

Projections of living arrangement and poverty rates for the elderly in Japan —Effect of changes in nuptiality behavior after 1980s on the poverty rate—

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Abstract

The social security system in Japan has been developed under the premises that the postwar families are common. The postwar family is that (1) most men and women get married; (2) husbands work as regular employees and wives are dependent homemakers; and (3) they seldom get divorce. Therefore, the social security system is generous for dependent wives and widows. However, these premises are no longer valid because the nuptiality behavior after 1980s completely changed. The percentage of marriage rate has decreased while divorce rate has increased significantly. Nevertheless, wage inequality between men and women still exists. As a result, never-married and divorced among the elderly women will increase and they will face a serious poverty risk in the future. This paper makes projections of living arrangement and poverty rate for the elderly and evaluates the effect of changes in nuptiality behavior on the poverty rate using a dynamic microsimulation model for Japan. The simulation results indicate that those changes will affect poverty rate only for the elderly women not for the elderly men.

1. Introduction

The advent of a super-aged society is forecast for Japan in the near future due to the rapid progress of a declining fertility rate and an aging population. According to the Population Projections for Japan (National Institute of Population and Social Security Research 2012), the total population of Japan is expected to decrease by 32.3% in the next 50 years from 128.06 million in 2010 to 86.74 million in 2060. The percentage of the elderly¹ in the population will increase by 16.9 points from 23.0% to 39.9%. Japan is the most aged country in the world, and one of the few depopulating countries.

A universal pension and health insurance system makes people appreciate, but there is concern about the sustainability of such social security system because of the aging society. The National Council on Social Security System Reform was established in November 2012, and it has begun a discussion about social security reform for the future. It includes not only intergenerational equity and sustainability but also the reduction of social welfare benefit that be regarded as a sanctuary. However, many people have concern about the adequacy such as the benefits for child raising, unemployment, pension, health care and nursing care.

The sustainability and adequacy of social security system like two sides of a coin. It is hard to balance the both. It is necessary to increase the social security expenditure for satisfying the adequacy, but the increase in the expenditure compromises its sustainability. Regarding the public pension system, a ceiling for premiums was set and a new scheme for adjusting benefits was introduced by the 2004 amendment. The adjusting system is called “macroeconomic slide system” which reduces the wage indexation and price indexation based on the decrease in the number of

¹ The elderly is defined here as those aged 65 and over.

insured persons and the increase in life expectancy. As a result, it diminished concerns about the sustainability, while it reinforced concerns about the adequacy.

However, the discussion about the adequacy of the public pension scheme was very poor. The 2004 amendment ensured the newly awarded pension's replacement rate of 50% at the age 65 for a specific single-income couple² covered by Employees' Pension Insurance. The replacement rates of the benefit for single persons or double-income couples are generally lower than 50%. Non-regular employed who is not covered by Employees' Pension Insurance will receive the basic pension only, and their benefit level³ will be very low. The government emphasized on the sustainability, and did not provide enough information on the adequacy.

The purpose of this paper is to show the future trends in the poverty rate, and analyze the cause of increase in the poverty rate for the elderly. The poverty line here is the level of livelihood assistance benefits. First, this paper illustrates the significant changes in nuptiality behavior after 1980s, those effects on the number of demographic events, and the marital status of the elderly. Then it makes projections the poverty rate of the elderly by sex under the baseline scenario and alternative scenarios of nuptiality behavior. Finally, it concludes that those changes have a significant negative impact on the poverty rates only for the elderly women.

² The husband is covered by Employees' Pension Insurance (category 2) from age 20 to 59, and the wife has always been dependent on him (category 3). See section 2 for the public pension scheme in Japan.

³ The average take-home pay for regular employees (male) in the year 2009 is 4,296,000 JPY (\$48,175; €36,102). The full basic pension is 792,100 JPY (\$8,883 and €6,657), and its ratio to the take-home pay is only 18.4%. The exchange rates are \$1=89.1750 JPY and €1=118.9951 JPY as of 13 January 2013.

2. Belief overview of pension system in Japan

The public pension scheme in Japan was established in the 1960s, and its current form is depicted in Figure 1. It is a two-tier system that consists of a flat-rate benefit called "basic pension" and an earnings-related benefit for regular employees. All people in Japan are covered by the basic pension, and are classified by their occupation. Regular employees are classified as category 2 subscribers, and are also covered by Employees' Pension Insurance or mutual-aid associations. Dependent spouses of category 2 subscribers are included in category 3 and others in category 1.

The amount of the basic pension in 2010 is a flat-rate benefit of 792,100 JPY (\$8,883 and €6,657) for 40 years of premium paid. A reduced pension is paid according to the number of premiums paid and credited as in formula (1).

$$Pension = 792,100 \times \frac{[\text{premium paid period}] + [\text{exempted period}] \times 0.5}{480} \dots\dots\dots (1)$$

The normal pensionable age is 65, and an early pension is paid from age 60 to 64. The pension may be deferred until age 70. The reduction rate of the early pension is 0.5% per month, and the increase rate of the deferred pension is 0.7% per month.

Employees' Pension Insurance provides an earning-related benefit, which is 21.924% of an average pensionable remuneration for 40 years of insured period. The normal pensionable age for those born after 1 April 1961 (male) or 1966 (female) is 65. The pensionable age for those born before that day is 60 to 64.

The benefits are automatically adjusted annually according to changes in CPI and take-home wages. However, in order to ensure the

sustainability, the indexations are reduced by the “macroeconomic slide system.” The reduction rate is about 1% every year until the sustainability is ensured. According to the 2009 Actuarial Valuation (Ministry of Health, Labour and Welfare, Pension Bureau, Actuarial Division 2010), the reduction is expected to start at the fiscal year 2012⁴ and to end at the fiscal year 2038 under the basic scenario.

The premium for category 1 subscribers was a flat rate of 15,100 JPY (\$169 and €127) per month in 2010. An exemption system of the premium is arranged for low-income earners, but their old-age pension will be reduced according to the exempt period. Since even the full amount of basic pension is not always enough for their old age, the reduced amount would make them very poor. In addition, a considerable number of people do not pay their premiums, and the growing number of the poor elderly is a matter of concern.

