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Projections of the Japanese Socioeconomic Structure Using a Microsimulation Model (INAHSIM)

Seiichi Inagaki

(The Incorporated Administrative Agency Farmers Pension Funds)

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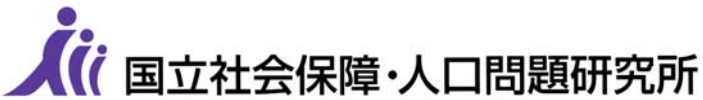

National Institute of Population and Social Security Research
Hibiya-Kokusai-Building 6F 2-2-3 Uchisaiwai-Cho
Chiyoda-ku Tokyo, Japan 100-0011

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Seiichi Inagaki
Farmers Pension Fund

Summary

Integrated Analytical Model for Household Simulation (INAHSIM) is a dynamic microsimulation model that was first developed in the 1980s by a multi-disciplinary research group. This study has attempted to improve the conventional INAHSIM in order to construct a more comprehensive alternative that includes social and economic elements. It has also revealed a general futuristic picture of the society and population in Japan in quantitative terms. Furthermore, a quantitative analysis of the impact of the ongoing spurt in young part-time freelance workers, known as “freeters” in Japanese, was conducted. This analysis serves as an application of the model and reveals the importance of potential measures to curb the growing number of freeters.

1. Introduction

The current social security system, which was established during the years of high economic growth rate, is considered to be an indispensable part of people's lives in present-day Japan. Its underlying premise was that the population would steadily increase and people's lifestyles would continue to be fairly uniform. However, the recently diversified lifestyles and decline in the birthrate were completely unexpected. These factors have resulted in a rapidly aging society. Subsequently, families and households have undergone major changes. The restructuring of Japan's current social security system presently appears to be an important task for the society.

The evaluation of a social security system suitable for such an economic society requires projections of the socioeconomic circumstances of older individuals over a very long period. These projections should include not only the population growth but also the circumstances of families and households, particularly the social and economic characteristics of older individuals such as their health status, employment status, and income level. These projections can be achieved most effectively by using a microsimulation method. Microsimulation models are widely used in Europe, Australia, and North America for the evaluation and planning of numerous social policies[1]. In Japan, the Integrated Analytical Model for Household Simulation[2] (INAHSIM) was developed in the 1980s by using the microsimulation method. However, this model only projects the compositions of families and households. Comprehensive models that cover various social and economic elements are yet unavailable[3].

This study has attempted to improve the conventional INAHSIM in order to construct a more comprehensive alternative that incorporates social and economic elements. Further, it has revealed a general futuristic picture of Japanese society and population in quantitative terms. In principle, this simulation assumes that recent individual behavior will remain constant in the future; however, it assumes three scenarios given the significant changes that have occurred in recent years in terms of employment.

The improvements in the model are as follows:

(1) All parent-child relations, including cases in which they do not live together, are specified in the initial data set.
(2) The sample size is 1/1000 of the population, which is a tenfold increase of the

[1] For instance, DYNASIM and CORSIM are used in the US; DYNAMOD is used in Australia; PENSIM, in the UK; MOSART, in Norway; LIFEPATHS, in Canada; and DESTINE, in France (Zaidi and Rake 2001).
[2] See Aoi and Okazaki, Fukawa, Hanada, Inagaki, and others (1986); Inagaki (1986), Inagaki and Matsuda (2003); and Fukawa (2005).
[3] Fukawa (2005) added physical status of the elderly to the model.

traditional model. Furthermore, 100 simulation runs are performed and the results are the averages of the 100 runs. Consequently, the degree of precision of the results is significantly improved by approximately 1/30 of the traditional model in terms of a sampling error. It also enables the estimation of the sampling error.

(3) Employment status, health status, and earnings are added as individual characteristics. As a result, statistics regarding socioeconomic characteristics are obtained.

(4) The occurrence of life events such as marriage and leaving home are controlled by the employment status[4]. Therefore, the recent controversial issues, such as delay of marriage or leaving home, particularly in the case of young freelance part-time workers, can be simulated. As a result, the impact of change in the employment pattern on future socioeconomic structure is evaluated.

(5) Future changes of transition probabilities are taken into account.

(6) Statistics regarding lifetime history, such as percentage of never-married females by cohort, are added.

A comparison of the results of this model with those of the official population projections (National Institute of Population and Social Security Research, 2002) reveals that the size of the total future population estimated by this model is smaller than that estimated by the official population projections[5]. This disparity is due to the following reasons:(1) persons in institutional households are excluded from this model; (2) international migration is not taken into account in this model while the official population projections assumes the excess of immigrants over emigrants; (3) the total fertility rates post 2050 are assumed to regress to the replacement level of 2.07 by 2150 as per the official population projections, while this model assumes that the fertility level after 2050 remains constant.

The number of households projected in this model can be compared with that projected by the official household projections (National Institute of Population and Social Security Research, 2004)[6]. Since the official household projections are based on the results of the official population projections, the comparison of the average household size or the composition of household type will be more appropriate than a comparison of the number of households. Both projections assume that recent individual behavior will principally remain constant[7] and hence the results of the two projections must be

[4] See Appendix A: Life Events and Transition Probabilities.

[5] The size of the population projected by this model is 91,595 thousand and 46,405 thousand in 2050 and 2100, respectively, while the official population projections are 100,593 thousand and 64,137 thousand, respectively.

[6] This study projects the number of households by family type in Japan between 2000 and 2025.

[7] The official household projections assume that the timing of young persons leaving home will be delayed in the case of the younger generation.

close. In fact, the average household size in 2025 is estimated as 2.35 and 2.37 according to this model and the official household projections, respectively. With regard to the composition of the household type[8], the 2025 percentages for the categories of single household, nuclear family, and others are estimated by this model as 34.8%, 48.8%, and 16.4%, respectively, while the official household projections are 34.6%, 54.6%, and 10.9%, respectively.

This paper will present an overview of the INAHSIM (Chapter 2), the assumptions of transition probabilities (Chapter 3), results of future projections (Chapter 4), and will conclude with an examination of the results and future directions (Chapter 5 and 6).

2. Overview of the INAHSIM

The development of the model can be divided into three phases: 1. Preparation of the initial data set, including matching and imputation; 2. Actual simulation assuming the transition probabilities; and 3. Statistics to be gathered in the simulation process.

The most crucial feature of the initial data set is its contents. The model discussed in this paper includes information on families pertaining to parent-child or husband-wife relationships, as well as relationships within households. The model also contains information pertaining to characteristics of individuals such as their health status, employment status, and earnings.

The simulation covers various life events that constitute demographic phenomena such as birth (childbearing from the viewpoint of the mother), death, marriage, divorce, and the changes in households that accompany the occurrence of marriages or divorces. Demographic phenomena also include transitions between employment statuses and the accompanying changes in earnings, transition between health statuses, young people leaving home and people living together with their elderly parents. These events occur in the course of life on the basis of the outcomes of each individual's decision-making[9]. In the model, the outcomes are given in terms of transition probabilities.

[8] Households are categorized into different types, namely, "single household," "nuclear family," and "others." These categories are called as "household structure" in this paper and "family type" in the official household projections. The definitions of nuclear family differ slightly between the two projections. For example, a household consisting of parents and divorced or widowed offspring is classified as a nuclear family by the official household projections, but this model classifies it under "others."

[9] Death and transition between health statuses occur regardless of individual intentions.

The statistics can be compiled for all the characteristics of the individuals in the data set. However, the model in this paper focuses on the tabulation of population structure, demographic phenomena, number of household members, household structure, family structure of aged individuals, health status, employment status, earnings, and the population of “parasite singles,” which is the Japanese name for never-married adults who depend on their parents.

2.1 Initial Data

The most important aspect of the microsimulation model is the method to create a miniature society that expresses different individual characteristics in a virtual context. Since the data set that expresses the miniature society defines everything that the model can simulate, there is a need to include as many characteristics and as much family and household information as possible. On the other hand, it is necessary to keep the data set as simple as possible because one that is excessively complicated poses difficulty in establishing the simulation structure. Above all, it is important to ensure that the data set structure is efficient because the information on families (husbands and wives, parents and children) and households needs to incorporate not only the characteristics of individuals but also of their spouses, children, and people living together.

In Japan, “the Family Register” and “the Basic Resident Register” have been established as systems for recording such information; these registers reveal everything pertaining to family and household statuses. With respect to basic changes in families and households due to the occurrence of life events, these two registers are updated with respect to six types of notifications—birth, death, marriage, divorce, moving-in and moving-out registrations. Since this system is very efficient and computer compatible, the real world system was used as a reference when creating the database for the INAHSIM.

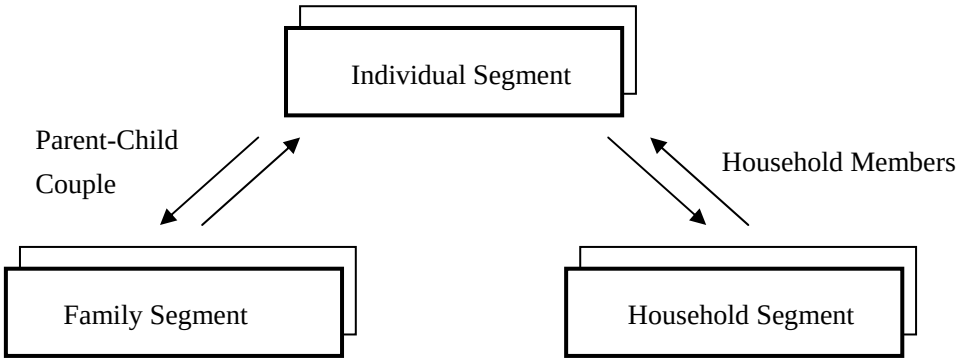
Therefore, the INAHSIM creates a miniature model of the real world by creating three tables that correspond to individual registers as well as those that correspond to “the Family Register” and “the Basic Resident Register,” and establishes links between these tables by using pointers. These three tables are called the individual, family, and household segments, respectively, in the INAHSIM.

