implemented in 1994, which gave a fixed-rate cut of 20% to the gross tax liability. Table 2 shows changes in the Japanese tax credits. Because the ceiling of the tax credit in this year was large (2 million yen), this policy was effective in cutting taxes.

Tax reforms in the late 1990s also reduced tax rates and increased tax deductions and exemptions. The tax rates in every income bracket, especially those for the highest income bracket, decreased, and the deductions for salaries, basic exemptions, and exemptions for

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spouses and dependents increased. These reforms reduced tax bases for all households. In addition, the use of tax credits to stimulate the economy continued until 2005.

In the early 2000s, the direction of income tax reforms changed to tax increases. The feature of the tax reforms in this period was a decrease in tax deductions and exemptions, which increased the tax base. More specifically, such deductions as the special deduction for spouses, the exemption for dependents, and the special exemption for dependents narrowed. These reforms increased the tax base, particularly of younger households, owing to reductions of the exemptions for dependents.

The features of the tax reforms in the late 2000s were increased tax rates and decreased tax deductions and exemptions. Tax rates in some income brackets increased, particularly in the highest income bracket, whereas the deduction for pensions decreased significantly and the exemption for the elderly was abolished. These reforms increased the tax base, mainly for the elderly, owing to reductions in the deduction for pensions and the exemption for the elderly. In addition, tax credits, which had lasted since 1998, were abolished in 2006.

Overall, the Japanese income tax reforms tended towards tax cuts in the 1980s and 1990s, but tax increases in the 2000s. These reforms have always employed both a tax rate policy and a tax base policy. Unlike tax rate policy, tax base policies have different effects on the tax liabilities of households, depending on their ages, occupations, income, family composition, and so on. The fundamental tax reforms in the late 1980s were effective in reducing the tax liabilities of the elderly, owing to larger decrease in their tax base than that of the younger generation.

4. Measurement and Data

4.1 Decomposition of Redistributive Effect

This study adopts a version of the decomposition approach developed by Lambert (2001), modified to conform to the Japanese personal income tax scheme. Our decomposition measure is similar to the approach presented by Onrubia et al. (2014) and Kristjánsson (2013). Onrubia et al. (2014) generalized the decomposition methodology by Pfähler (1990) and Lambert (2001) in order to conform to the existence of several deductions, allowances, and tax credits, as well as considering the re-ranking correction of tax treatments. Kristjánsson (2013), whose approach is most closely related to our estimation, decomposes a redistributive effect into the effects of labor income tax and capital income tax, applying the "natural decomposition rule" of Shorrocks (1982, 1983), to quantify the redistributive effects of a dual income tax system. Both studies expand the baseline decomposition procedures in order to apply them to actual income tax systems, in particular, a dual income tax system.

With regard to Japanese personal income tax, capital income tax, including that on interest and dividend revenue, relied mostly on a withholding tax of 15% or 20%, after deductions (e.g., Iwamoto et al., 1995). In addition, tax credits were implemented for labor income tax over the years 1994–2005, except for 1997. Because labor income and capital income were taxed substantially separately and tax credits were implemented, we adopt a modified version of the decomposition methodology developed by Onrubia et al. (2014) and Kristjánsson (2013).

Our decomposition model is expressed as

$$\Pi^{RS*} = \alpha_L \frac{1 - \delta_L - g_L}{1 - g_L} \Pi_R^{RS*} - \alpha_L \frac{g_L}{1 - g_L} \Pi_D^{RS*} + \Pi_C^{RS*} + \alpha_K \Pi_K^{RS*} + RR + \Gamma,$$

where Π^{RS*} is the redistributive effect of income tax, or the Reynolds–Smolensky (RS) index of income tax (defined as the difference between the Gini coefficients for pre-tax income and for post-tax income); Π_R^{RS*} is the rate effect of the labor income tax, or the RS index on rate effect (defined as the difference between the Gini coefficients for labor taxable income and for taxable income net of tax liabilities); Π_D^{RS*} is the base effect of labor income tax, or the RS index on base effect (defined as the difference between the Gini coefficients for pre-tax labor income and for labor taxable income); Π_C^{RS*} is the credit effect of the labor income tax, or the RS index on credit effect (defined as the difference between the Gini coefficients for post-tax labor income and post-tax labor income net of tax credits); and Π_K^{RS*} is the redistributive effect of capital income tax, or the RS index of capital income tax (defined as the difference between the Gini coefficients for pre-tax capital income and for capital income net of tax liabilities). Note that the results of the redistributive effects of capital income tax are not presented in a table because, as stated later, the effects are quite small relative to the tax rate and base effects. g_L and δ_L denote the share of labor income tax liability and deductions to labor income, respectively, and α_L and α_K denote the ratio of labor income and capital income to total income, respectively. The re-ranking effect is represented by RR, and Γ is the "indirect effect," described by Kristjánsson (2013), which represents the effects of changes in income tax schemes.[7]