The premium of the basic pension for category 2 and 3 subscribers is included in the insured person’s premium to Employees’ Pension Insurance or the mutual-aid associations. The insurers transfer the premium to the basic pension program. Since employers pay their employees’ premium to the insurers, problems such as non-payment of premium do not arise as in the case of category 1 subscribers.

This scheme supposes that most employees are regular workers, and most category 1 subscribers are composed self-employed persons or farmers who do not have a fixed retirement age. It is also supposed that most men and women get married, single-income family is common, and dependent spouses seldom get divorce. The level of the basic pension is not necessary to be high as long as these premises are valid. However, the social and economic structure of Japan has dramatically changed. The

⁴ Since inflation rate was negative in 2012, the “macroeconomic slide” was not applied.

number of self-employed persons or farmers has decreased significantly, and many regular employees have been replaced by non-regular employees. As a result, the main component of category 1 subscribers has completely changed from self-employed persons to non-regular employees or the unemployed. In addition, marriage rate has declined and divorce rate has increased significantly. The premises of the current public pension scheme are no longer valid.

3. Outline of INAHSIM

3.1. Simulation cycle

INAHSIM is an abbreviation of the Integrated Analytical Model for Household Simulation, and is a dynamic microsimulation model for Japan. It is originally developed in early 1980s as a household simulation model to accommodate a Japan's society. The simulation cycle of INAHSIM version 3.7⁵ is shown in Figure 2. The life events are assumed to occur in annual cycles. The life events incorporated in this model are marriage, birth, death, divorce, international migration, change in health status, change in employment status, estimating earnings, determining pensions, young people leaving home, living with elderly parents, entering an institution, and payment of pension premium.

3.2. Key life events and transition probabilities

Transition probabilities for each life event are given in advance, and it is possible to take into account their future trends. In the assumptions of the baseline scenario, future trends in first marriage rates and mortality rates are assumed. The future trends in the transition probabilities of

⁵ The version 3.7 is minor version-upgrade of Inagaki (2010). See also Inagaki (2005, 2007).

employment status are also taken in account. The other transition probabilities of the baseline scenario are assumed to continue in the future. Appendix A and B summarize the transition probabilities.

The key life events used in the simulation for the income distribution of the elderly are "Living with elderly parents," "Estimating earnings," and "Determining pensions."

The first event is living with elderly parents. When elderly people, who do not live with their children, become very old and need care, many children move in to take care of them. This is an important life event to secure the life of the elderly in Japan.

The second event is estimating earnings. Earnings are assumed to conform to a log-normal distribution by sex, age group, and employment status. The earnings of each person are calculated by formula (2) using one's z-score. The z-score represents one's ability to earn money, and it is constant throughout one's life. The z-score is assumed to be determined at birth on the basis of one's parents' z-scores⁶. An immigrant's z-score is assigned randomly at his/her entry. The z-scores of the initial population are estimated on the basis of their earnings in the year 2004 by sex, age group, and employment status.

$$\text{Earnings} = \exp(\text{Mean} + \text{SD} \times [\text{z-score}]) \dots\dots\dots (2)$$

The third event is determining pensions. The pensionable age for basic pension is 65 years. The pensionable age for earnings-related benefits is statutorily fixed at 60–65 years and is specified by sex and year of birth. Early and deferred pensions are not considered. The pension amount is estimated on the basis of the pensioner's percent rank, sex, subscription category, and employment status at the age of 35, assuming the distribution of the newly awarded pension amounts. The percent rank is

⁶ It is determined randomly at the version 3.7.

equivalent to his/her z-score. The pension amount distributions under the current pension system are estimated using the Internet Survey on the Individual Records of Regular Pension Coverage Notice (Inagaki 2012).

It should be noted that individual heterogeneity in earnings are not fully taken into account since the z-score is fixed throughout one's life. Annual fluctuation in z-score is an issue in the future. However, the age-based remuneration system still exists in Japan, and correlation between wages by age is relatively strong as shown in Table 1.

Regarding economic assumptions, the wage increase and the inflation rate are assumed consistent with those in the 2009 Actuarial Valuation (Ministry of Health, Labour and Welfare, Pension Bureau, Actuarial Division 2010). In a long run, the wage increase and the inflation rate are assumed 2.5% and 1.0% respectively. The annual reduction rate of the pension benefit by the "macroeconomic slide system" is about 1% every year from the year 2012 to 2019 for the earning-related benefit and to 2038 for the basic pension.

3.3. Initial population

The 2004 Comprehensive Survey of the Living Conditions (CSLC) conducted by the Ministry of Health, Labour, and Welfare is the main source of the initial population⁷. The survey is conducted every three years using large sample sizes. In the 2004 survey, the sample size was 25,091 households and 72,487 household members. The survey covers kinship relationships within household members⁸, marital status, employment status, condition of need for long-term care, earnings, pension amounts,

⁷ The data used in this study were made available to the author by the Ministry of Health, Labor, and Welfare of Japan, notice number No.1102-2 dated 2 November 2012.

⁸ Kinship relationships between the persons living in different households are imputed.

and other socioeconomic characteristics. The initial population of 49,307 private households and 126,570 household members is prepared by resampling with replacement from the micro data. The elderly population of 1,212 persons in institutional households is prepared separately and is added to the initial population. In the end, the initial population is 127,782 persons, and reflects Japan's society on a 1/1000 scale.

4. Past trends and future prospects for the elderly in Japan

4.1. Marriage and divorce

The Population Projections for Japan project the size and structure of the population into the future based on assumptions on future fertility, mortality, and international migration levels using the cohort component method. Therefore, the numbers of births and deaths are projected but the numbers of marriages or divorces are not projected. However, the prospects for the nuptiality and marital fertility are implicitly assumed to forecast the future fertility. Those indices are mean age at first marriage, proportion of never married, completed number of births from married couple, and coefficient of divorce, bereavement, and remarriage.