The individual segment includes individual characteristics such as the year of birth, sex, marital status, health status, employment status, and earnings, in addition to the family segment number that indicates the couple’s status as parents, the family segment number that indicates the couple’s status as husband and wife, and the household

segment number that represents the household that the individual is a member of. The family segment includes characteristics concerning couples such as the year of marriage, number of children ever born, the year of the dissolution of marriage, the cause for the dissolution (divorce or death of a spouse) as well as the individual segment number that corresponds to the husband, wife, and their children. The household segment includes household characteristics such as the year that the household was formed, number of household members and household structure, as well as the individual segment number that represents the members in that household.

Figure 1 depicts the relationship between the segments. A family is represented by the linkage between the individual and family segments, while a household is represented by the linkage between the individual and household segments. Given that families composed of parents and children or married couples do not necessarily live in the same household, there is no direct linkage between the family and household segments.

Figure 1 Basic Structure of the Data Set



The initial data set, which is a miniature society 1/1000 the size of Japan's society, was derived from the micro data of the Comprehensive Survey of the Living Conditions of People on Health and Welfare[10] conducted in 2001. Although most of the information in the data set can be obtained directly from this micro data, the information on parents who do not live with their children and that on earnings were imputed. Individuals were categorized into different statuses, namely, "full-time employees," "part-time workers," "self-employed," and "unemployed," based on the pension schemes they belonged to. Health statuses were divided into two categories—"good" and

[10] The data used in the paper were made available to the author by the Statistics Bureau, Ministry of Internal Affairs and Communications of Japan, notice number No. 31, dated January 27, 2004.

"poor"—based on the individuals' health awareness or objective information such as whether they had been hospitalized.

Since this survey is a sample survey, the cases wherein the parents and children do not live together will not be surveyed simultaneously. Consequently, parent-child relations of individuals who do not live together cannot be obtained from the survey[11]. However, if these relations are not included in the initial data set, it will be difficult to simulate some life events, such as people living together with their elderly parents, because in such cases, it is not possible to identify the relationships between parents and children who live together. In order to overcome this problem, statistical matching procedures for parents and children who do not live together are used for preparing the initial data set[12].

With regard to earnings, the results of the survey are modified because the survey examines the amount of earnings in the previous year and thus is inconsistent with the other characteristics such as employment status. In particular, the earnings are imputed using multiple regression models with sex, age group, and employment status as the explanatory variables.

2.2 Simulation Cycle

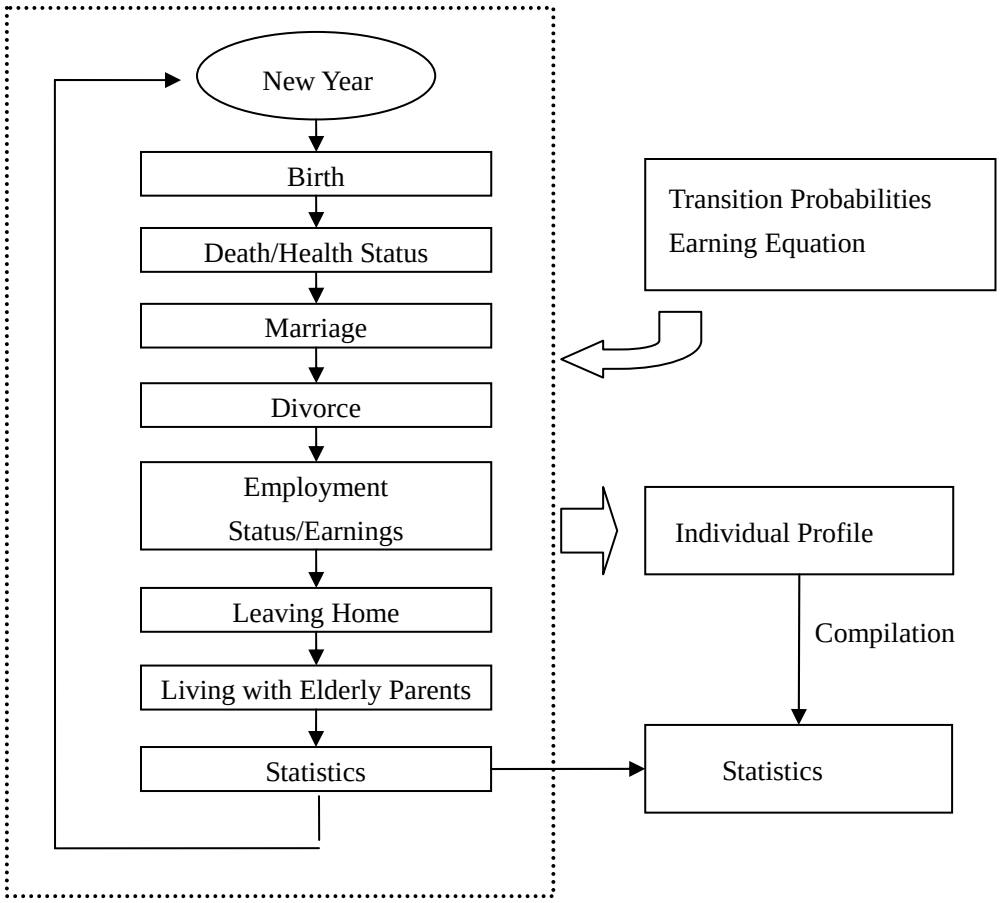
In the microsimulation model, changes in individual characteristics are simulated upon the occurrence of life events such as marriage and employment, using the Monte Carlo method in the miniature society, which is created as described above. In this model, individual life events include demographic phenomena such as birth, death, marriage, and divorce and accompanying changes in households (leaving home at the time of marriage and changes in the household at the time of divorce, among others), the transition between employment statuses and the accompanying changes in earnings, transition between health statuses, never-married young people leaving home and people living together with their elderly parents.

As depicted in Figure 2, these individual life events are assumed to occur in annual cycles in the simulation. Life events that have occurred in this model include birth, death, transition between health statuses, marriage, divorce, transition between employment statuses and the accompanying changes in earnings, young people leaving home and people living together with their elderly parents; the events are expected to occur in this order. The order in which life events occur is significant because in the

[11] It only specifies the presence or absence of children who are separated from their parents.
[12] The traditional INAHSIM cannot sufficiently simulate changes in households due to this aspect.

INAHSIM, simulation cycles are not executed continuously but rather in discrete timeframes spanning one year. Since marriage and birth are generally expected to occur after a time lag of over a year, marriage follows birth in order to ensure that these events do not occur in the same year. Considering that changes in households, such as young people leaving home or people living together with their elderly parents, are often influenced by employment and health statuses, the model is set so that these events follow the demographic phenomena or the transition between employment statuses. With respect to birth, this model only takes legitimate children into account because the percentage of illegitimate children[13] in Japan is very low. This model does not take into account international migration either because it is still low[14] in Japan.

Figure 2 Simulation Cycle



[13] The percentage of illegitimate children out of total births was low at 1.87% (2002), which is the reason why this model does not take these children into account. Therefore, birth is an event considered to occur in the case of married couples.

[14] The percentage of foreigners in Japan was 1.12% as of October 1, 2002. This model does not take into account international migration because its level is low (the number of persons entering the country that exceed the number of persons leaving the country in 2002 was -115,000 for Japanese persons and +87,000 for foreigners). This must be taken into account when discussing the acceptance of foreigners in the future.

2.3 Compiling Statistics

The final step is to observe the changes in the miniature society. This step can be divided into dynamic statistics, which are compiled after the life events occurred; static statistics, which are compiled after the simulation for each year is performed; and panel statistics, which save individual life histories as individual profiles and are compiled after the simulation has been performed. In the same way that various statistical surveys are conducted in the real world, these statistics can be freely generated as distinct from the simulation process.

With regard to the main statistics that are compiled for this model, the time-series statistics include population by age group, number of parasite singles, number of households by number of household members, number of households by household structure, number of aged persons by family type, number of aged persons by health status, distribution of earnings, number of occurrences of life events such as demography and total fertility rate. Statistics that are compiled by cohort include: the percentage of individuals who remain never-married throughout their lifetime, average age of the first marriage, and average number of children.

3. Transition Probabilities of Life Events[15]

3.1 Fertility

Various studies have been conducted in order to delve into the reasons for the decline in the birthrate. Given that the number of illegitimate children in Japan is very low, analyses are often conducted according to the proportion of married women and the marital fertility rate. Viewing the changes in these two factors with respect to the declining birthrate in recent years, the impact of the decline in the marital fertility rate is low, which can be largely explained in terms of the proportion of married women.

Therefore, this model assumes that only married women bear children and that “birth” occurs based on the marital fertility rate by parity and the mother’s age. Given that the changes in marital fertility rate are relatively stable unlike those in the total fertility rate, the model assumes that the marital fertility rate for 2001 will be maintained in the future. Changes in the birthrate in this model can therefore be attributed solely to the

[15] Life events and transition probabilities used in this and the traditional models are summarized in Appendix A. See Inagaki (2005) for the figures of transition probabilities used in this model.

proportion of married women.

In order to calculate the marital fertility rate, the numerator is taken as the number of births by parity and mother's age obtained from Vital Statistics of Japan 2001, while the denominator is taken as the population of married women according to age estimated from the 2001 Comprehensive Survey of the Living Conditions of People on Health and Welfare. The sex ratio of boys to girls at birth is 105.5.

3.2 Mortality and Health Status

Mortality rates are specified by sex and age. The future life tables, which serve as the basis of the mortality rate, are taken directly from *Population Projections for Japan: 2001–2050, January 2002* (National Institute of Population and Social Security Research 2002).

The health status is classified as good or poor. The probability of a change for the worse by sex and age is assumed for the simulation.

3.3 Marriage

With regard to marriage, the recent trends have indicated that people are marrying later or not marrying at all. In fact, a glance at the changes in the percentage of never-married persons by age group reveals that this percentage is rising every year, and the average age at which the first marriage occur is also rising. A major factor behind this is considered to be the changes in the marriage patterns among people of marriageable age or never-married women between the ages of 20–29 and never-married men between the ages of 25–34.