To assess the redistributive effects from a longitudinal perspective, we adopt the "fixed income" approach pioneered by Kasten et al. (1994). This methodology calculates taxable income and tax liabilities by fixing applied income in order to identify the effects of policy reforms from a longitudinal viewpoint. Specifically, we apply tax codes for each year

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[7] For the detailed derivation of this equation, see Miyazaki and Kitamura (2016).

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to a base year income to isolate the impacts of tax policy changes from other potential factors that might cause variations in income, such as economic fluctuations, income growth, and socio-demographic changes. However, the fixed income approach has one drawback for the precise assessment of policy changes from a long-term perspective, namely the instability of obtained results across applied base years. If different results are obtained for different base years, it is difficult to attain robust consequences when evaluating the effectiveness of tax policy reforms. To deal with this problem, we employ several years as base years, specifically 1984, 1994, 2004, and 2009, to make sure robustness of the estimated redistributive effects.

4.2 Calculation of Household Income and Data

This study employs individual and household microdata of the NSFIE (National Survey of Family Income and Expenditure) for the period 1984–2009, supplied by the Ministry of Internal Affairs and Communications (MIC).[8] The data comprise between 46,000 and 54,000 households for each year, including single and multi-family households, and contain information on members' earnings, marital status, sex, age, job, and type and status of

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[8] The NSFIE data comprise a smaller proportion of low-income individuals than other Japanese individual income microdata, such as the Comprehensive Survey of Living Condition (CSLC) and the Survey on Income Distribution (SIR). Then the inequality measures of the market income from the NSFIE tend to be lower than those from the CSLC. It is common, however, that income inequality measures from the NSFIE and CSLC pose similar trends.

employment.[9] Earnings consist of salaries, revenues from agriculture and fishery business and business other than agriculture and fishery, on-the-side jobs income, pension and retired income, housing and land rent, and earnings from interest and dividends. From the earnings data, we calculate the total earnings for each individual.

We then quantify the tax liabilities of every household using the data on individual earnings and characteristics. The procedure for computing tax liabilities under the Japanese tax system is the standard procedure used in other countries. Taxable income is calculated from earnings by applying deductions for salaried and pension incomes, and subtracting the tax deductions and exemptions. Finally, we compute tax liabilities by multiplying taxable income by income tax rates. If tax credits are implemented, we compute final tax liabilities by extracting tax credits from the tax liabilities. We consider the following deductions and exemptions: deductions for medical expenses; social insurance premiums; life insurance premiums; fire and other casualty insurance premiums; basic exemption; exemptions for working students, a spouse and dependents; and a special exemption for spouses. Pre-tax incomes are normalized at the 2004 level, using pre-tax income growth in the sample as an indicator.

Insert Table 3 around here

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[9] However, it should be noted that it is impossible to identify earnings of all the family members because for some type of family members except head and spouse, earnings data are aggregated. In contrast, the data other than earnings can be identified at individual level.

Table 3 provides the averages of pre-tax and post-tax incomes and the number of observations by age group and by sampled year. The age groups are classified into households with heads aged 39 or under (young group), 40–59 (middle-age group), 60 or over (elderly group). The elderly group is further broken down into those aged 60–69 (younger elderly group) and those aged 70 or over (older elderly group) in order to consider the effects of the aging society in details. As shown, the average pre-tax and post-tax incomes were large for the middle-age group relative to the other groups. In 1984, the elderly group's income exceeded that of the young group, but the relative magnitude between the two groups changed in 2009. The growth rates between 1984 and 2009 for the young and middle age groups were positive, but were negative for the elderly group. This has caused the abovementioned inverse relation in income. Specifically, within the elderly group, the income of the older elderly was smaller than that of the younger elderly for the entire period, and the older elderly's growth rate is largely negative relative to that of the younger elderly. Reflecting the declining birthrate and the population aging in Japan, the size of the sample for the elderly increased rapidly over the 25 years, while that of the young decreased.