According to the medium-variant assumption of the Population Projections, the total fertility rate, whose statistic value was 1.39 in 2010, will slightly decline to 1.35 in 2060. The assumptions for nuptiality and marital fertility are as follows:

- (a) The mean age at first marriage of women by cohort increases gradually from 25.7 years of age for the cohort born in 1960 to 28.2 years of age for the cohort born in 1995. It levels off at nearly the same level until the cohort born in 2010 and remains unchanged thereafter.
- (b) The proportion of never married women increases from 9.4% for the cohort born in 1960 to 20.1% for the cohort born in 1995. It then levels

off at nearly the same level until the cohort born in 2010 and remains unchanged thereafter.

(c) The completed number of births from married couples drops from 2.07 for the cohorts born from 1958 to 1962 to 1.74 for the cohort born in 1995, remaining unchanged thereafter.

(d) The coefficient of divorce, bereavement, and remarriage decreases from the actual figure of 0.962 for the cohort born in 1960 to 0.938 for the cohort born in 1995. It remains unchanged thereafter.

The assumptions of INAHSIM are different from those of the Population Projections. They are probability of first marriage (remarriages) by sex and age⁹, probability of divorce by wife's age¹⁰, and probability of marital fertility by mother's age and number of ever-born children. Since the INAHSIM is a dynamic microsimulation model, it can estimate not only the numbers of births and deaths but also the numbers of marriages and divorces. According to the estimate of INAHSIM, the mean age at first marriage of women will be 28.1, the proportion of never married women will be 17.9%, and the completed number of births from married couples will be 1.78 for the cohort born in 2010. The total fertility rate will be 1.38 in 2060.

Figure 3 shows past trends and future prospects for the numbers of births, deaths, marriages, and divorces.

Since the percentage of illegitimate births¹¹ is very low and marital fertility has been leveling-off in Japan, there was a strong correlation between the numbers of marriages and births with one or two year time lag. Therefore, there was a peak of the number of marriages just before the baby booms. The numbers of marriages in early 1970s exceeded one million, and that formed the second baby boom. Since, the number of

⁹ It is controlled by employment status of a groom.

¹⁰ It is controlled by a couple with or without children.

¹¹ It was 2.2% in 2011.

divorces were only 10% of marriages at that time, the number of births were twice the number as marriages.

After the late 1970s, the number of population at marriageable age has been decreasing, and it has been growing tendency to put off marriage. As a result, the number of marriages decreased by 30% in the next decade. After that, the number of marriages remained as level of 700,000 but the number of births decreased significantly. The ratio of births to marriages was 2.04 in 1980 but it was 1.53 in 2010. The reason why the fertility has declined is increase in the number of divorces¹² and later marriage.

The first marriage rate, which affects the number of marriages, significantly declined after late 1970s. The probability of first marriage for never-married women¹³ aged 25 to 29 was 25.3% in 1970, but that declined to 22.1% in 1980, 16.7% in 1990, 11.8% in 2000, 9.9% in 2005, and 10.0% in 2010. The trend of the first marriage behavior for women aged 20 to 24 was similar to those aged 25 to 29.

This simulation assumes that the marriage behavior after 2015 remains unchanged, and then the number of marriages will decrease in line with the number of population at marriageable age. It will decrease to 497,000 in 2045 and 282,000 in 2100.

The number of divorces was used to be few, less than 100,000 before late 1970s, but it increase significantly after 1980s, and it recorded by more than 300,000 in early 2000s. It decreased a little after that, but it was 251,000 in 2010. The ratio of divorces to marriages was less than 10% before late 1970s, but that increased to 21.0% in 1982, 31.0% in 1998, and 38.3% in 2003. It decreased a little after that, but it was still 35.9% in 2010.

This simulation assumes that the divorce behavior remains

¹² Thirty five percent of divorces occurred within 5 years after marriage. (Vital statistics 2010, Ministry of Health, Labor, and Welfare)

¹³ See the statistics in National Institute of Population and Social Security Research (2012).

unchanged after 2010, and then the number of divorces will decrease as marriages. The number of divorces will decrease to 199,000 in 2027 and 90,000 in 2100.

These significant changes in nuptiality behavior will affect the structure of household, especially the marital status and co-resident family for the elderly. However, the changes occurred mainly on young generation at that time, and then its effect on the elderly is very limited until now. It will emerge gradually.

Table 2 shows past trends and future prospects for the percentage of the elderly by sex and marital status. Almost all men and women were married or widow(er) in 1970. The percentage of never married or divorced was only 2.2% for male and 3.0% for female. In 2010, the percentage was still low, 7.4% for male and 8.7% for female. However, this will significantly increase to 31.3% for male and 27.3% for female in 2050. Never married and divorced will not be exceptional for the elderly in the future.

4.2. Percentage of the elderly by co-resident family type

Figure 4 shows past trends and future prospects for percentages of the elderly by co-resident family type. These trends are divided into the following subtypes: single-person households, couple-only households, those living with married children, those living with unmarried children, other private households, and those in an institution¹⁴.

In Japan, the tradition that children take care of their elderly parents used to be common because social security system was not well developed. Therefore, the majority of the elderly were living with their children. Even in 1986, the percentage of the elderly living with their children was 64.3%.

¹⁴ Persons living in an institution are not investigation object of the CSLC. Therefore, those living in an institution are excluded by the year 2010. It is estimated that the percentage of those living in an institution is 5.5% in 2010 using INAHSIM.

In addition, the children living with their parents were generally married, and the percentage of the elderly living with unmarried children was not so high. The percentage of those living with married children was 46.7%, and that with unmarried children was 17.6%.

However, the percentage of those living with married children has been decreasing by 29.2 points from 46.7% in 1986 to 17.5% in 2010. Thanks to the development of social security system, most of the elderly are not necessary to live with children for their livelihood currently. As most newlyweds, including the first child, do not live with their parents, the tradition has been losing. That is another factor for the changes in the family type.

On the other hand, the percentage of those living with unmarried children has been increasing by 7.2 points from 17.6% in 1986 to 24.8% in 2010. This is a case of parents becoming elderly while children are not able to become independent of their parental roof because many of them do not have sufficient economic resources due to their unstable employment and, therefore, continue to live with their parents without getting married. They are called as “parasite single” that is a Japanese-English term for single adults who live with their parents and do not marry until their late twenties or thirties.

