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Household savings in Japan revisited

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Summary

This paper investigates household saving behaviour by different cohorts with various household characteristics in Japan. Pooling the National Survey of Family Income and Expenditure in 1984, 1989 and 1994, the cohort analysis finds a substantial behavioural difference in the baby-boomer generation in Japan after 1989. As this generation is the largest demographic group, this finding provides valuable information to policy makers, especially in terms of intergenerational equity.

J.E.L. Classification: D91, E2, E21, H55.
Keywords: Savings, life-cycle, cohorts, and social security wealth.

1. Introduction

It has been six years since our publication on household savings in Japan. Our previous publication made use of the considerable micro data, the National Survey of Family Income and Expenditure (NSFIE), over the period of 1979–1989 (see Takayama and Kitamura, 1994). Now that the micro data from the 1994 NSFIE have become available among academic users, we would like to add new information to our previous work and uncover new facts that have emerged after the burst of the bubble economy.

Many papers have been written on the topic of Japanese household saving. Among them, Hayashi (1997) is a landmark of this literature. Chapter 10 of Hayashi (1997) provides an excellent account of recent literature and evidence on Japanese

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saving. He identifies key stylized facts: (1) Japan's saving rate is not as high as commonly thought, and (2) the accumulation of wealth by Japanese households starts very early and lasts until very late in life, with unconsumed wealth transferred to the next generation in the form of bequests. As to the second point, Hayashi, Ando and Ferris (1988) argue that the bulk of intergenerational transfers take place in the form of bequests and that bequests come not only from the independent (nuclear) old, but also from the pool of extended families that seem to accumulate wealth regardless of the parents' age. Barthold and Ito (1992), using bequest tax filing information, show that about one-third to one-half of household assets are obtained by bequests in Japan. It implies that the old households do not dissave enough and leave sizeable bequests, intended or not. Takayama and Kitamura (1994) also find some evidence of substantial intergenerational transfers from the NSFIE. Ohtake (1991) argues that bequests are motivated by selfishness rather than by altruism. From these studies, we conclude that intergenerational transfers do occur at a substantial magnitude, no matter what motivation lies behind it.

Horioka (1990, 1993) provides another good survey of the literature from the viewpoint of different motives for saving. The author has identified more than 30 factors. Horioka and Watanabe (1997) also conducted empirical investigation of saving motives using micro data from a Japanese government survey. Horioka finds that net saving for retirement and precautionary motives are of dominant importance. Using a different data set, Ohtake and Horioka (forthcoming) discover that retirement and housing motivations are of importance. Motivation for the acquisition of owner-occupied housing remains strong and it promotes high saving, especially because of limited mortgage markets and high down-payment requirements (i.e. the presence of liquidity constraints). Hayashi, Ito and Slemrod (1988) investigate the effects of tax incentives and down-payment requirements on a household's tenure choice and on saving behaviour in the U.S.A. and Japan by simulation methods. The result is that these factors do not offer a complete explanation of the large gap between the saving rates of the two countries largely because of institutional differences in the typical down-payment ratio and tax incentives.

This paper will shed light on the saving behaviour by different cohorts with various household characteristics. This is important because (1) generational (cohort) aspects of saving behaviour is relatively unexplored in Japan, and (2) plurality of saving behaviours is attributable to various household characteristics, not to saving motives as such. We construct the cohort data by pooling a total of 110 194 households, after eliminating outliers in the 1984, 1989, and 1994 NSFIE.

As age effect, time effect, and cohort effect interact with each other, it is difficult to separate them individually. Therefore, we need to go beyond tabulation and summary statistics as shown in Takayama and Kitamura (1994), to use some statistical methods to overcome these difficulties and to identify the main driving forces of household savings behaviour in Japan.

2. The data

Since 1959, the NSFIE has been conducted every five years to reveal levels of income, consumption and household assets, their structure and distribution, as well as the differences among regions. All these analyses are performed through the investigation of two key areas: family income and expenditure, and assets and liabilities in Japanese households. This survey is designed to sample over 50 000 households (54 000 in 1984, 59 100 in 1989, and 56 000 in 1994). Survey items include (1) family income and expenditure, (2) annual income, financial assets and liabilities, (3) major durable goods, and (4) attributes of households and their members, including housing conditions.