5. Empirical Results

5.1 Results

Table 4 presents the calculated results of the redistributive effect for the young, the middle-age and the elderly groups. We chose 2004 as the base year because it represents the results obtained using other base years, and lies close to the middle of the sample period. We also calculate the redistributive effects using 1984, 1994, and 2009 as base years, and provide the results in Appendix A. If needed, we refer to these results. The table reports the overall

redistributive effects, rate effects, and base effects from 1984 to 2009, and the credit effects for 1994–2004. The right-hand side of the table shows the growth rates for the periods 1984–1989, 1994–1999, 2004–2009, and 1984–2009 (the entire period). We selected these periods because they contained remarkable personal income tax reforms in each period, as shown in Table 1. The redistributive effects of capital income tax are not reported in the table because these effects are quite small relative to other equalizing effects.

Insert Table 4 around here

We attained the following findings. First, we find that the overall redistributive effects were greatest for the elderly group, followed by the middle-age group, and were lowest for the young group for the period 1984–2009. Furthermore, this trend increased steadily over time. That is, for every sampled year, the RS indices of the total effect are ranked by the young, the middle-aged, and the elderly, in ascending order.[10] As shown in the rightmost side of the table, the growth rates of the total effect from 1984 to 2009 were negative for all age groups, and smallest for the young, followed by the elderly, and largest for the middle-aged. These findings demonstrate that the equalization effects of the Japanese personal income tax were smallest for the young group and greatest for the elderly, and moreover, this difference subsequently expanded during the sample period.

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[10] This argument holds for the other base-year cases, although the magnitudes of the redistributive effects vary across applied base-year incomes (see Tables A1–A3).

Second, a larger reduction in the tax base effect for the young than for the elderly increases the difference in the total redistributive effect between the two groups. As a result of a short-term change, in the period 1984–1989, the base effect largely increased for the elderly group. However, in the same period, the directions of the changes in the base effect were opposite for the young and middle-age groups. Tax theory tells us that a larger tax deduction gives rise to an increase in tax progressivity, even when a marginal tax rate is flat, needless to say progressive. Accordingly, now that the expansion of tax deductions and exemptions through the 1987 and 1989 tax reforms was more effective for the elderly than for the young, the redistributive effects decreased most for the young and least for the elderly during the sample period.

Turning to the rate effect, the elderly group experienced a larger decrease throughout the sample period than others did. This trend is not consistent with that in the total redistributive effect in the sense that, as mentioned earlier, the young group experienced a greater reduction in the total redistributive effect over the entire period than did the elderly. Based on the sizes of the percentage changes over the sample years, the changes in overall redistributive effect can be attributed to the changes in base effect, since the decreases in total effect are ordered in the same way as those in base effect. This finding indicates that the changes in base effects determined a trend in overall redistributive effects from the 1980s to the 2000s. Also, for all age groups, the rate effects dropped in the periods 1984–1989 and 1994–1999, but rose in 2004–2009.

The younger elderly (aged 60–69) and older elderly (aged 70 or over) might face a different equalizing impact of personal income tax, because the labor participation rates are quite different between the two groups. Furthermore, in the older elderly group, higher income earners such as executives could account for large share of workers, which differs to

the case of the younger elderly. Given the population aging in Japan, it could make sense to explore the equalization impacts of the income tax schedule for the elderly in detail. In addition, now that Japan has been experiencing a rapid population aging for the past 20 years, this experience could provide important implications for most countries that will face an aging society in the future. Thus, we examine the redistribution through personal income tax by dividing the elderly into the younger elderly and older elderly groups.

Insert Table 5 around here

Table 5 reports redistributive effects for the younger and older elderly. It is revealed that the redistributive effect of income tax for the older elderly group was smaller than that for the younger elderly. As shown on the left-hand side of the table, the older elderly faced smaller overall equalizing effects than did the younger elderly. Specifically, the rate effects are definitely lower for the older elderly, but the base effects are almost equal between the two groups. During the sample period, the equalizing indices dropped more considerably for the older elderly, as shown in the rightmost column of the table.[11] Thus, the redistributive effects of income taxation, specifically the total and rate effects, were weaker for the older elderly between 1984 and 2009, and this tendency has recently strengthened.