After 2010, the percentage of those living with married children will continue to decrease, and it will be the least co-resident family type by 2020. The percentage will continue to decrease further, and it will be only 9.4% by 2050. This is unthinkable change because this co-resident family type used to be the most common type for a long period. On the other hand, the percentage of those living with unmarried children will increase by 2030; the percentage of those living with children will not decrease significantly. However, in many of the latter type of family, children do not support their parents but the parents support their adult children. The

increase in this family type is a matter of concern in the future because this supporting system is not sustainable.

While the percentage of those living with children has decreased, those living in a single-person household or couple-only household have increased significantly. The percentage of those living in a single-person household has increased by 6.8 points from 10.1% in 1986 to 16.9% in 2010. The percentage of those living in a couple-only household has increased by 15.2 points from 22.0% to 37.2% in the same period. Currently, the percentage of those living in a single-person household is not high because the most elderly are married and both husband and wife are still alive.

However, for the future, the share of co-resident family types will completely change. Old wives in a couple-only household will be a single-person household due to the bereavement of their husband. In addition, never married and divorced persons whose were increased after 1980s will attain old age and be a single-person household. Those living in an institution¹⁵ will also increase due to the aging among the elderly.

What will happen to the adult children called “parasite single” in the future? They are depending financially upon their parents due to their unstable employment. They generally do not cover by the Employee’ Pension Insurance and their old pension will be the basic pension only. In addition, many of them cannot pay their pension premium; as a result, their basic pension will be reduced from the full pension. It will be difficult for them to save money for their old age. After the death of their parents, they will attain old age and be a single-person household. They will likely fall into poverty.

Currently, majority of the elderly living in a single-person household

¹⁵ The percentage of the elderly living in an institution by sex, age and marital status will remain constant in the future. Therefore, it is assumed that the supply of institutions will increase along with its demand.

are widows. However, in the future, the percentage of never married in those living alone will increase from 14.3% in 2010 to 46.7% in 2100. The percentage of widow(er)s will decrease by half from 60.4% to 31.6%.

4.3. Household income distributions and income disparities

Figure 5 shows household income distributions in the years 1994, 2009, 2030, and 2100. The percentages are calculated with one million yen increments in between. The peak of the distribution in 1994 was 3 million yen (\$33,642 and €25,211) level, but that in 2009 was 2 million yen (\$22,428 and €16,807) level. The peak will decrease to 1 million yen level thereafter. The percentage of low-income households with less than 2 million yen will increase significantly while the percentage of middle- or high-income households will decrease. However, high-income households will decrease modestly.

In Japan, there used to be few differences in income among the people, so it was said all Japanese belonged to the middle class during the postwar period of rapid economic growth. However, as mentioned above, the middle class will shift to the lower class and that will expand income disparities.

How much will low-income households increase then? Here, low-income households are defined as those under the minimum cost of living. The household income in this model includes only earnings and pension benefit¹⁶. Asset income or other social security benefits are not included. The Livelihood assistance by the Public Assistance Act is regarded as the minimum cost of living. The amounts of the livelihood assistance for some specific households are shown in Table 3.

Ministry of Health, Labor, and Welfare, Social Welfare and War Victim' Relief Bureau, Public Assistance Division (2010) estimated the number of households under the livelihood assistance using the 2007 CSLC

¹⁶ However, the share of earnings and pension benefits in household incomes was 92.3% in 2010 according to the 2011 CSLC.

micro data. According to this estimate, the number of low-income households was 5,970,000 or 12.4% in the total number of households. If their property was taken into account, that was 2,290,000 households or 4.8%. However, the actual number of households on welfare was 1,080,000 or 2.2% that was much fewer than the expected number because the ability of working and the assistance from other relatives are also taken into account to decide to provide the benefit.

Low-income households are not always poor. It is necessary to take into account properties and other factors. Unfortunately, this model does not incorporate the module for properties, and then the percentage of this low-income household is regarded as an index of poverty. However, since the low-income households generally have fewer properties, the trend in this percentage can be considered as the trend in poverty.

According to the simulation results, the percentage of low-income households will increase from 12.6% in 2009 to 16.1% in 2030, and 19.0% in 2050. After the year 2050, the percentage will remain the same level of around 19%. The reason why the percentage will increase is increase in the number of elderly households¹⁷ and reduction of the amounts of public pension benefits in real terms. The percentage of low-income households in elderly household will increase significantly from 15.3% in 2009 to 28.6% in 2050. Elderly households will face a growing risk of poverty in the future.

4.4. Poverty rates for the elderly

In the previous section, the simulation results indicate that the percentage of the number of low-income households will increase. That for elderly household will increase more significantly. How much the percentage of number of people in the low-income households will increase

¹⁷ The elderly household is defined as the household consist of the elderly (age 65 and over) only or the elderly and children under age 18.

then? Since the size of the low-income household are generally small, that percentage is smaller than the percentage of the low-income households. We here define the poverty rate as the percentage of the number of people in the low-income households. Figure 6 shows future prospects for the poverty rates by age group and sex.

The poverty rate for the elderly will increase from 9.4% in 2009 to 17.8% in 2038 rapidly. After the year 2038, which is the last year of the “macroeconomic slide” for the pension benefit, it will increase modestly to 19.8% in 2060. On the other, the poverty rate for the people under age 65 will increase but it is very modestly. Hence, the poverty rate in Japan will increase into the future, but it will occur chiefly in the elderly.

The trends in poverty rates by sex are very different. By the year 2038, the poverty rates for both sexes will increase in the same way while increase in the poverty rate for females is little faster than that for males. However, after the year 2038, the poverty rate for females will continue to increase while that for males will stay at the level in 2038.

This is due to the changes in nuptiality behavior after 1980s. As mentioned in the section 2, the current public pension system is premised on the postwar family style in Japan. The postwar lifestyle is that (1) most men and women get married; (2) husbands work as regular employees and wives are dependent homemaker; and (3) they seldom get divorce. Under these premises, it used to be existed wage inequality between men and women. Therefore, the tax and social security system including public pension system in Japan supports the life of married women and widows more than that of never-married and divorced women. However, the nuptiality behavior after 1980 was dramatically changed, as the wage inequality still remains. As a result, the number of never-married or divorced elderly women will increase in the future, but their pension benefits will be very poor.