Table 1 examines the changes in the first marriage rate among never-married persons by sex and age group. The declining trend in the first marriage rate is evident for each age group, but a drop among the above-mentioned men and women of marriageable age is notable. An observation of the rate of decline from 1990 to 2000 reveals that the first marriage rate has fallen by 20–30% for these age groups. In contrast, the degree of change has become relatively smaller in other age groups.

Table 1　First Marriage Rate for Never-married Persons by Sex and Age Group

(Groom)				(per thousand)
Age Group	1970	1980	1990	2000
20-24	46.04	38.04	28.86	29.33
25-29	213.81	129.91	104.57	82.53
30-34	204.51	122.23	101.12	70.98
35-39	73.56	48.17	43.18	42.68
40-44	30.69	16.90	17.38	18.70
(Bride)				
Age Group	1970	1980	1990	2000
20-24	138.43	109.05	63.28	48.47
25-29	250.22	221.60	168.66	118.60
30-34	86.10	84.70	90.91	80.65
35-39	39.14	33.25	33.67	37.69
40-44	21.23	14.84	12.47	13.08

(Source) Jinko Toukei Shiryoshu, 2004 (National Institute of Population and Social Security Research)

Accordingly, the marriage rate is based on sex, age, and whether it is a first marriage or remarriage. It was assumed that the declining trend in the first marriage rate would continue for the specific age groups described above and that the degree of change in marriage rate for other age groups would stabilize in the future.

Although it is not easy to predict the extent to which the decline in the first marriage rate will continue, this model assumed that the first marriage rate for these specific age groups will fall further 15% over the next 10 years. Consequently, the percentage of women born in 1985 who remain never-married throughout their lifetime[16] is almost equivalent to the assumption of the population projections made by the National Institute of Population and Social Security Research (2002).

This model simulates the occurrence of marriage using the marriage rate by sex. However, the numbers of brides and grooms are not always the same, necessitating the adjustment of the numbers of brides and grooms such that they become equal. The adjustment process is as follows: First, select the candidates of brides and grooms using twice the marriage rates as specified in the Monte Carlo method and then, calculate the average number of the candidates. One-half of the average number will be

[16] The percentage of women born in 1985 who will remain never-married throughout their lifetime will be 17.2% in the case of the medium variant, while according to the assumption (medium variant) of the population projections, it is expected to be 16.8%.

the number of couple formations. Next, take a sampling of the candidates of brides and grooms. Finally, form couples between the brides and the grooms that are sampled.

Furthermore, it is a known fact that men's employment status affects their marriage patterns. Table 2 illustrates the percentage of never-married men by employment status and age group. Among the age group of 30–34, 37.5% of full-time employees, 51.0% of part-time workers, and 81.2% of the unemployed are never-married. Therefore, there is a great disparity in the percentage of never-married men depending on the employment status. The employment status at the time of marriage cannot be determined by this data alone because the employment status changes for some people after they get married due to unemployment and other reasons. However, it is expected that there is a significant disparity in the marriage rate depending on the employment status. If the disparity is estimated by assuming that the employment status will not change from what it was at the time of marriage, the probability of first marriage by age for part-time workers can be considered to be half the figure for full-time employees, and the probability of first marriage is almost zero for unemployed persons.

Table 2 Percentage of Never-married Males by Employment Status and Age Group

(%)

Age Group	Total	Full-Time	Part-Time	Self Employed	Unemployed
20-24	92.9	89.3	91.0	81.4	99.0
25-29	68.5	65.9	70.7	45.1	92.4
30-34	40.9	37.5	51.0	24.8	81.2
35-39	24.9	20.9	40.6	18.4	67.9
40-44	17.5	14.0	32.9	12.4	61.9
45-49	13.4	9.8	26.3	10.7	54.6

(Source) Comprehensive Survey of the Living Conditions of People on Health and Welfare, 2001 (Ministry of Health, Labour and Welfare)

In view of the above, the marriage rate is specified by sex, age, and whether it is a first marriage or remarriage, and the first marriage rate was assumed to fall by 15% for specific age groups (men aged 25–34, women aged 20–29) over the next 10 years. In addition, it is assumed that there would be disparities in the first marriage rate for men depending on their employment status. It is also assumed that the probability of first marriage for part-time workers is set at one-half the probability for full-time employees and that unemployed people will not marry.

In order to calculate the marriage rate, the numerator taken as the number of marriages

by sex, age, and whether it is a first marriage or remarriage obtained from Vital Statistics of Japan 2001, while the denominator is taken as the population specified by sex, age, marital status, and employment status estimated from the 2001 Comprehensive Survey of the Living Conditions of People on Health and Welfare.

3.4 Changes in Households at the Time of Marriage

Marriage is a major reason why individuals leave their parents' home. Since children leaving their parents' home will significantly affect the future household composition of aged persons, whether couples decide to live with the husband's parents or wife's parents or set up independent households at the time of marriage are critical factors to be considered in the study of the future population and household structure. As a result of the growing spread of nuclear families during the period of high economic growth in the 1960s–1970s, fewer married couples lived with their parents[17].

Table 3 shows the proportion of married couples living with their parents by sex, marital status, and age group. An observation of the figures for people in their late 20s, who have the highest number of first marriages, reveals that the proportion of never-married men and married men who live with their parents is 73.3% and 14.3%, respectively. With regard to women, the corresponding percentages are 79.9% and 4.0%, respectively. Therefore, it can be estimated that the probability of couples living with the husband's parents is 20% $(=14.3\% \div 73.3\%)$ and that of couples living with the wife's parents is 5% $(=4.0\% \div 79.9\%)$[18]. Based on the probability of couples living together with their parents, it is assumed that these patterns will continue in the future.

[17] Traditionally, in Japan, the eldest married son used to live with his parents in order to look after them.

[18] It is assumed that the couple will not live with husband's/wife's parents if one of his/her siblings is married and living with his/her parents.

Table 3 Percentage of Those Living with Parents by Sex, Marital Status, and Age Group

(Male)						(%)
Age Group	Married		Never-married		Divorced, Widowed	
	Living with Parents	Not Living with Parents	Living with Parents	Not Living with Parents	Living with Parents	Not Living with Parents
20-24	24.1	75.9	74.0	26.0	72.1	27.9
25-29	14.3	85.7	73.3	26.7	49.4	50.6
30-34	15.1	84.9	69.8	30.2	52.0	48.0
35-39	18.6	81.4	66.8	33.2	45.3	54.7
40-44	23.8	76.2	68.1	31.9	44.5	55.5
45-49	24.1	75.9	57.2	42.8	36.2	63.8
(Female)						(%)
Age Group	Married		Never-married		Divorced, Widowed	
	Living with Parents	Not Living with Parents	Living with Parents	Not Living with Parents	Living with Parents	Not Living with Parents
20-24	6.7	93.3	80.2	19.8	59.7	40.3
25-29	4.0	96.0	79.9	20.1	39.3	60.7
30-34	2.7	97.3	76.5	23.5	36.9	63.1
35-39	3.7	96.3	69.0	31.0	30.7	69.3
40-44	4.5	95.5	65.9	34.1	26.9	73.1
45-49	4.2	95.8	58.5	41.5	20.3	79.7

(Source) Comprehensive Survey of the Living Conditions of People on Health and Welfare, 2001 (Ministry of Health, Labour and Welfare)

3.5 Divorce

The number of divorces was at 168,969 couples in 1991. This figure continued to rise sharply, reaching 285,911 couples in 2001, but has remained roughly flat for three years, with the number of divorces at 289,836 and 283,906 couples in 2002 and in 2003, respectively. One of the social problems during this period was the increase in the number of divorces among middle-aged couples, who had lived together for over 20 years. Given that the number of these cases has leveled off, it appears that the growth in the number of divorces has come to a halt.

In this model, it was assumed that divorce occurs in accordance with the divorce rate by wife's age, and the divorce rate would remain around the level attained in 2001. In order to calculate the divorce rate, the numerator is taken as the number of divorces by wife's age, obtained from Vital Statistics of Japan 2001; and the denominator is taken as the number of married couples by wife's age estimated from the 2001

Comprehensive Survey of the Living Conditions of People on Health and Welfare.

3.6 Changes in Households at the Time of Divorce

When a divorce is granted, one of the major issues concerns whether the husband or wife gains custody of the children and the manner in which changes occur in households. For example, if the wife gains custody of the children after a divorce is granted in a nuclear family household consisting of a married couple and children, she will have to decide whether to have a single-mother household or return to her parents' home. The husband will also have to choose whether to live alone or return to his parents' home.

To begin with, the ratio is fairly stable at 20% of husbands and 80% of wives gaining custody, and it is assumed that this ratio will be maintained in the future. In cases where there are two or more children, it is assumed that either the husband or wife will obtain custody for all the children.

Next, the changes in households at the time of divorce are assumed to be as follows. If a divorced person lives with his/her parents, he/she will stay in his/her home after the divorce. If a divorced person is not living with his/her parents, he/she will either return to his/her parents' home or form a new household. Table 3 shows the percentage of individuals living with their parents by sex, marital status, and age group. This percentage is higher for divorced or widowed men and women than for married men and women. For example, the percentage of married men and women aged 30–34[19], living with their parents is 15.1% and 2.7%, respectively, while that of divorced or widowed men and women is 52.0% and 36.9%, respectively. These statistics show that a certain proportion of men and women return to their parents' home at the time of divorce.

The probability that divorced men or women who do not live with their parents will return to their parents' home after the divorce is given in this model. Let us assume that r is the probability that they will return to their parents' home and the changes in households occur only at the time of divorce. In this case, divorced persons living with their parents are either those who lived with their parents before the divorce or those who returned to their parents' home at the time of divorce. Therefore, we obtain

$$t = s + r(1 - s),$$

where t is the percentage of married men or women living with their parents and s is that for divorced men or women living with their parents. From this, we have

[19] This age group has the highest number of divorces.

$$r = \frac{t - s}{1 - s}.$$

Applying the percentages[20] for the age group of 30–34 to the equation, the probability *r* is estimated around 43% for men and 35% for women.

$$\text{Men:} \quad 43\% = \frac{52.0\% - 15.1\%}{100.0\% - 15.1\%}$$

$$\text{Women:} \quad 35\% = \frac{36.9\% - 2.7\%}{100.0\% - 2.7\%}$$

In addition, this probability is assumed to be the same for all age groups, and it is assumed that such behavior will continue in the future.