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[11] This result depends partly on the underlying income distribution of a base year. As can be seen in the rightmost column of Panel C in Tables A4 and A5, applying the tax laws to the 2009 income yields equal or slightly lower percentage changes for the older elderly than for the younger elderly. Totally, however, overall redistributive effects appear larger for the older elderly.

5.2 Discussion

Our findings are summarized as follows. The equalizing impacts of the Japanese personal income tax system are weakest for the young group, followed by the middle-age group, and are strongest for the elderly, and this tendency had lasted from 1984 to 2009. One explanation for this difference is larger reduction in the base effects for the young group than for the elderly, particular in the period 1984–1989. Redistributive effects differ even within the elderly group. The redistributive effects for the older elderly group are less than those for the younger elderly group, mainly owing to lower rate effects for the older elderly. This tendency has recently become strong.

The findings bring us the following policy implications. First, in an aging society, post-tax income inequality is expected to grow in the near future. As mentioned earlier, the equalization of income distribution through the progressive income tax has worsened over the 25 years (our sample period), particularly for older elderly group. Therefore, it is therefore anticipated that Japan will experience a more serious decrease in the redistributive effect of the income tax system and, consequently, greater inequality in post-tax income distribution. This result coincides partly with the insights obtained by other researchers concerning the income inequality in Japan (e.g., Fukawa and Oshio, 2007; Ohtake, 2005). Second, Japan might face much larger post-tax income inequality in the long term. In Japan, the pre-tax income inequality within young generation has been increasing recently, mainly owing to an increase in the number of young people who hold part-time jobs (Cabinet Office, 2006). Their post-tax income distribution is anticipated to be more unequal in future, given the recent less equalizing function of the personal income tax. This, in turn, would increase overall income inequality in Japan as the young cohort ages.

To deal with the increasing income inequality, the government should reform the personal income tax system so that it can recover its redistributive effects and alleviate the increasing post-tax income inequality. One way to redistribute more to those whose incomes fall below a taxation threshold is to implement an in-work refundable tax credit. It is a tax-credit system in which subject to family members' working, the household can receive a tax credit or a tax refund if their overall income is too low (Morinobu, 2008; Tajika and Yashio, 2006). In particular, this refundable tax credit seems to work more effectively for the redistribution among the older elderly than does an combination of progressive tax rates and deductions and exemptions, because most of them have not been taxed.

6. Conclusion

The OECD countries have experienced several fundamental tax reforms since the early 1980s. Through personal income tax reforms—especially large tax rate cuts and widening tax deductions and exemptions in the 1980s—the equalizing function of income tax has declined, resulting in greater post-tax inequality. The Japanese government also has implemented personal income tax changes several times since the 1980s, following the tax reforms in the OECD countries. These tax changes in Japan have unambiguously weakened the equalizing effect of personal income tax from the early 1980s to the late 2000s.

In the 30 years after 1980, population aging has been prevalent among the OECD countries. In the same period, Japan also has experienced rapid population aging and declining birthrates, and has become one of the most aging societies among developed countries. Some previous studies suggest that the population aging in Japan is closely

associated with income inequality and, in future, continued population aging may generate deeper inequality (e.g., Fukawa and Oshio, 2007).

The objectives of this study are to explore how different the redistributive effects of the income tax reforms in Japan are among various age groups, and how the effects alter over time, using Japanese household microdata for the period 1984–2009. We measure the redistributive effect using the Reynolds–Smolensky index, and decompose it into the redistributive effects of the tax rates, the tax base, and tax credits, taking into account the properties of the Japanese income tax system. Our results were as follows. First, the overall redistributive effect was greatest for the elderly group, followed by the middle-age group, and then the young group for the period 1984–2009. Furthermore, this trend increased steadily over time. Second, the difference in the total redistributive effect between the young and elderly increased owing to a large reduction in the base effect for the young. Third, the redistributive effect of income tax for the older elderly group is smaller than that for the younger elderly group. Now that the Japanese population is aging, these findings suggest that Japan will face more severe income inequality in the short run and the long run. In addition, these results could provide insightful policy implications for redistribution policies of other countries, most of which are anticipated to face an aging society as in Japan in the future.

One caveat of our study is that the analysis focuses on Japan. The income tax systems and the significance of population aging vary across countries, so it may be difficult to generalize our results to other countries. However, Japan is one of the most aging countries. Therefore, the study on the relationship between the redistributive effects of income tax and population aging could provide a valuable insight for redistribution policies in other countries, and for further study.