As mentioned in the section 4.1, the changes in nuptiality behavior occurred after 1980 among the young generation at that time. Since the generation has not attained old age currently, the effect of these changes on the poverty is hidden and it will emerge in the future.

5. Effect of changes in nuptiality behavior on poverty rates for the elderly

Let us evaluate the effect of changes in nuptiality behavior on poverty rates for the elderly using the INAHSIM. The simulation results in the previous sections are based on the baseline scenario. In this section, we assume alternative scenarios that the nuptiality behavior will go back to that before 1980s. Specifically the alternative scenarios are as follows:

- (a) Divorce rate will decrease to 30% level of the baseline scenario after 2015
- (b) In addition to (a), first marriage rate will increase to 140% level of the baseline scenario after 2015

Under the scenario (b), the mean age at first marriage of women will be 26.9, the proportion of never married women will be 9.0%, and the completed number of births from married couples will be 1.88 for the cohort born in 2010. The total fertility rate will be 1.65 in 2100.

Figure 7 compares the future trends in poverty rates for the elderly by sex among the baseline scenario and the scenarios (a) and (b). Since the alternative scenarios assume that the changes of nuptiality behavior will occur after 2015, it will not affect the poverty rate for the elderly for the time being. The definitive effect can be seen in the difference of poverty rates in 2100. The poverty rates for the elderly female in 2100 are 27.0% for the baseline scenario, 24.4% for the alternative scenario (a), and 20.6% for the alternative scenario (b). Therefore, the effect of the changes in divorce behavior will be 2.6 points and the effect of the changes in

marriage behavior will be another 3.8 points. These changes will affect the poverty rate only for women not for men.

6. Conclusion

The poverty rate in Japan will increase into the future. That is mainly occurred on the elderly. There are two main reasons. One is the reduction of the pension benefit in real terms by the “macroeconomic slide system” that was introduced by the 2004 amendment. The other one is the increase in the percentage of never married or divorced elderly women. This paper is focused on the latter reason.

The current public pension scheme is premised on the postwar family style in Japan. The postwar lifestyle is that (1) most men and women get married; (2) husbands work as regular employees and wives are dependent homemakers; and (3) they seldom get divorce. Under these premises, the public pension system and other social security systems have been working very well in spite of the existence of wage inequality between men and women.

However, these premises are no longer valid. For example, (1) marriage rate has decreased significantly; (2) many regular employees have been replaced by non-regular employees and the percentage of dependent homemakers has decreased; and (3) divorce rate has increased significantly. Since these changes occurred mainly on the young generation after 1980s, those effects on the elderly’s life has not emerged yet. We do not well recognize these potential problems. It is surprising that the public pension system still uses the postwar family style as a model household for evaluating the adequacy of the pension benefits.

The dynamic microsimulation model INAHSIM revealed this latent problem by projecting the poverty rates in the future. Improvement of employment environment and resolution of inequality between men and

women are political issues, and we should overcome these issues. However, even if these problems are resolved, it does not have an immediate effect on the elderly's life. Since the public pension system, including the basic pension, adopts social insurance system, low amount of pension benefits is promised to today's low-income earners. Nuptiality behavior will not likely go back to the traditional one.

In any case, increase in the poverty rate for the time being, at least 20 or 30 years, is inevitable. We should recognize that the current public pension scheme never protects all the people from the poverty risk in their old age. Therefore, the author proposes the introduction of national minimum benefit to the elderly¹⁸. At the same time, a review of the generous benefits for dependent wives and widows is also necessary as the financial resource for the national minimum benefit. It is indisputable that the restructure of tax and social security scheme to meet with the new life styles is essential.

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¹⁸ The benefit can be limited to the late elderly (aged 75 and over).

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Tables & Figures

**Table 1 Rank correlation coefficient of pensionable remuneration
(People born in 1950s)**

	20's	30's	40's	50's
Age 20's	1.000			
Age 30's	0.707	1.000		
Age 40's	0.539	0.796	1.000	
Age 50's	0.422	0.627	0.843	1.000

Note: Inagaki 2012

Table 2 Percentage of the elderly by sex and marital status

Year	Male				Female			
	Never-married	Married	Widower	Divorced	Never-married	Married	Widow	Divorced
1970	0.9%	76.0%	21.8%	1.3%	1.2%	31.4%	65.7%	1.8%
1990	1.1%	83.6%	13.8%	1.5%	2.3%	40.5%	54.2%	3.0%
2010	3.7%	81.8%	10.8%	3.7%	4.0%	49.6%	41.7%	4.7%
2030	13.4%	68.0%	11.8%	6.8%	6.6%	44.7%	39.3%	9.3%
2050	23.7%	59.0%	9.7%	7.6%	15.4%	40.3%	32.4%	11.9%
2100	26.4%	56.6%	8.8%	8.2%	17.6%	37.3%	32.4%	12.7%

Note: Population census 1970, 1990, and 2010 before 2010, and the simulation results after 2010

Table 3 Amount of livelihood assistance (year 2012)

Type of household	Household members	Livelihood assistance per month
Nuclear family	33-year-old husband 29-year-old wife 4-year-old child	145,770 yen (\$1,635 and €1,225)
Single-person household	68 years old	72,370 yen (\$812 and €608)
Couple-only household	68-year-old husband 65-year-old wife	109,440 yen (\$1,227 and €920)
Single mother household	30-year-old mother 4-year-old child 2-year-old child	128,420 yen (see note) (\$1,440 and €1,079)

Note: Additional benefit for a single mother household is excluded because this model does not include social security benefits for that household.