3.7 Employment Patterns and Estimate of Earnings

In recent years, a growing number of individuals have not pursued higher education or found employment after graduating from high school or college, but have instead worked part-time or have remained unemployed. The *White Paper on National Life* (Cabinet Office ed., 2003) focuses on fresh graduates who work part-time and analyzes the factors behind this increase. On the corporate side, the factors include the decreasing number of job offers to fresh graduates and the growing number of part-time workers employed in order to cut down on personnel costs. Meanwhile, from the students' viewpoint, the factors include the impact of declining qualifications, changes in perceptions about work, problems with career guidance in high schools, and those with university education. Another reason that has been pointed out is the vicious cycle with declining labor demand and changes in perception among young people.

With regard to changes in perception about work, it appears that one of the underlying factors for this is the decline in a sense of independence resulting from the continuation of a dependent lifestyle, where young people, if they live with and are economically supported by their parents, can live without having a steady job and have plenty to live on with a part-time job. A growing number of young people are content with their so-called "parasite single" condition, which leads to the important issue of independence among young people.

Table 4 examines the changes in the proportion of fresh graduates who are either full-time employees or so-called freeters[21]. The proportion of recent college graduates

[20] These figures are the percentages for divorced or widowed men and women. However, the number of the widowed is low and hence, the percentages are considered as those for the divorced.
[21] "Freeters" in Japanese refers to young freelance part-time workers. The concept also includes

who are freeters was 7.4% in 1990. This figure surged to 31.3% in 2002, an increase of more than 20 points was observed in the past decade. Meanwhile, the proportion of recent high school graduates who are freeters rose by approximately 25 points, from 13.1% to 38.4%. From these statistics, it appears that employment patterns are greatly changing for both recent college and high school graduates.

Table 4 Percentage of Full-Time Employees and Freeters (Fresh Graduates)

				(%)
Year	Full-Time Employees		Freeters	
	High School	College	High School	College
1980	41.6	75.3	12.9	11.3
1985	39.8	77.2	10.8	10.4
1990	34.4	81.0	13.1	7.4
1995	24.9	67.1	22.1	18.9
2000	18.2	55.8	35.4	32.3
2001	18.1	57.3	35.1	30.6
2002	16.8	56.9	38.4	31.3
(Source) White Paper on National Life, 2003 (Cabinet Office)				

In this model, the transition probability between employment statuses with respect to employment patterns is specified by sex and age. Since employment patterns are completely different for women with spouses and women without spouses, women are divided into four categories: women with spouses, women without spouses, newly married women (women previously without spouses but now with spouses) and newly divorced or widowed women (women previously with spouses but now without spouses). Transition probabilities are assumed for these four categories. These transition probabilities are estimated on the assumption that the composition of employment status by sex, age, and the existence of spouses, according to the 2001 Comprehensive Survey of the Living Conditions of People on Health and Welfare, is locally stable. Therefore, provided these transition probabilities are fixed in the long run, the composition of employment status will remain constant.

Given that significant changes have occurred in the employment patterns among fresh graduates, three scenarios were assumed regarding the changes of employment patterns among young people in the next 10 years, and the impact of each scenario on the future birthrate and population structure was evaluated. The three scenarios were specifically defined as follows: (1) employment patterns will not change in the future (medium variant), (2) the number of new graduates who are freeters will rise even more in the

unemployment.

future, and the proportion of full-time employees at age 25 will drop by 20 points from the current figure (low variant), and (3) employment patterns will return close to their pre-1990 state and the proportion of full-time employees at age 25 will rise by 20 points from the current figure (high variant).

Earnings are estimated using the multiple regression models using sex, age group, and employment status as the explanatory variables. The model is the same as that used for the imputation of earnings in the initial data.

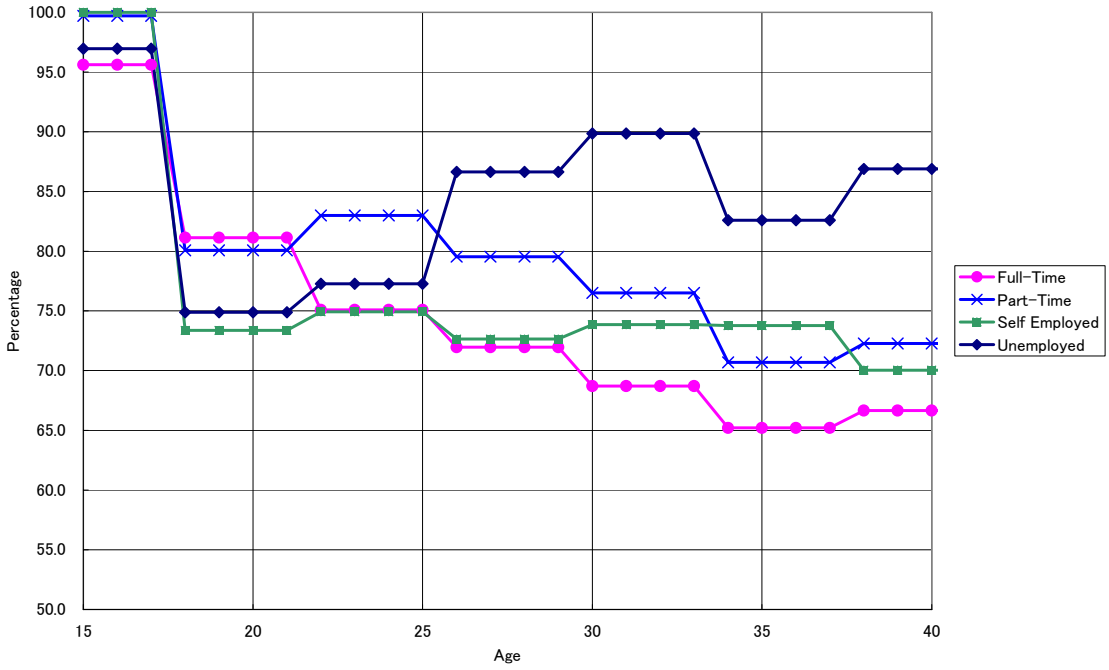
3.8 Never-married Young People Leaving Home

The main reasons why never-married young people leave home for reasons other than marriage include pursuing higher education, finding a job, and changing jobs. In recent years, however, when there has been a delay in never-married young people leaving home, due to the growing number of parasite singles and other reasons. Figure 3 illustrates the proportion of never-married men who live with their parents by employment status and age group. The tendency is that the higher the age, the lower the proportion of never-married men who live with their parents, and this proportion is the lowest for full-time employees and highest for unemployed individuals. The proportion of never-married, unemployed men living with their parents increases at age 25 because although they leave home to pursue higher education, they return and resume living with their parents due to economic difficulties, among other problems. A similar trend is evident for never-married women.

This trend occurs because the feasibility of independent life largely depends on the economic situation. This model, therefore, assigns a probability for never-married young individuals leaving home by sex, age, and employment status (16 categories, including all cases where the transitions between four employment statuses occur). Likewise, with transition probabilities for employment status, the proportion of never-married young individuals living with parents by sex, age, and employment status is assumed to be locally stable when estimating the transition probabilities of those leaving home.

It is assumed that the probability of never-married young people leaving home will stay constant in the future, but since it is controlled by employment status, the difference in the scenarios of employment patterns will also be reflected in young people leaving home.

Figure 3 Percentage of Never-married Males Living with Parents by Employment Status and Age Group



3.9 People Living Together with Their Elderly Parents

In Japan, the spread of nuclear families began with the period of high economic growth. In many cases, however, parents end up living with their children as they near old age and become widowers or their health condition worsens, among other reasons. Children living together with their elderly parents used to be the most common method of providing life security for aged persons. It remains a vital life security function even today, despite the enhancements in social security for aged persons.

This model defines the probability of people living together with their elderly parents, taking into account only sex and age. Furthermore, it is assumed that only single, aged persons will live with their children since in many cases, aged persons end up living with their children after the death of their spouses.

As is the case with other transition probabilities, the probability that people will live with their old parents is estimated on the assumption that the proportion of aged persons living with their children by sex and age is locally stable. It is assumed that the probability that people live together with their elderly parents will remain constant in the future.

4. Results of Future Projections

In order to obtain long-term projections using the microsimulation model, 100 simulations were performed using a sample of 1/1000 the population size (approximately 126,000 persons) for the years 2001–2100, and the average value was calculated for these simulations. As explained earlier, three scenarios of employment patterns for young people were assumed: (1) employment patterns will not change in the future (medium variant), (2) the proportion of full-time employees at age 25 will drop by 20 points from the current figure (low variant) and (3) the proportion of full-time employees at age 25 will rise by 20 points from the current figure (high variant).

The following section provides an overview of Japan's future population structure and examines the differences in the three scenarios, particularly emphasizing the results of the medium variant.

4.1 Total Fertility Rate

The decreasing proportion of fresh graduates who are full-time employees will lead to a growing number of freeters, which in turn will result in falling income levels among young men. Since many women consider income levels of potential husbands as a selection criterion for marriage, the growing number of freeters will contribute to a decline in the number of marriages. In Japan, where marriage is a prerequisite to childbirth, the decline in the number of marriages will be directly reflected in the falling birthrate.