Appendix A

Insert Tables A1 – A5 around here

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Table 1. Contents of the Japanese Income Tax Reforms, 1984‑2009

Concept	1985−1989	1990−1994
Tax schedules	Reduction in the number of tax brackets (1987, 1988, 1989)	-
	Reduction of the top tax rate (1987, 1988, 1989)	
	Expansion of the threshold of minimum tax rate (1987, 1988)	
Deductions and exemptions	Expansion of deduction from salaries (1989)	Expansion of deduction from pensions (1990)
	Establishment of deduction from pensions (1988)	Expansion of exemption for dependent-relatives (1993)
	Expansion of basic exemption (1989)	Expansion of special deduction from blue return (for business revenue) (1993)
	Expansion of exemption for spouses (1989)	
	Expansion of special exemption for spouses (1987, 1988, 1989)	
	Expansion of exemption for dependents relatives (1989)	
	Expansion of exemption for the elderly (1989)	
	Expansion of exemption for working students (1989)	
	Reduction of medical expenses deduction (1989)	
Tax-free small-sum savings system	-	Expansion of tax-free small-sum savings system (1994)
Tax credits	-	Temporary fixed rate tax cut (1994)
Effects of deduction and exemption reforms in age groups	Expansion of exemption in all age classes (by the exemption for dependent-relatives)	Expansion of exemption in all age classes (by the exemption for dependent-relatives)
	Expansion of exemption for the elderly (by the exemption for the elderly)	Expansion of deduction in the elderly (by the deduction from pensions)

Notes : Numbers in parentheses represent the year when the tax reform of interest was implemented. One yen is about 0.01 USD.

Table 1. (*continued*)

Concept	1995−1999	2000−2004
Tax schedules	Reduction of the number of tax brackets (1999) Reduction of the top tax rate (1999) Reduction of tax rates (1995)	-
Deductions and exemptions	Expansion of deduction from salaries (1995) Expansion of basic exemption (1995) Expansion of exemption for spouses (1995) Expansion of special exemption for spouses (1995) Expansion of exemption for dependent relatives (1995, 1998, 1999) Expansion of special deduction from blue return (for business revenue) (1998)	Reduction of special exemption for spouses (2004) Reduction of exemption for dependent-relatives (2000) Expansion of special deduction from blue return (for business revenue) (2000)
Tax-free small-sum savings system	-	-
Tax credits	Temporary fixed rate tax cut (1995, 1996) Temporary fixed amount tax cut (1998) Establishment of the permanent fixed rate tax cut (1999)	-
Effects of deduction and exemption reforms in age groups	Expansion of exemption in all age classes (by the exemption for dependent-relatives)	Reduction of exemption for the young people (by the exemption for dependent-relatives below the age of 16)

Table 1. (*continued*)

Concept	2005–2009
Tax schedules	Expansion in the number of tax brackets (2007)
	Expansion of the top tax rates (2007)
	Expansion of tax rates (2007)
Deductions and exemptions	Reduction of deduction from pensions (2005)
	Abolishment of exemption for the elderly (2005)
	Expansion of special deduction from blue return (for business revenue) (2005)
Tax-free small-sum savings system	Reduction of tax-free small-sum savings system (2006)
Tax credits	Reduction of the permanent fixed rate tax cut (2005)
	Abolishment of the permanent fixed rate tax cut (2006)
Effects of deduction and exemption reforms in age groups	Reduction of exemption for the elderly (by the deduction for pensions and exemption for the elderly)

Table 2. Contents of Tax Credits

Year	Type of Tax Credits	Ceiling of Tax Credits
1994	Fixed-rate tax cut of 20%	2 million yen
1995	Fixed-rate tax cut of 15%	50,000 yen
1996	Fixed-rate tax cut of 15%	50,000 yen
1998	Fixed-amount tax cut (38,000 yen for householders, and 19,000 yen for each dependent relatives)	-
1999-2005	Fixed-rate tax cut of 20%	250,000 yen

Note : One yen is about 0.01 USD.