Figure 1 The public pension scheme in Japan

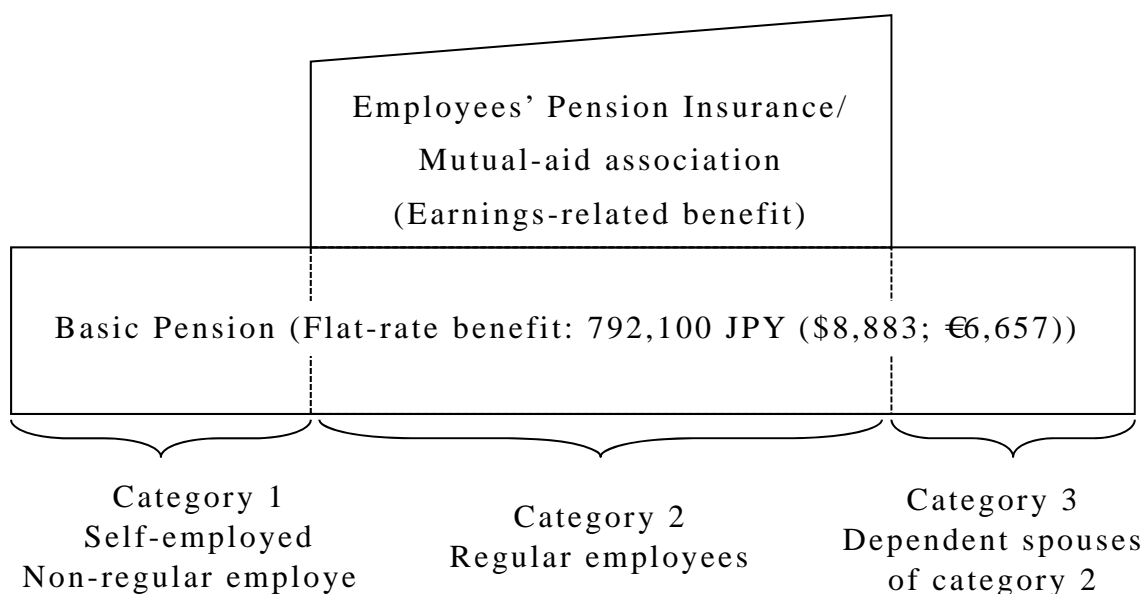


Figure 2 Simulation cycle of INAHSIM

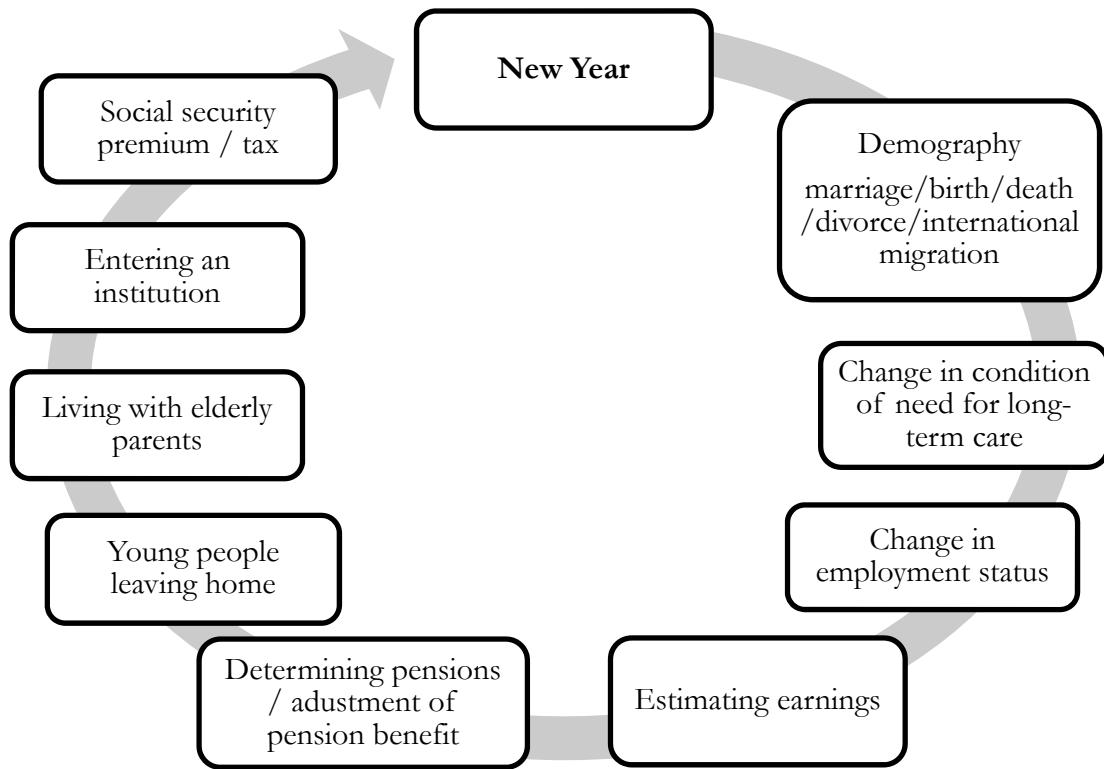
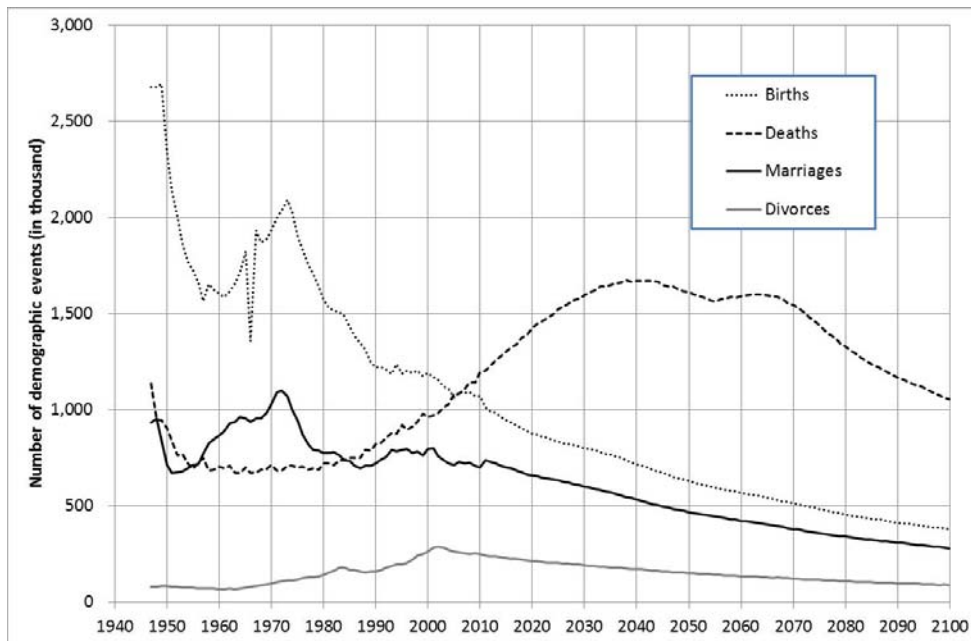
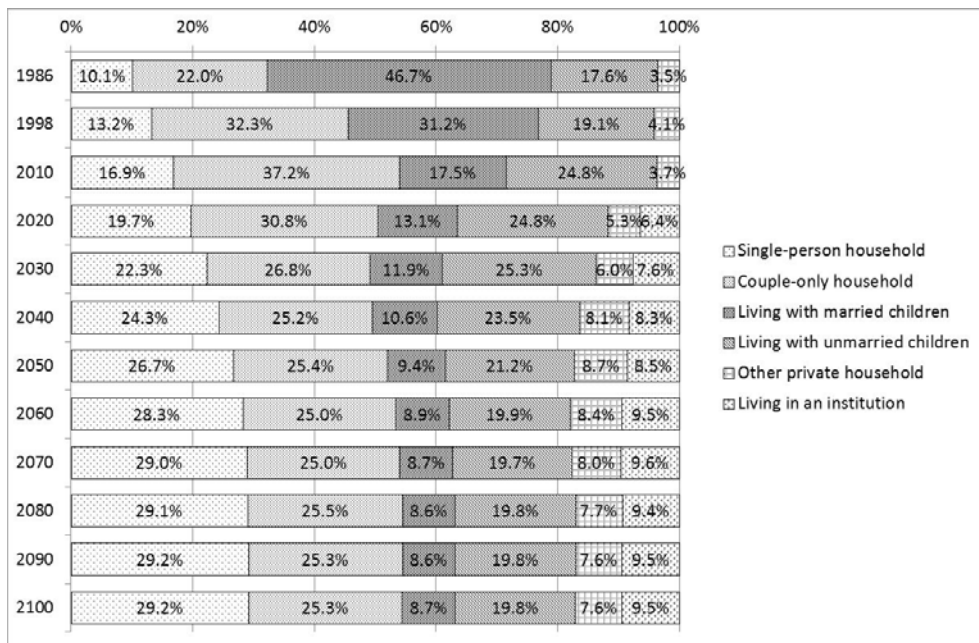