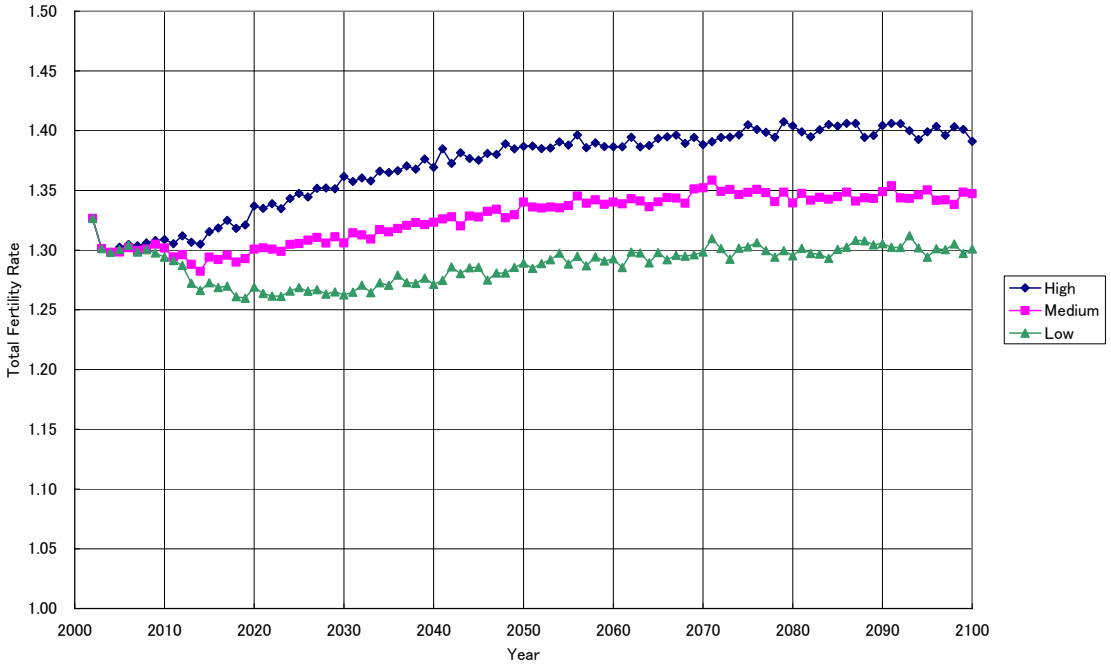
Table 5 shows the percentage of women who remain never-married throughout their lifetime by the year of birth. With the growing incidence of people marrying later or not marrying at all, the trend shows that the younger the generation, the higher the percentage of persons who remain never-married throughout their lives. The increasing percentage of persons who remain never-married throughout their lives will have a major impact on the declining birthrate. As described above, the decreasing proportion of fresh graduates who are full-time employees will lead to a reduction in the number of marriages, which in turn will result in an increase in the percentage of persons who remain never-married throughout their lives. In fact, for women born in the years 1985–1994, the percentage of persons who remain never-married throughout their lives is projected to be 17.1% in the medium variant and 18.3%, or 1.2 points higher, in the low variant.

Table 5　Percentage of Never-married Females in a Lifetime by the Year of Birth

				(%)
	1955-64	1965-74	1975-84	1985-94
Medium Variant	8.6	14.1	16.4	17.1
Low Variant	8.6	14.2	17.0	18.3
High Variant	8.6	14.0	15.8	15.7

Figure 4 compares trends in the total fertility rate for the three different scenarios. In the medium and low variants, the birthrate will continue to drop until around the year 2020, but will thereafter recover, finally reaching 1.35, 1.30, and 1.40 in the medium, low, and high variants, respectively. The reason why the birthrate will continue to decline in the near future is because the model assumes that the marriage rate will keep falling over the next decade. After the marriage rate stops falling, the number of births will catch up and the birthrate will rise. However, the reversal will be weak, and the birthrate will only recover to approximately 1.35 in the medium variant.

Figure 4　Trends in Total Fertility Rate



Since conditions other than employment patterns of young people, such as perceptions about marriage and childbirth, are the same among these three scenarios, the difference in the total fertility rates in the future can be interpreted as the impact on the birth rate caused by the increase in freeters. The following section will consider how this impact

will affect the future population structure.

4.2 Population by Three Major Age Groups[22]

According to the medium variant, the population will start declining after 2005, and will reach 91.6 million in 2050 and 46.4 million in 2100. An observation of the changes in the future population by three major age groups reveals that the child population (age group 0–14) and productive age population (age group 15–64) will decline; however, the aged population (age group 65 and above) will continue to grow, despite the overall population shrinking, until around the year 2020. Consequently, the percentage of the aged population will continue to rise. This percentage, which was 18.4% in the year 2001, is expected to increase to 30.5% in 2025, 36.8% in 2050, 38.3% in 2075 and 37.9% in 2100.

Since the results of projections show that there is a small difference in the total fertility rate for the low and high variants (±0.05) as compared to the medium variant, there are no big differences in the population size. Even for the year 2050, the difference in the population size is around ±1 million and the percentage of the aged population remains around ±0.4 points.

4.3 Number of Households[23]

Table 6 presents the trends in number of households, average household size, and household composition by household structure. The number of households will begin to decline after 2020 with decline in the population after 2005. This is because the average household size will continue to shrink faster. It is projected that the average household size of 2.75 in 2001 will decrease to 2.35 in 2025, 2.21 in 2050 and 2.14 in 2100.

[22] See Appendix B-1.
[23] See Appendix B-2. Households are categorized into different structures of household, namely, "single household," "couple only," "couple with never-married children," "single parent with never-married children," "three-generation family," and "others." "Nuclear family" is composed of "couple only," "couple with never married children," and "single parent with never married children."

Table 6 Trends in Number of Household by Structure

Year	Number of Households (thousand)	Average Household Size	Percentage Distribution (%)			
			Single Household	Nuclear Family	Three-Generation Family	Others
2001	45,664	2.75	24.1	58.9	10.6	6.4
2025	49,531	2.35	34.8	48.8	6.7	9.7
2050	41,386	2.21	39.7	43.6	5.9	10.7
2100	21,644	2.14	43.3	40.8	5.6	10.3

With regard to the household structure, the percentage of single households will increase but that of nuclear families and three-generation families will decrease. The nuclear family is the dominant type, accounting for 58.9% in 2001. However, its share will decrease to 48.8% in 2025, 43.6% in 2050, and 40.8% in 2100. The three-generation household was one of the typical households in Japan at one time, accounting for 16.2% in 1980, but its share will decrease rapidly. On the other hand, the percentage of single households will increase from 24.1% in 2001 to 34.8% in 2025, 39.7% in 2050, and 43.3% in 2100. By the end of the 21st century, single household will dominate in Japan.

4.4 Number of Parasite Singles[24]

"Parasite singles" refer to young never-married persons (singles) who depend on their parents for a long time and do not intend becoming independent. It is not uncommon for individuals in their early 20s to be never-married and they are thus not considered parasites. However, if they are in their 30s, dependent on their parents, and do not wish to get married, then they are regarded as parasite singles. However, the definition of parasite singles is not necessarily clear, and many of the statistics pertaining to this concept are also ambiguous.

This paper, therefore, defines parasite singles as never-married persons who live with their parents and are either part-time workers or unemployed. Never-married, full-time employees living with their parents also constitute so-called parasite singles, but this paper limits the definition to people with low income who would not have the means to live unless they lived with their parents. Consequently, as long as the parents possess sufficient income, these parasite singles will have a sufficient amount to live on, but once the parents become pensioners or their health status worsens, then their standard of living may drop substantially. Parasite singles, as defined in this paper, are in a

[24] See Appendix B-3.

rather economically unstable situation from the future perspective as well.

There is a big difference in the proportion of parasite singles aged 30–34 among the three scenarios. The proportion was 7.7% in 2001. According to the medium variant, it will increase to around 10% in 2015, and will subsequently stay constant thereafter. In the low variant, however, the proportion is expected to increase to around 15%, and their future is of considerable concern. In contrast, the proportion will fall to around 5% in the high variant.

4.5 Family Type among Aged Persons[25]

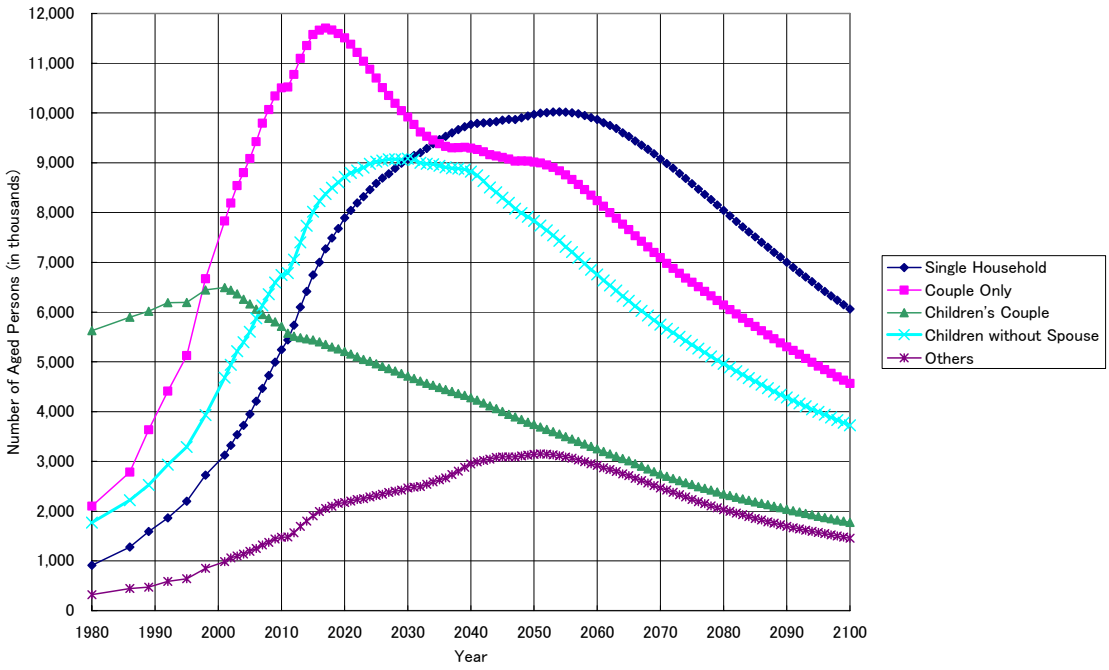
In the past, life security for aged persons in Japan was mainly based on private support by children and other means, but with the enhancement of the public pension system, a scheme by which aged persons could live independently without having to rely on their children was established. However, it is still difficult to live independently on the basic pension alone.