Year	Type of Tax Credits	Ceiling of Tax Credits
	Fixed-rate tax cut of 20%	2 million yen

Table 3. Average of Pretax and Posttax Incomes across Age Groups, 1984‑2009

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-2009
Overall							
Pretax income	236.2	231.2	235.8	235.3	232.7	233.0	-1%
Posttax income	212.7	211.2	216.6	219.0	216.1	217.4	2%
Observations	[45899]	[52756]	[54182]	[53467]	[50611]	[47084]	
Young Group (Head Aged 39 or under)							
Pretax income	185.5	189.0	195.2	202.6	211.5	216.6	17%
Posttax income	171.8	177.0	183.5	192.2	199.6	207.0	20%
Observations	[15724]	[15737]	[14346]	[12652]	[10278]	[8443]	
Middle Age Group (Head Aged 40 - 59)							
Pretax income	265.1	275.1	285.9	297.0	299.1	314.0	18%
Posttax income	236.7	249.2	260.9	274.4	276.2	290.8	23%
Observations	[23392]	[26020]	[26531]	[24529]	[21649]	[18350]	
Elderly Group (Head Aged 60 or over)							
Pretax income	253.7	187.8	179.4	167.7	167.5	166.6	-34%
Posttax income	225.0	170.1	164.0	156.5	155.4	155.4	-31%
Observations	[6783]	[10999]	[13305]	[16286]	[18684]	[20291]	
Younger Elderly Group (Head Aged 60 - 69)							
Pretax income	264.9	208.6	203.5	190.0	189.9	190.7	-28%
Posttax income	233.5	188.2	185.1	176.8	175.3	176.9	-24%
Observations	[4918]	[7859]	[9357]	[10268]	[11003]	[11275]	
Older Elderly Group (Head Aged 70 or over)							
Pretax income	224.1	135.9	122.1	129.5	135.5	136.4	-39%
Posttax income	202.5	125.0	113.9	122.0	126.9	128.4	-37%
Observations	[1865]	[3140]	[3948]	[6018]	[7681]	[9016]	

Notes : Units are 10,000 yen, and one yen is about 0.01 USD. Pretax incomes are normalized by the growth rate of pretax income at 2004. Pretax and posttax incomes are equivalently scaled with square-root of the number of family member. Brackets present the number of observation.
Sources : Ministry of Communication and Internal Affairs (MIC) (1984, 1989, 1994, 1999, 2004, 2009)
The National Survey of Family Income and Expenditure (NSFIE) .

Table 4. Redistributive Effects of Personal Income Taxation across Young, Middle Age and Elderly Groups, 1984-2009 Tax Laws Applied to 2004 Income

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. Young Group (Head Aged 39 or under)										
Total	0.020	0.017	0.014	0.013	0.012	0.012	-14%	-8%	2%	-40%
Rate effect	0.006	0.004	0.004	0.002	0.003	0.005	-31%	-50%	51%	-25%
Base effect	0.014	0.013	0.014	0.014	0.012	0.008	-7%	1%	-35%	-47%
Credit effect	-	-	-0.003	-0.003	-0.003	-	-	18%	-	-
B. Middle Age Group (Head Aged 40 - 59)										
Total	0.028	0.027	0.022	0.019	0.019	0.022	-4%	-12%	17%	-23%
Rate effect	0.014	0.013	0.011	0.007	0.009	0.012	-8%	-40%	32%	-17%
Base effect	0.015	0.014	0.017	0.016	0.013	0.010	-2%	-3%	-21%	-29%
Credit effect	-	-	-0.005	-0.003	-0.003	-	-	42%	-	-
C. Elderly Group (Head Aged 60 or over)										
Total	0.033	0.035	0.028	0.024	0.024	0.025	7%	-14%	2%	-24%
Rate effect	0.017	0.008	0.006	0.003	0.006	0.011	-51%	-41%	90%	-34%
Base effect	0.016	0.027	0.029	0.024	0.022	0.014	67%	-17%	-38%	-14%
Credit effect	-	-	-0.006	-0.003	-0.003	-	-	53%	-	-

Notes : Redistributive effects are measured by the RS (Reynolds-Smolensky) indices related to each income component. "Total" refers to the overall redistributive effect of labor income tax; "Rate effect" the redistributive effect of labor income tax rates; "Base effect" the effect of deductions for labor income; "Credit effect" the effect of tax credits for labor income. The results of rate effects on capital income are omitted due to the fact that capital income taxation rarely had an effect on income inequality. Panel A, B and C correspond to the analyses using, respectively, the young, middle age, and elderly group as a sample.

