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Tax Reforms, Redistribution and Population Aging: Evidence from Japan

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Abstract

In the 1980s, income tax rates decreased and income tax deduction thresholds changed through income tax reforms in the OECD countries. Likewise, in Japan in the 1980s and 1990s, income tax rates decreased and the income tax deduction threshold increased. Recently, it has been pointed out that inequality and redistribution vary over different age groups. This study attempts to explore how different the redistributive effects of the income tax reforms in Japan are among various age groups, using Japanese household microdata for the period 1984–2009. The following results are obtained. 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

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for the older elderly group is smaller than that for the younger elderly group. The consequences from Japan's experience could provide insightful suggestions for redistribution policies in other countries, most of which will face an aging society in the future.

Keywords: Base effect; personal income tax; population aging; rate effect; redistribution

JEL classification: D31, H2, H24

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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, it was widely recognized that bracket creep and the high top marginal income rate had negative effects on the Japanese economy. From the 1987–1989 tax reforms until the end of the 1990s, income tax rates decreased, the number of tax brackets decreased, and the income tax deduction thresholds increased. After the tax reform 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 over different age groups. Fukawa and Oshio (2007) examine income inequality in the 1980s and 1990s in Japan, and conclude that the increase in income inequality was caused mainly by increases in before-tax income inequality among workers. They also show that the income inequality would increase further because of the aging process. Oshio (2006) argues that the increase in income inequality during the past 20 years in Japan can be explained by the aging process, 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. Although several empirical studies examine the effects of the redistribution policy on income inequality, given the aging process, very few studies examine the effects of the tax reforms on income inequality for the various age groups. Other studies decompose the redistributive effects based on the tax rate change and the tax base change due to the changes in tax deductions (e.g.,

Miyazaki and Kitamura, 2016; Mochizuki et al., 2010). However, they do not address these redistributive impacts across different age groups.

We investigate the redistributive effect of the Japanese income tax system over a period of 25 years in order to evaluate the long-term effects of tax reforms. This study decomposes the redistributive effects into tax rate and tax base (via deductions) effects for different age groups, and examines the decomposed redistributive effects of tax rates and base across age groups. Also, in order to stimulate the economy, the special tax credit policy had been implemented over the years 1994–2005 (except 1997) in Japan. Because it would have offset the redistributive effect of income tax through large-sized deduction of tax liabilities for high income earners, our study also takes into account redistribution by this special tax credit policy.

Our empirical results are as follows. First, the overall redistributive effect was greatest for the elderly group, followed by the middle-aged group, and then was lowest for the young group during the period 1984–2009. This trend strengthened steadily over time. Second, a larger reduction in the base effect for the young than for the elderly increased the difference in the 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, the aging of the Japanese population will deepen income inequality in the near future. Population aging in Japan increases the proportion of the elderly, and particularly the older elderly. Thus, less progressivity in the Japanese income tax for the older elderly accelerates post-tax inequality. Furthermore, from a long-term perspective post-tax inequality is expected to rise. As mentioned above, the redistribution among the young through income tax is becoming

negligible and, thus, their post-tax income inequality is growing more sharply than it is in other age groups. This will lead to more severe inequality when the current young become the elderly, because inequality in a society generally accumulates and expands over time. These consequences could provide insightful suggestions for redistribution policies in other countries. This is because although Japan is one of the most aging countries even among developed countries, it is certainly anticipated that other countries—for example, the OECD and Asian countries—will experience population 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 in Western countries during this period, using individual or household microdata. As Verbist (2004) noted, progressivity is one of the important determinants of the redistributive effect, and can be decomposed into factors that make up a tax system. Many analyses have tried to determine how each part of income taxation affects the redistributive effect, particularly the redistributive effect of tax rates and deductions, using the

decomposition approach of redistributive effects pioneered by Pfähler (1990) and Lambert (2001). In this literature, researchers have examined the roles of the tax rate structure and the tax base structure, including allowances, deductions, and tax credits, in determining the overall redistributive effects for Western countries, such as Iceland (Kristjánsson, 2013), and Spain (Onrubia et al., 2014), 15 EU countries (Verbist, 2004), and 15 OECD countries (Wagstaff and Doorslaer, 2001).