In particular, parasite singles who have been dependent on their parents, get old, and do not marry, and will only have the public pension to rely on. They will not be eligible to receive the employees' pension because they will have been either part-time workers or unemployed during their active years; they will have to live solely on the basic pension in their old age. In addition, if they were covered under the exemption system or did not contribute to the basic pension for a period of time, these parasite singles will receive an even smaller amount in pensions, and it will be exceedingly difficult for them to support their lives.

In this context, critical factors that need to be examined when considering the future lives of aged persons include not only the level of public pensions but also the circumstances of families living with aged persons. Figure 5 categorizes family types for aged persons into "single households," "couple only households," "living with married children and their spouses," "living with children without spouses," and "other," and examines the prospective changes.

[25] See Appendix B-4.

Figure 5　Trends in Number of Aged People by Family Type (Medium Variant)



In Japan, it was formerly common for aged persons to live with their married children**.** The spread of nuclear families, however, led to a gradual decline of such households, and finally, in the 1990s the most common family type was “couple only households.” It is expected that the number of “couple only households” will surge in the coming years, and it will continue to be common for most aged persons to live in this family type until the 2030s. Around the year 2020, when this figure reaches its peak, nearly 12 million aged persons will be living in “couple only households.”

Henceforth, “single households” will become the most common family type and the number of aged persons living alone will reach 10 million around the year 2050. In 2050, the aged population will number 33.7 million out of a population of 91.6 million, which means that aged persons living alone will account for 11% of the entire population and 30% of the total number of aged persons.

One noteworthy point regarding family types among aged persons is that the number of aged persons “living with children without spouses” will grow rapidly in the years to come. Aged persons that fall into this category is expected to total 4.7 million in 2001 and rise to approximately 9 million around the year 2030. This number will increase because the parents of parasite singles will get old, which explains why aged persons in these circumstances will grow in number hereafter. By the time these parasite singles themselves age, their parents will have reached an age where they are

likely to die, and the parasite singles will become aged persons living alone.

A comparison between the low and high variants shows that there are remarkable differences in terms of family type, but no significant changes in the percentage of aged persons or population size. Comparing the occurrences expected around the mid-2030s, the number of aged persons in "single households," "couple only households," and "living with children without spouses" is approximately the same in the low variant, but the number of aged persons "living with children without spouses" is approximately 1 million less than that in the high variant. This indicates that a difference in the proportion of fresh graduates who are full-time employees will produce a difference in family types among aged persons in the mid-2030s. With regard to the occurrences expected after the year 2050, it will be most common for aged persons to be living alone in either variant, and the proportion of aged persons living alone is particularly high in the low variant.

4.6 Distribution of Earnings[26]

Table 7 shows the trends in the total amount of earnings[27], population, number of households, earnings per household, and earnings per person. Improvement of productivity and rising prices are not taken into account in the estimation of the earnings.

Table 7 Trends in Earnings

Year	Total Earnings (trillion yen)	Population (thousand)	Number of Households (thousand)	Earnings per Person (thousand yen)	Earnings per Household (thousand yen)
2001	242.3	125,753	45,656	1,927	5,307
2025	211.1	116,567	49,531	1,811	4,262
2050	155.3	91,595	41,386	1,696	3,753
2100	77.3	46,405	21,644	1,667	3,573

The total amount of earnings was 242.3 trillion yen in 2001. It is expected to decrease by 211.1 trillion yen in 2025, 155.3 trillion yen in 2050 and 77.3 trillion yen in 2100, along with the decline of the productive age population. This indicates a reduction in the Japanese economic activity in the future.

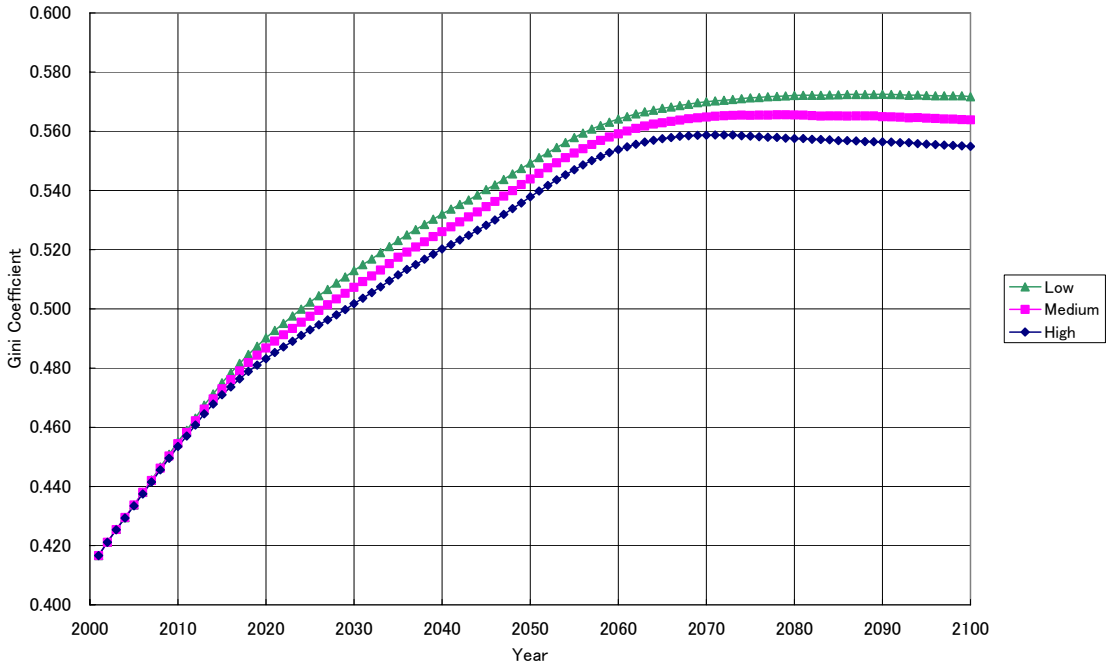
Since the proportion of the unemployed will increase because of aging, the earnings

[26] See Appendix B-5.
[27] Retirement allowance, allowance in kind, etc., are not included.

per person will decrease. The earnings per person in 2001 was 1,927 thousand yen, but it is expected to reach 1,696 thousand yen in 2050 and 1,667 thousand yen in 2100. The earnings per household are also expected to decrease, because the size of households will shrink due to an increase in the number of single households.

In order to reveal the rising income inequality, Gini coefficients are calculated based on the earnings of each household in Figure 6. According to the 2001 Comprehensive Survey of the Living Conditions of People on Health and Welfare, property income constitutes 2.6% of total income while earning income constitutes 80.1%, and hence, the earning income comprises a large portion of income before-tax-and-benefit[28]. Therefore, the Gini coefficient considered in this paper is before-tax-and-benefit basis. Since the social security and tax systems are not built in this model, the Gini coefficient after-tax-and-benefit cannot be calculated.

Figure 6 Trends in Gini Coefficients



The Gini coefficient before-tax-and-benefit[29] in 2001 was 0.417, but it is expected to

[28] The other sources of income include public pension (14.1%), social security benefit (0.6%), and others (2.6%). Therefore, the percentage of the earnings to income before-tax-and-benefit is 93.9% (=80.1%÷(80.1%+2.6%+2.6%)).

[29] According to Income Redistribution Survey in 2002, the Gini coefficient before-tax-and-benefit was 0.498. Since this model assumes no variation in the earnings of each group (employment status, sex, and age group), a lower Gini coefficient is estimated by this model. In addition, the exclusion of property income also lowers the Gini coefficient.

be 0.497 in 2025 and 0.544 in 2050 for the medium variant. The income inequality will continue to rise until mid-21st century due to ageing and an increase in the percentage of single households.

An increase in the number of freeters does not appear to be a major cause of the rising Gini coefficient. In fact, the Gini coefficient in 2050 is 0.549 and 0.538 for the low and high variants, respectively. The difference between the two variants is only 0.011 because freeters are not likely to leave their parents' home and thus, the income in the households will not reduce. However, the income inequality is potentially rising among these households because the freeters cannot leave their parents' home due to economic reasons.

5. Examination of Results and Future Directions

This study offered quantitative evidence that the future household and family composition will change dramatically with the rapid ageing of Japan's population. By the mid-21st century, following the spread of nuclear families, the growing number of parasite singles will lead to a transformation in the existing concept of the family.

The changes in family type among aged persons are particularly striking. At one time in Japan, it was common for aged persons to live with their married children. Over half of all aged persons were living with their married children until the 1980s. Nonetheless, this family type is expected to be the least common after 30 years in the 2010s, and aged-person households, either couple only households or single households, will instead comprise the majority. Even in cases where aged persons live with their children, they will be more likely to live with their unmarried children rather than their married children. As mentioned above, it is considered that many of the children without spouses would be parasite singles. Given that many of these parasite singles will be faced with unstable employment and low wage levels, the family, as a means of providing life security, may not function fully in such cases.

When these parasite singles themselves become aged persons from the year 2040 onward, the number of aged persons living alone will increase further. Providing life security for parasite singles will become an extremely serious challenge because, considering their employment status during their active years, it will be difficult for them to save money for their old age, and then, basic pensions will be the only form of public pensions they will receive (they will receive even less in pensions if they are covered under the exemption system or have not contributed to the basic pension for a certain period of time). Furthermore, since parasite singles will not have any children,

the life security provided by living with their children will not be an option.

The only time that parasite singles can lead an affluent life is when their parents earn sufficient income. Approximately 10 years later, when their parents retire and their health status worsens, a significant drop in the standard of living of parasite singles will be inevitable. The recent increase in the number of freeters and parasite singles may also give rise to a huge number of such families.

In this kind of future society, there is a concern that the gap between the rich and the poor will widen excessively, and it will be difficult to enforce effective social security policies. In order to prevent such a situation from occurring, it will be necessary to control the increase in the number of parasite singles to the maximum possible extent by advancing employment measures targeting young people. These include: encouraging a sense of independence among young people, increasing employment opportunities, promoting cooperation between companies and schools, and enhancing career guidance at schools. These measures will increase the marriage opportunities for young people, raise the birthrate, and may potentially revitalize Japan's future.