With a large sample size and wide coverage in items, the NSFIE is a treasure trove of information. It enables researchers to make detailed analyses according to various household characteristics.†

The data we use here are taken from the 1984, 1989, and 1994 NSFIEs for two-or-more person households.‡ In our previous study (Takayama & Kitamura, 1994), monthly consumption data were converted into yearly data after taking seasonal fluctuations into account. As yearly income is originally given in the NSFIE, savings are calculated as yearly income minus taxes and social security contributions, minus yearly consumption.

The advantage of this approach is that internationally comparable yearly savings can be obtained, given that most households smooth out their consumption-saving patterns over a year.§ The

† For details of the NSFIE, see Hayashi, Ando and Ferris (1988).

‡ There is another set of survey for single-person households. The sample size is about 4900. The data cleaning processes are as follows. (1) If head age is recorded as zero, then delete. (2) If disposable income is zero or negative, then delete. (3) If both saving and disposable income are negative, then delete (because saving rate cannot be defined properly). (4) If saving rate is less than −10 000(%), then delete. (5) If values of disposable income, consumption, saving and saving rate are beyond 4 times of standard deviation of respective variable, then delete (elimination of outliers).

§ Of course, we cannot eliminate possibilities of purchasing large consumer durables and houses, which are rare events in all households. In such cases, yearly consumption can easily exceed yearly disposable income.

disadvantage is in the need to estimate some crucial variables such as yearly consumption, yearly taxes, and social security contributions. The NSFIE contains information only for the three months from September through to November. We had to use external information from the Family Income and Expenditure Survey (FIES) for the other months' consumption. Also, taxes and social security contributions had to be calculated using information on household characteristics and yearly income provided in the NSFIE. Regrettably, these imputations can be sources of errors.† Hence, in this paper and unlike our earlier publication (Takayama & Kitamura, 1994), we decided not to adjust the saving data to the annual base. This yields some significant differences since bonus payments are paid out in June and December, while our data covers only September through November.

The most frequently discussed problem with the NSFIE data is the sample selection bias among old households. The extended family was prevalent in Japan. For example, in 1994, 17·5% of all households were extended family and 30·6% of all households had household members aged over 65.‡ The existence of extended families implies that there are two categories of older people: those still maintaining an independent household (i.e. the independent old) and those living with children (i.e. the dependent old). Wealth and flow of savings for the dependent old cannot be observed directly because of no breakdown among family members in the NSFIE. When the true age profile of saving behaviour is to be identified, we have to extract savings and wealth of dependent old from the extended families and add them to those of the independent old. As the economic status of the independent old is substantially better than that of the dependent old, the old-age saving behaviour would have a self-selection bias if we did not make such adjustments. Hayashi, Ando and Ferris (1988) suggest a method of removing this bias by comparing nuclear families and extended families whose younger generation is similarly aged. We find however that this method needs to be refined due to insufficient control of household

† For example, conversion from three monthly to yearly consumption is done simply through multiplying common (average) annual conversion factors for 10 major expenditure items by three monthly respective consumption. Needless to say, each household has different expenditure patterns over a year. It may not be appropriate to apply common (average) annual conversion factors for households with different characteristics (e.g. different demographic compositions and different income groups). Furthermore, to calculate annual taxes and social security contributions is very difficult, given numerous exemptions, deductions and allowances.

‡ This implies that 13·1% of the elderly live on their own and this trend has been increasing over time. Sooner or later, of all people aged over 65, more than half will live independently from their children, giving a rapid decrease in number of children and generous social security benefits.

characteristics to carry out statistical matching between nuclear and extended families†. Takayama and Kitamura (1994) provide a complementary estimation method of intergenerational transfers to Hayashi, Ando and Ferris (1988).

It is quite important to adjust this sample selection bias, if the main research issues are concerned with the saving and wealth accumulation behaviour of old households or intergenerational transfers from old to young households.