Table 5. Redistributive Effects of Personal Income Taxation across the Younger and Older Elderly, 1984-2009 Tax Laws Applied to 2004 Income

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. Younger Elderly Group (Head Aged 60 - 69)										
Total	0.034	0.035	0.028	0.024	0.024	0.026	5%	-14%	5%	-23%
Rate effect	0.018	0.011	0.007	0.004	0.007	0.012	-41%	-41%	59%	-34%
Base effect	0.016	0.025	0.028	0.024	0.021	0.014	54%	-16%	-32%	-13%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	53%	-	-
B. Older Elderly Group (Head Aged 70 or over)										
Total	0.031	0.033	0.026	0.023	0.024	0.023	8%	-15%	-1%	-25%
Rate effect	0.016	0.005	0.003	0.002	0.004	0.010	-65%	-43%	170%	-34%
Base effect	0.016	0.028	0.029	0.023	0.023	0.013	80%	-19%	-43%	-16%
Credit effect	-	-	-0.006	-0.003	-0.003	-	-	54%	-	-

Notes: Basically the same as Table 4. Panel A, B correspond to the analyses using, respectively, the younger and older elderly group as a sample.

Table A1. Redistributive Effects of Personal Income Taxation by Base Year, Head Aged 39 or under

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. 1984-2009 Tax Laws Applied to 1984 Income										
Total	0.021	0.018	0.016	0.015	0.013	0.012	-13%	-8%	-4%	-41%
Rate effect	0.006	0.004	0.007	0.003	0.003	0.004	-31%	-51%	29%	-25%
Base effect	0.016	0.014	0.014	0.015	0.013	0.008	-8%	8%	-36%	-48%
Credit effect	-	-	-0.004	-0.003	-0.003	-	-	25%	-	-
B. 1984-2009 Tax Laws Applied to 1994 Income										
Total	0.021	0.017	0.016	0.015	0.012	0.013	-18%	-8%	9%	-40%
Rate effect	0.007	0.003	0.007	0.003	0.002	0.005	-63%	-48%	155%	-30%
Base effect	0.015	0.015	0.013	0.015	0.014	0.008	3%	11%	-40%	-45%
Credit effect	-	-	-0.004	-0.003	-0.002	-	-	23%	-	-
C. 1984-2009 Tax Laws Applied to 2009 Income										
Total	0.021	0.018	0.016	0.015	0.013	0.013	-13%	-9%	4%	-37%
Rate effect	0.007	0.005	0.008	0.004	0.004	0.005	-27%	-45%	32%	-22%
Base effect	0.014	0.013	0.013	0.014	0.012	0.008	-6%	10%	-33%	-45%
Credit effect	-	-	-0.004	-0.003	-0.003	-	-	24%	-	-

Notes : Basically the same as Table 4. Panel A, B and C correspond to the senarios using, respectively, 1984, 1994 and 2009 incomes as base year.

Table A2. Redistributive Effects of Personal Income Taxation by Base Year, Head Aged 40 - 59

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. 1984-2009 Tax Laws Applied to 1984 Income										
Total	0.029	0.026	0.024	0.021	0.018	0.019	-10%	-12%	5%	-33%
Rate effect	0.012	0.011	0.015	0.009	0.008	0.009	-13%	-42%	16%	-24%
Base effect	0.017	0.015	0.015	0.015	0.014	0.010	-9%	3%	-26%	-38%
Credit effect	-	-	-0.006	-0.003	-0.003	-	-	47%	-	-
B. 1984-2009 Tax Laws Applied to 1994 Income										
Total	0.029	0.025	0.024	0.021	0.017	0.022	-14%	-13%	27%	-26%
Rate effect	0.014	0.008	0.015	0.009	0.006	0.011	-43%	-41%	101%	-21%
Base effect	0.016	0.018	0.015	0.016	0.016	0.011	12%	3%	-32%	-30%
Credit effect	-	-	-0.006	-0.003	-0.003	-	-	46%	-	-
C. 1984-2009 Tax Laws Applied to 2009 Income										
Total	0.029	0.028	0.025	0.021	0.019	0.023	-4%	-13%	18%	-21%
Rate effect	0.015	0.014	0.017	0.011	0.010	0.012	-8%	-39%	25%	-17%
Base effect	0.014	0.014	0.014	0.014	0.012	0.010	0%	1%	-18%	-26%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	53%	-	-

Note : The same as Table A1.