Figure 3 Numbers of births, deaths, marriages, and divorces



Note: Vital statistics (Ministry of Health, Labor, and Welfare) before 2010, and the simulation results after 2010

Figure 4 Percentage of the elderly by co-resident family type



Note: Comprehensive Survey of Living Conditions (Ministry of Health, Labor, and Welfare) before 2010, and the simulation results after 2010

Figure 5 Household income distributions

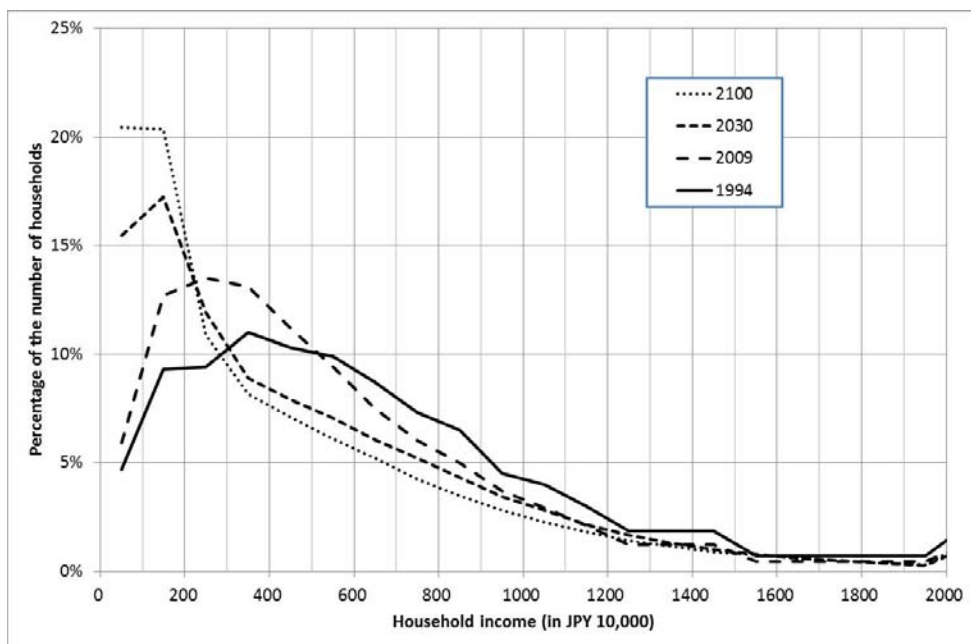


Figure 6 Poverty rates by age group and sex

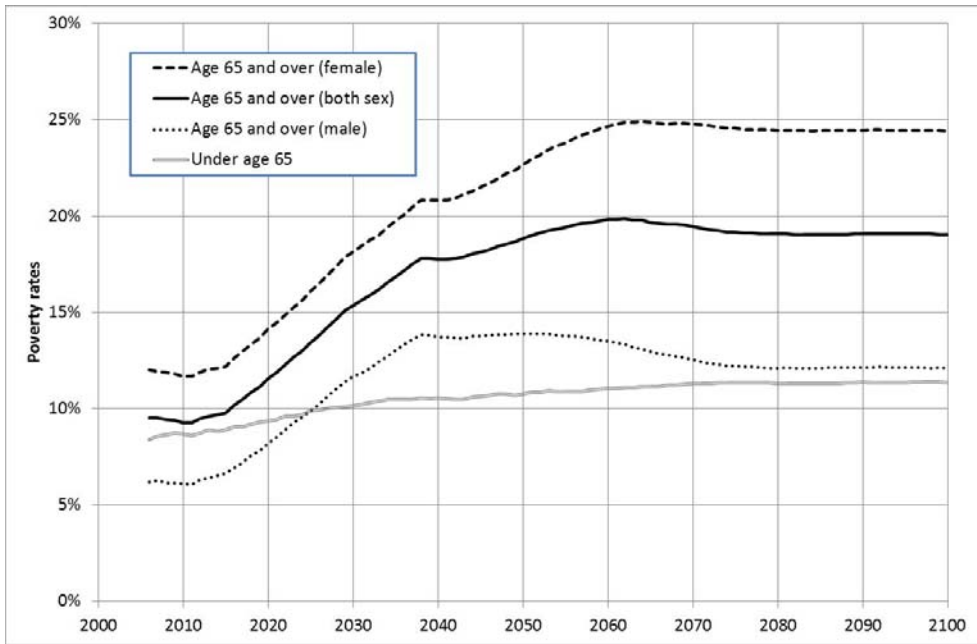
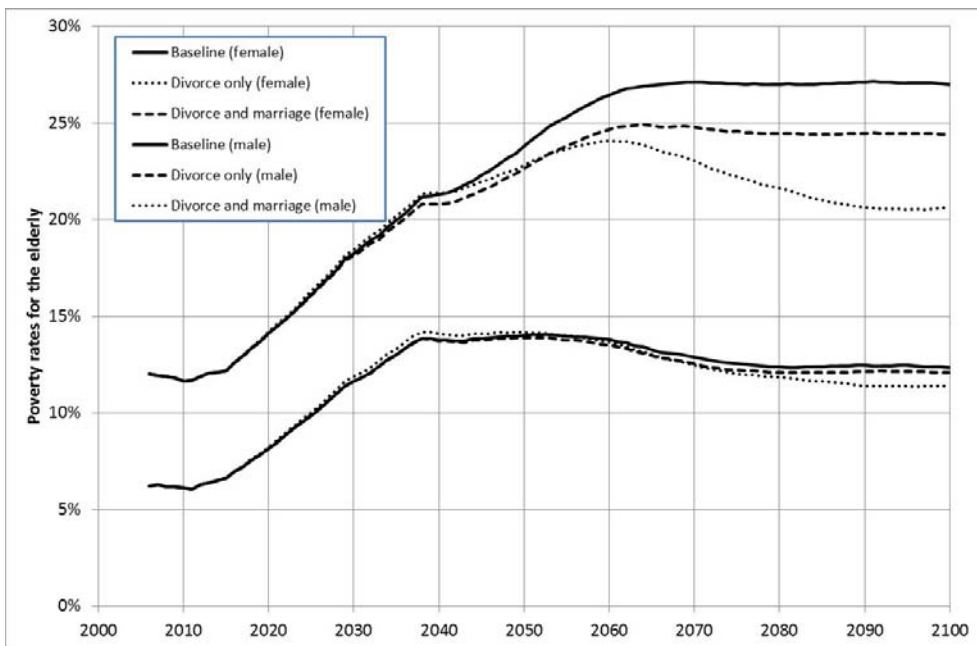


Figure 7 Poverty rates for the elderly by sex



Appendix A: Demographic life events

Events	Transition probabilities	Key assumptions (years 2010, 2030, 2050, and 2100)	Source
Marriage	Probability of first marriage (remarriages), by age, sex and employment status	Crude marriage rate (per 1000 population): 5.8, 5.1, 4.7, 4.8	Vital statistics 2005
	Probability of co-residency with parents at marriage	Groom's parents: 0.2 Bride's parents: 0.05	CSLC 2001*
Birth	Probability of marital fertility, by mother's age and number of ever-born children	Total fertility rate: 1.34, 1.37, 1.39, 1.37	Vital statistics 2005
Death	Probability of death by age, sex, and health status	Life expectancy: Male: 78.53, 81.88, 83.37, 83.37 Female: 85.49, 88.66, 90.07, 90.07	Population Projections**
Divorce	Probability of divorce, by wife's age, with or without children	Crude divorce rate (per 1000 population): 1.92, 1.63, 1.52, 1.54	Vital statistics 2005
	Probability returning to parents' home after divorce, by sex	Male: 0.43 Female: 0.35	CSLC 2001*
	Probability of custody by sex	Male: 0.2; Female: 0.8	Vital statistics 2005
International migration	Number of immigrants by sex and age	Number of immigrants per 1000 population: 0.30, 0.44, 0.56, 1.28	Population Projections**

(*) CSLC: Comprehensive Survey of Living Conditions (Ministry of Health, Labour and Welfare)