6. Conclusion

The microsimulation model is a model that allows simultaneous, consistent projections not only of the population but also of the socioeconomic characteristics including household and family circumstances, health status, employment status, and income over the long run. This model is almost complete in its projections of household and family circumstances and employment status, but inadequate in terms of health status and income. It does not make projections for characteristics such as education, location of residence, and housing situation. A great deal of research has confirmed that these characteristics affect individual behavior including marriage, young people leaving home, and people living together with their old parents. It is therefore possible that incorporating these characteristics will produce even more convincing simulation results. There is also a need to perform simulation, taking into account international migration and whether or not aged people enter care facilities.

For example, it will be possible to perform a variety of simulations by incorporating information on social security benefits and tax. Since income distribution in both before-tax-and-benefit and after-tax-and-benefit bases will be clear, it will become possible to quantitatively measure the situation concerning the rise in the degree of inequality and the redistribution effect of taxes and the social security system. It will also be possible to control behavior prompted by income level such as marriage,

leaving home, or individual behavior with regard to childbirth. It is said that young women compare income levels of parents and potential husbands when they decide to marry. The model will be able to simulate this behavior toward marriage.

Furthermore, by having a more sophisticated projection of health status, it will be possible to understand the situation of the family and its income with aged persons requiring nursing care, as well as instituting controls to such aged persons who live together with their children. These projections will also facilitate a better understanding of the needs of aged persons entering care facilities in the future.

As stated in the introduction, socioeconomic policy simulations are extensively performed using this microsimulation model in Europe, Australia, and North America. It would be appreciated if this study can contribute, in some modest way, in the role and function that the social security policy and tax system should play, as well as in compiling education or housing policies.

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Appendix A: Life Events and Transition Probabilities

Life Event	Group at Risk	Transition Probability	Variables used to Determine Event	
			Traditional Model	New Model
Birth	married women	married fertility rate	age, parity, child bearing interval	age, parity
	new born babies	sex ratio	uniformly	uniformly
Death	all persons	mortality rate	sex, age	sex, age (1)
Marriage	never-married persons	rate of first marriage	sex, age	sex, age, employment status (2)
				sex, age (2)
	divorced or widowed persons	rate of remarriage	sex, age	sex, age
Divorce	married couple	divorce rate	duration of cohabitation	age of wife
Leaving Home	never-married persons living with their parents	probability of leaving home	sex, age	sex, age, employment status
	married men living with their wives	probability of leaving alone for job purpose	age	(3)
Returning Home	never-married persons not living with their parents	probability of returning home	sex, age	sex, age, employment status
	married men not living with their wives	probability of returning home	age	(3)
Health Status	all persons	transition probability of health status	(3)	sex, age
Employment Status	all persons	transition Probability of employment status	(3)	sex, age (male) (2)
				sex, age, marital status (female) (2)
Change in Household at Marriage	newly married couple	probability of living with grooms' parents or brides' parents, or forming new household	uniformly	uniformly
Custody at Divorce	divorced couple	probability of wives gaining custody	uniformly	uniformly
Change in Household at Divorce	divorced couple	probability of returning their parents' home	sex	sex
Change in Household at Widowed	widowed persons	probability of returning their parents' home	sex	(3)
People Living with Their Elderly Parents	aged persons not living with their children	probability of living together with their children	age, single household or couple only household	sex, age (single only)
Earnings	all persons	multiple regression model	(3)	sex, age, employment status

(1) Future change in this behavior (transition probability) is taken into account.

(2) Improvement of mortality rate in the future is taken into account.

(3) This life event is not included in the model.

(Table B-1) Population by Three Mager Age Group

(Medium Variant) (in thousand, %)

Year	Number of Population				Percent Distribution			
	Total	0-14	15-64	65+	Total	0-14	15-64	65+
2001	125,758	18,402	84,240	23,116	100.0	14.6	67.0	18.4
2005	126,004	17,324	82,679	26,001	100.0	13.7	65.6	20.6
2010	125,282	16,328	79,273	29,681	100.0	13.0	63.3	23.7
2015	123,388	15,303	74,408	33,677	100.0	12.4	60.3	27.3
2020	120,419	14,260	70,656	35,502	100.0	11.8	58.7	29.5
2025	116,567	13,141	67,841	35,586	100.0	11.3	58.2	30.5
2030	112,066	12,167	64,638	35,260	100.0	10.9	57.7	31.5
2035	107,137	11,341	60,892	34,904	100.0	10.6	56.8	32.6
2040	101,965	10,635	56,219	35,111	100.0	10.4	55.1	34.4
2045	96,722	9,974	52,393	34,356	100.0	10.3	54.2	35.5
2050	91,595	9,314	48,579	33,701	100.0	10.2	53.0	36.8
2075	65,987	6,584	34,115	25,288	100.0	10.0	51.7	38.3
2100	46,405	4,652	24,175	17,578	100.0	10.0	52.1	37.9

(Low Variant) (in thousand, %)

Year	Number of Population				Percent Distribution			
	Total	0-14	15-64	65+	Total	0-14	15-64	65+
2001	125,758	18,402	84,240	23,116	100.0	14.6	67.0	18.4
2005	126,002	17,326	82,676	26,001	100.0	13.8	65.6	20.6
2010	125,263	16,319	79,274	29,670	100.0	13.0	63.3	23.7
2015	123,328	15,247	74,413	33,668	100.0	12.4	60.3	27.3
2020	120,281	14,110	70,657	35,514	100.0	11.7	58.7	29.5
2025	116,307	12,886	67,839	35,582	100.0	11.1	58.3	30.6
2030	111,692	11,835	64,601	35,257	100.0	10.6	57.8	31.6
2035	106,631	10,980	60,748	34,903	100.0	10.3	57.0	32.7
2040	101,328	10,265	55,964	35,100	100.0	10.1	55.2	34.6
2045	95,967	9,601	52,015	34,350	100.0	10.0	54.2	35.8
2050	90,705	8,909	48,084	33,711	100.0	9.8	53.0	37.2
2075	64,298	6,104	32,910	25,284	100.0	9.5	51.2	39.3
2100	44,083	4,203	22,681	17,199	100.0	9.5	51.5	39.0

(High Variant) (in thousand, %)

Year	Number of Population				Percent Distribution			
	Total	0-14	15-64	65+	Total	0-14	15-64	65+
2001	125,758	18,402	84,240	23,116	100.0	14.6	67.0	18.4
2005	125,998	17,327	82,679	25,991	100.0	13.8	65.6	20.6
2010	125,282	16,348	79,272	29,662	100.0	13.0	63.3	23.7
2015	123,455	15,385	74,408	33,661	100.0	12.5	60.3	27.3
2020	120,590	14,435	70,656	35,499	100.0	12.0	58.6	29.4
2025	116,861	13,414	67,862	35,586	100.0	11.5	58.1	30.5
2030	112,496	12,503	64,728	35,265	100.0	11.1	57.5	31.3
2035	107,684	11,710	61,077	34,897	100.0	10.9	56.7	32.4
2040	102,647	11,024	56,514	35,110	100.0	10.7	55.1	34.2
2045	97,563	10,390	52,811	34,362	100.0	10.6	54.1	35.2
2050	92,595	9,766	49,128	33,701	100.0	10.5	53.1	36.4
2075	67,825	7,097	35,417	25,311	100.0	10.5	52.2	37.3
2100	48,990	5,183	25,819	17,988	100.0	10.6	52.7	36.7

(Table B-2) Number of Households by Structure of Household

(Medium Variant) (in thousand)

Year	Total	Single Household	Couple Only	Couple with Never-married Children	Single Parent with Never-married Children	Three-Generation Family	Others
2001	45,664	11,017	9,403	14,872	2,618	4,844	2,909
2005	47,686	12,804	9,919	14,186	2,790	4,450	3,537
2010	49,233	14,424	10,196	13,428	3,050	4,045	4,089
2015	49,997	15,670	10,137	12,716	3,272	3,735	4,467
2020	50,078	16,620	9,840	11,959	3,457	3,499	4,705
2025	49,531	17,232	9,400	11,203	3,570	3,301	4,824
2030	48,465	17,528	8,929	10,441	3,604	3,121	4,842
2035	46,988	17,536	8,468	9,687	3,545	2,955	4,798
2040	45,196	17,246	8,062	8,966	3,414	2,792	4,716
2045	43,288	16,850	7,725	8,292	3,203	2,613	4,604
2050	41,386	16,441	7,402	7,681	2,966	2,454	4,441
2075	30,759	13,229	5,290	5,347	1,955	1,708	3,230
2100	21,644	9,372	3,687	3,777	1,377	1,208	2,225

(Low Variant) (in thousand)

Year	Total	Single Household	Couple Only	Couple with Never-married Children	Single Parent with Never-married Children	Three-Generation Family	Others
2001	45,664	11,017	9,403	14,872	2,618	4,844	2,909
2005	47,683	12,805	9,919	14,185	2,791	4,448	3,535
2010	49,185	14,400	10,167	13,446	3,053	4,050	4,068
2015	49,889	15,622	10,059	12,739	3,286	3,740	4,443
2020	49,918	16,557	9,703	11,994	3,485	3,507	4,672
2025	49,331	17,183	9,214	11,225	3,622	3,317	4,770
2030	48,227	17,460	8,704	10,461	3,683	3,136	4,784
2035	46,709	17,435	8,219	9,703	3,657	2,959	4,736
2040	44,880	17,121	7,789	8,968	3,555	2,773	4,673
2045	42,946	16,714	7,437	8,282	3,374	2,581	4,558
2050	41,036	16,321	7,117	7,636	3,165	2,404	4,394
2075	30,302	13,292	4,942	5,158	2,072	1,622	3,217
2100	20,841	9,266	3,332	3,546	1,415	1,119	2,164

(High Variant) (in thousand)