Table A3. Redistributive Effects of Personal Income Taxation by Base Year, Head Aged 60 or over

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. 1984-2009 Tax Laws Applied to 1984 Income										
Total	0.034	0.030	0.027	0.023	0.021	0.021	-13%	-15%	3%	-38%
Rate effect	0.015	0.009	0.012	0.007	0.007	0.009	-42%	-42%	34%	-39%
Base effect	0.019	0.022	0.022	0.020	0.017	0.013	12%	-11%	-28%	-35%
Credit effect	-	-	-0.006	-0.003	-0.003	-	-	56%	-	-
B. 1984-2009 Tax Laws Applied to 1994 Income										
Total	0.034	0.029	0.029	0.024	0.021	0.023	-15%	-15%	10%	-32%
Rate effect	0.016	0.005	0.011	0.007	0.004	0.010	-69%	-41%	169%	-38%
Base effect	0.018	0.024	0.025	0.022	0.021	0.013	36%	-12%	-38%	-26%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	55%	-	-
C. 1984-2009 Tax Laws Applied to 2009 Income										
Total	0.031	0.033	0.029	0.025	0.023	0.024	7%	-14%	1%	-23%
Rate effect	0.016	0.007	0.010	0.006	0.006	0.010	-55%	-42%	85%	-37%
Base effect	0.015	0.026	0.027	0.024	0.022	0.013	76%	-12%	-38%	-9%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	51%	-	-

Note : The same as Table A1.

Table A4. Redistributive Effects of Personal Income Taxation by Base Year, Head Aged 60 - 69

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. 1984-2009 Tax Laws Applied to 1984 Income										
Total	0.035	0.032	0.029	0.025	0.023	0.023	-10%	-15%	4%	-34%
Rate effect	0.017	0.011	0.014	0.008	0.008	0.010	-38%	-41%	27%	-38%
Base effect	0.018	0.022	0.022	0.020	0.018	0.013	18%	-10%	-25%	-28%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	57%	-	-
B. 1984-2009 Tax Laws Applied to 1994 Income										
Total	0.035	0.031	0.031	0.026	0.023	0.025	-11%	-15%	11%	-28%
Rate effect	0.019	0.007	0.014	0.008	0.005	0.012	-64%	-41%	147%	-36%
Base effect	0.017	0.025	0.024	0.022	0.022	0.014	51%	-11%	-40%	-19%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	57%	-	-
C. 1984-2009 Tax Laws Applied to 2009 Income										
Total	0.034	0.034	0.031	0.026	0.024	0.026	2%	-14%	6%	-24%
Rate effect	0.018	0.010	0.014	0.008	0.008	0.012	-44%	-40%	52%	-36%
Base effect	0.016	0.025	0.025	0.022	0.020	0.014	57%	-11%	-31%	-10%
Credit effect	-	-	-0.007	-0.003	-0.003	-	-	54%	-	-

Note : The same as Table A1.

Table A5. Redistributive Effects of Personal Income Taxation by Base Year, Head Aged 70 or over

	1984	1989	1994	1999	2004	2009	Growth rates, 1984-1989	Growth rates, 1994-1999	Growth rates, 2004-2009	Growth rates, 1984-2009
A. 1984-2009 Tax Laws Applied to 1984 Income										
Total	0.031	0.024	0.021	0.018	0.016	0.016	-22%	-17%	0%	-48%
Rate effect	0.010	0.004	0.006	0.003	0.003	0.006	-56%	-44%	73%	-43%
Base effect	0.020	0.020	0.021	0.018	0.016	0.011	-2%	-15%	-33%	-47%
Credit effect	-	-	-0.005	-0.003	-0.003	-	-	54%	-	-
B. 1984-2009 Tax Laws Applied to 1994 Income										
Total	0.029	0.021	0.023	0.019	0.016	0.018	-26%	-16%	11%	-40%
Rate effect	0.011	0.002	0.005	0.003	0.001	0.006	-83%	-45%	311%	-46%
Base effect	0.018	0.019	0.024	0.020	0.017	0.012	10%	-16%	-33%	-34%
Credit effect	-	-	-0.006	-0.003	-0.002	-	-	52%	-	-
C. 1984-2009 Tax Laws Applied to 2009 Income										
Total	0.027	0.029	0.026	0.023	0.021	0.020	9%	-13%	-2%	-23%
Rate effect	0.013	0.004	0.006	0.003	0.003	0.008	-70%	-46%	162%	-37%
Base effect	0.014	0.025	0.026	0.023	0.021	0.012	85%	-14%	-42%	-10%
Credit effect	-	-	-0.006	-0.003	-0.003	-	-	48%	-	-

Note : The same as Table A1.