(**) Kaneko, R., Ishikawa, A., Ishii, F., Sakai, S., Iwasawa, M., Mita, F., Moriizumi, R. (2008), "Population projections for Japan: 2006–2055 outline of results, methods, and assumptions," *The Japanese Journal of Population* 6(1):76-114.

Appendix B: Life events other than demography

Events	Transition probabilities	Note	Source
Change in condition of need for long-term care	Transition probability of health status (good or poor) by age and sex	Estimate the probabilities of keeping the percentages of condition of need for long-term care, by sex and age	CSLC 2001*
Change in employment status	Transition probability of employment status, by sex, age, and marital status	Relative risks are considered for women who have a first baby, who are living with their parents, or who just got married.	The 2009 Actuarial Valuation**
Estimating earnings	Distribution of earnings by age, sex and marital status	Estimate of the parameters of log-normal distribution	CSLC 2004*
Determining pensions	Distribution of newly awarded pension amounts by age and sex of subscription category at age 35	Estimate based on individual records from the regular pension coverage report.	Inagaki (2012)
Young people leaving home	Probabilities of leaving/returning home, by age, sex, and employment status	Estimate of probabilities that percentages of young, never-married children co-resident with their parents will remain constant.	CSLC 2001*
Living with elderly parents	Probability of living with children, by age and sex	Estimate of probabilities that percentages of children co-resident with elderly parents will remain constant.	CSLC 2001*
Entering an institution	Probability of entering an institution, by sex, age, and marital status	Estimate of probabilities that percentages of the elderly in institutions will remain constant.	Population Census 2005

(*) CSLC: Comprehensive Survey of Living Conditions (Ministry of Health, Labour and Welfare)

(**) Ministry of Health, Labour and Welfare, Pension Bureau, Actuarial Division (2010)