Year	Total	Single Household	Couple Only	Couple with Never-married Children	Single Parent with Never-married Children	Three-Generation Family	Others
2001	45,656	10,970	9,447	14,939	2,496	4,871	2,933
2005	47,690	12,816	9,919	14,185	2,785	4,449	3,537
2010	49,283	14,468	10,227	13,417	3,049	4,041	4,081
2015	50,131	15,762	10,217	12,691	3,253	3,716	4,492
2020	50,266	16,716	9,973	11,936	3,416	3,469	4,756
2025	49,765	17,346	9,583	11,172	3,514	3,274	4,876
2030	48,730	17,639	9,144	10,427	3,518	3,102	4,899
2035	47,275	17,649	8,713	9,683	3,427	2,948	4,856
2040	45,511	17,369	8,334	8,961	3,255	2,798	4,794
2045	43,607	16,941	8,013	8,313	3,017	2,651	4,672
2050	41,721	16,495	7,728	7,724	2,775	2,502	4,498
2075	31,251	13,153	5,663	5,543	1,837	1,789	3,264
2100	22,505	9,470	4,040	4,045	1,327	1,298	2,325

(Table B-3) Numbers of Parasaite Singles, and Those Proportions to Population by Age Group

(Medium Variant) (in thousand, %)

Year	Number of Parasite Singles			Proportion of Parasaite Singles to Population		
	25-29	30-34	35-39	25-29	30-34	35-39
2001	1,365	642	336	15.6	7.7	4.3
2005	1,242	766	389	16.2	8.7	4.8
2010	1,230	711	491	16.5	9.3	5.6
2015	1,145	721	460	16.7	9.7	6.0
2020	1,028	673	465	16.8	9.8	6.3
2025	958	600	434	16.7	9.8	6.4
2030	908	556	387	16.9	9.7	6.4
2035	863	533	359	16.8	9.9	6.3
2040	794	504	344	16.8	9.8	6.4
2045	733	465	324	16.9	9.9	6.3
2050	675	427	301	16.8	9.8	6.4
2075	480	304	211	16.7	9.9	6.4
2100	342	209	147	16.7	9.6	6.4

(Low Variant) (in thousand, %)

Year	Number of Parasite Singles			Proportion of Parasaite Singles to Population		
	25-29	30-34	35-39	25-29	30-34	35-39
2001	1,365	642	336	15.6	7.7	4.3
2005	1,252	765	389	16.3	8.7	4.8
2010	1,412	718	491	19.0	9.4	5.6
2015	1,617	822	463	23.6	11.1	6.1
2020	1,590	941	527	26.0	13.8	7.1
2025	1,499	921	609	26.2	15.1	8.9
2030	1,414	868	597	26.3	15.2	9.8
2035	1,341	818	562	26.2	15.2	9.8
2040	1,221	775	527	26.1	15.2	9.8
2045	1,118	704	502	26.3	15.1	9.8
2050	1,028	647	456	26.3	15.2	9.8
2075	714	450	312	26.3	15.2	9.8
2100	494	307	210	26.1	15.2	9.8

(High Variant) (in thousand, %)

Year	Number of Parasite Singles			Proportion of Parasaite Singles to Population		
	25-29	30-34	35-39	25-29	30-34	35-39
2001	1,365	642	336	15.6	7.7	4.3
2005	1,223	766	389	15.9	8.7	4.8
2010	954	698	494	12.8	9.1	5.6
2015	618	563	452	9.0	7.6	5.9
2020	474	375	363	7.7	5.5	4.9
2025	442	295	247	7.7	4.8	3.6
2030	414	274	192	7.7	4.8	3.1
2035	400	255	178	7.8	4.7	3.1
2040	368	247	165	7.7	4.8	3.1
2045	344	226	161	7.7	4.7	3.1
2050	316	211	147	7.6	4.7	3.1
2075	234	153	108	7.7	4.7	3.1
2100	171	110	73	7.7	4.7	2.9

(Table B-4) Number of Aged Persons (65 and Over) by Family Type

(Medium Variant) (in thousand)

Year	Total	Single Household	Couple Only	Living with Married Children and Their Spouses	Living with Children without Spouses	Others
2001	23,116	3,125	7,829	6,495	4,682	985
2005	26,001	3,951	9,087	6,164	5,606	1,194
2010	29,681	5,245	10,504	5,713	6,745	1,475
2015	33,677	6,744	11,576	5,439	8,015	1,904
2020	35,502	7,892	11,510	5,212	8,718	2,170
2025	35,586	8,585	10,701	4,963	9,023	2,313
2030	35,260	9,083	9,917	4,715	9,081	2,464
2035	34,904	9,470	9,381	4,486	8,939	2,628
2040	35,111	9,767	9,290	4,282	8,824	2,947
2045	34,356	9,856	9,108	4,001	8,299	3,091
2050	33,701	9,972	9,015	3,742	7,831	3,140
2075	25,288	8,577	6,597	2,535	5,343	2,236
2100	17,578	6,060	4,564	1,773	3,724	1,456

(Low Variant) (in thousand)

Year	Total	Single Household	Couple Only	Living with Married Children and Their Spouses	Living with Children without Spouses	Others
2001	23,116	3,125	7,829	6,495	4,682	985
2005	26,001	3,953	9,091	6,162	5,603	1,192
2010	29,670	5,250	10,500	5,713	6,746	1,462
2015	33,668	6,745	11,550	5,431	8,040	1,902
2020	35,514	7,882	11,444	5,199	8,811	2,180
2025	35,582	8,576	10,579	4,939	9,184	2,304
2030	35,257	9,045	9,729	4,676	9,367	2,439
2035	34,903	9,397	9,130	4,424	9,349	2,603
2040	35,100	9,664	8,987	4,199	9,325	2,924
2045	34,350	9,730	8,788	3,906	8,861	3,065
2050	33,711	9,855	8,686	3,633	8,408	3,130
2075	25,284	8,725	6,171	2,387	5,617	2,384
2100	17,199	6,109	4,127	1,641	3,803	1,519

(High Variant) (in thousand)

Year	Total	Single Household	Couple Only	Living with Married Children and Their Spouses	Living with Children without Spouses	Others
2001	23,116	3,125	7,829	6,495	4,682	985
2005	25,991	3,956	9,083	6,159	5,605	1,187
2010	29,662	5,251	10,489	5,708	6,747	1,467
2015	33,661	6,753	11,571	5,434	7,996	1,907
2020	35,499	7,909	11,555	5,214	8,640	2,182
2025	35,586	8,643	10,808	4,984	8,820	2,331
2030	35,265	9,167	10,088	4,754	8,771	2,484
2035	34,897	9,575	9,607	4,542	8,526	2,647
2040	35,110	9,895	9,560	4,370	8,310	2,974
2045	34,362	9,967	9,410	4,122	7,743	3,120
2050	33,701	10,047	9,389	3,871	7,253	3,141
2075	25,311	8,406	7,061	2,684	5,051	2,108
2100	17,988	6,009	5,004	1,930	3,631	1,412

(Table B-5) Amount of Earnings and Gini Coefficient

(Medium Variant)

Year	Total Earnings (trillion yen)	Population (thousand)	Number of Households (thousand)	Earnings per Person (thousand yen)	Earnings per Household (thousand yen)	Gini Coefficient
2001	242.3	125,758	45,656	1,927	5,307	0.417
2005	240.2	126,004	47,686	1,907	5,038	0.434
2010	233.8	125,282	49,233	1,867	4,750	0.454
2015	226.0	123,388	49,997	1,832	4,520	0.473
2020	218.8	120,419	50,078	1,817	4,369	0.487
2025	211.1	116,567	49,531	1,811	4,262	0.497
2030	201.7	112,066	48,465	1,800	4,162	0.507
2035	190.1	107,137	46,988	1,775	4,046	0.517
2040	178.4	101,965	45,196	1,750	3,948	0.526
2045	166.8	96,722	43,288	1,725	3,853	0.535
2050	155.3	91,595	41,386	1,696	3,753	0.544
2075	109.4	65,987	30,759	1,658	3,556	0.565
2100	77.3	46,405	21,644	1,667	3,573	0.564

(Low Variant)

Year	Total Earnings (trillion yen)	Population (thousand)	Number of Households (thousand)	Earnings per Person (thousand yen)	Earnings per Household (thousand yen)	Gini Coefficient
2001	242.3	125,758	45,656	1,927	5,307	0.417
2005	239.9	126,002	47,683	1,904	5,031	0.434
2010	232.1	125,263	49,185	1,853	4,718	0.455
2015	222.5	123,328	49,889	1,804	4,459	0.475
2020	214.0	120,281	49,918	1,779	4,287	0.490
2025	205.1	116,307	49,331	1,764	4,158	0.502
2030	194.4	111,692	48,227	1,741	4,031	0.513
2035	181.5	106,631	46,709	1,702	3,885	0.523
2040	168.4	101,328	44,880	1,662	3,753	0.532
2045	156.0	95,967	42,946	1,626	3,633	0.540
2050	144.6	90,705	41,036	1,594	3,523	0.549
2075	100.3	64,298	30,302	1,560	3,310	0.571
2100	69.0	44,083	20,841	1,566	3,312	0.572

(High Variant)

Year	Total Earnings (trillion yen)	Population (thousand)	Number of Households (thousand)	Earnings per Person (thousand yen)	Earnings per Household (thousand yen)	Gini Coefficient
2001	242.3	125,758	45,656	1,927	5,307	0.417
2005	240.7	125,998	47,690	1,911	5,048	0.433
2010	236.1	125,282	49,283	1,884	4,790	0.453
2015	229.9	123,455	50,131	1,862	4,587	0.471
2020	224.1	120,590	50,266	1,858	4,458	0.483
2025	217.6	116,861	49,765	1,862	4,373	0.493
2030	209.6	112,496	48,730	1,863	4,302	0.502
2035	199.3	107,684	47,275	1,851	4,216	0.511
2040	188.9	102,647	45,511	1,840	4,151	0.520
2045	177.9	97,563	43,607	1,824	4,081	0.528
2050	166.2	92,595	41,721	1,795	3,984	0.538
2075	119.1	67,825	31,251	1,756	3,811	0.558
2100	86.6	48,990	22,505	1,768	3,849	0.555

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No	Author	Title	Date