In Japan, the fundamental tax reforms in the late 1980s resulted in large cuts to the marginal tax rates, particularly those of the top taxpayers, and an increase in income tax deductions. In contrast to the case of Western countries, the redistributive effects of the Japanese income tax reforms have been examined mainly using aggregated data, not microdata at the individual or household levels. Using tax return data of reported income, Mochizuki et al. (2010) present evidence that the redistributive effects of income tax declined steadily over time, and then decreased dramatically during the periods 1969–1975 and 1987–1991, specifically for high income earners. This study addresses the redistributive effects of tax rates and deductions, but employs published aggregated data. In contrast, using a micro simulation method, Tajika and Yashio (2006) found that because tax bases narrowed in Japan, it is possible to redistribute more to the poor by adopting tax credits that can be refunded to those who did not pay taxes. Miyazaki and Kitamura (2016) examine the effects of changes in income tax rates and income tax bases on tax progressivity using the methodology of Pfähler (1990) and Lambert (2001). They demonstrate that the redistributive effects of Japanese income tax are likely to decline over the period 1984–2009 and that the redistributive effect of tax deductions and exemptions is greater than that of tax rates.

As stated above, some empirical studies have focused on income inequality and redistribution. Among them, Fukawa and Oshio (2007) and Oshio (2006) focused primarily

on the trend of income inequality and redistribution policies, paying attention to intergenerational transfers between the young and the elderly.[2] Oshio (2006) shows that the increase in income inequality was caused largely by the population aging, and that the inequality in disposable income for the younger generation increased during this the period. Fukawa and Oshio (2007) show that the inequality in market income across working households increased, and that income inequality could increase further owing to the population aging.

Overall, income inequality in Japan has been growing. Specifically, the extent of income equality appears more severe for the young, in part because of less progressive redistribution policies. It is expected that income equality and redistribution will become more problematic in future. In contrast, the impact of income tax on the post-tax income distribution has not been examined for different generations, while the redistributive impacts probably vary across generations.

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

[2] The first study to examine inequality in Japan across generations was that of Ohtake and Saito (1998). They demonstrate that the young could probably face a more unequal distribution at birth, and that half of the rapid increase in inequality was attributed to population aging in the 1980s. In this case, they assessed inequality based on consumption and Japanese household microdata.

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.[3]

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.

[3] 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.

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.

The tax reforms in the late 1990s also reduced the tax rates and increased the 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 spouses and dependents increased. These reforms reduced the tax base for all households. In addition, the use of tax credits to stimulate the economy continued until 2005.

In the early 2000s, the tendency 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, deductions such 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. The 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 the reduction 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, 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 the 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 1994–2006, 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.[4]

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 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). The data comprise between 46,000 and 54,000 households for each year, including single and multi-family households, and contain

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

information on members' earnings, marital status, sex, age, job, and type and status of employment.[5] 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.[6]

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.

[5] 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.

[6] More detailed information about the way to construct income data is presented in Miyazaki and Kitamura (2016, Sec.2).

Insert Table 3 around here

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. 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, where 2004 is selected as a base year. 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, 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.[7] As shown in the rightmost side of each 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.

[7] 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, rather than progressive. Given that tax deductions and exemptions were increased by the 1987 and 1988 fundamental tax reforms, it seems plausible that the base effect for the elderly increased during this period. Mainly arising from these trends, the base effects decreased most for the young during the sample period, followed by the middle-aged, and then the elderly.

Turning to the rate effect, the elderly group experienced a larger decrease throughout the sample period than others did. This trend in the rate effect 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. Given 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, as the decreases in the total effect are ordered in the same way as those in the base effect. This finding indicates that the changes in base effect determined a trend in overall redistributive effect 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 a 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 the 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.[8] 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.

[8] 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 lasted from 1984 to 2009. One explanation for this difference is the larger reduction in the base effects for the young group than for the elderly, particular in the period 1984–1989. The 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 the lower rate effects for the older elderly. This tendency has recently become strong.

The following policy implications are suggested by our findings. 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 the 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 the 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 the 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). The post-tax income distribution of young people is anticipated to be more unequal in future, given the recent less equalizing function of personal income tax. This, in turn, would increase the 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 possible solution for the redistribution for households that fall below the 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 existing 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; Ohtake and Saito, 1998).

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 term and the long term. 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 similar to 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, this study on the changes in 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) Establishment of deduction from pensions (1988) Expansion of basic exemption (1989) 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)	Expansion of deduction from pensions (1990) Expansion of exemption for dependent-relatives (1993) Expansion of special deduction from blue return (for business revenue) (1993)
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 for the elderly (by the exemption for the elderly)	Expansion of exemption in all age classes (by the exemption for dependent-relatives) 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	The temporary fixed rate tax cut (1995, 1996) The 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.

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.
Source : 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.