The purpose of this paper is somewhat different from these, and is to identify the cohort effects on savings, especially those of the baby-boomer cohort by using statistical methods. We have decided not to adjust our data based on two reasons. First, we would like to avoid any arbitrary statistical adjustments as discussed above (namely a seasonal adjustment to derive yearly savings and a sample selection bias of the old households) which may create artificial errors in variables. We will use the raw data from the NSFIE. Second, we find ample evidence of rapidly decreasing numbers of extended families. Thus, it may be quite misleading to excessively stress the importance of the extended family in Japan (see Table 2). Furthermore, this paper is not directly concerned with the old households as it were, but with the younger households and cohorts.

Hence, there are two main reasons why the results in this paper are not directly comparable to earlier work (e.g., Takayama and Kitamura, 1994). First, the current paper only refers to the quarter between September and November. Second, we do not apply corrections for elderly people living in extended family living arrangements. Comparable analysis using annual data and methodological work to remove sample selection bias are left to our future work.

3. Cohort analysis of saving behaviour

For most of the interesting questions about saving and the life-cycle, it is necessary to track individuals over time and to observe the changes in consumption, income, and savings as people age. Of course, the best possible data set for such analysis is panel data in which each individual household can be tracked over time. However, such data are rarely available in Japan, especially for an economy-wide official survey.

† For example, the extended families are prevalent in self-employed households living in the rural areas, while the nuclear families are prevalent in employees' households living in the big cities. A simple comparison between the two only adjusting age cohorts is quite misleading, because this comparison may reflect differences in region, occupation, and social values.

As a second-best solution, we can construct cohort data from an independent survey such as the NSFIE. In this paper, cohorts are grouped into five-year intervals of birth. Since the NSFIE itself is surveyed every five years, this grouping is done for the sake of convenience. In other words, the 25–29 age bracket in 1984, for example, is linked with the 30–34 age bracket in 1989 and the 35–39 age bracket in 1994 to form the cohort of 1955–1959 birth year. Longitudinal profiles created this way are called *synthetic cohorts*.

Table 1 shows the number of households by cohort over the different surveys. Except for a very old cohort (i.e. Cohort 1) and very young cohorts (i.e. Cohorts 8 and 9), the population in each survey remains, more or less, constant which reflects the demographic distribution of total population in Japan.

Table 2 reports the average number of household and working members by cohorts. It is necessary to check whether the basic household characteristics remain stable.

The average number of household members decreases over time for the older cohorts (i.e. cohorts 1–6) and increases over time for the younger cohorts (i.e. cohorts 7–9). Apart from differences in the sample base, it seems quite natural that members of older cohorts decrease as their children become independent and spouses pass away, and that members of younger cohorts increase as the couple has children and their parents merge in. But, in general, Table 2 implies that the average Japanese household is a nuclear family, not an extended family (e.g. three generations cohabitation). The lower panel of Table 2 shows the average number of working members. Up to cohorts 1–3, the average working members decrease due to the fact that their children become independent and spouses pass away. But, for cohort 4 to cohort 6, average working members increase while average household members decrease in the upper panel. It may be the case that in recent years more housewives continue working into their 30s and 40s.

TABLE 1 *Number of households by cohort*

Birth year		1984	1989	1994	Total
Cohort 1	(1920–24)	1514	1520	2352	5386
Cohort 2	(1925–29)	2940	2783	2797	8520
Cohort 3	(1930–34)	3705	3748	3394	10 847
Cohort 4	(1935–39)	4557	4443	4142	13 142
Cohort 5	(1940–44)	5775	5575	5468	16 818
Cohort 6	(1945–49)	6363	6682	6326	19 371
Cohort 7	(1950–54)	4934	6356	6560	17 850
Cohort 8	(1955–59)	2067	4230	5527	11 824
Cohort 9	(1960–64)	347	1974	4115	6436
Total		32 202	37 311	40 681	110 194

TABLE 2 *Average number of household members and working members*

Average number of household members by cohort

Birth year		1984	1989	1994	Total
Cohort 1	(1920–24)	2·82	2·57	2·26	2·51
Cohort 2	(1925–29)	3·24	2·79	2·48	2·84
Cohort 3	(1930–34)	3·54	3·19	2·75	3·17
Cohort 4	(1935–39)	4·05	3·58	3·12	3·60
Cohort 5	(1940–44)	4·32	4·07	3·54	3·98
Cohort 6	(1945–49)	4·28	4·38	4·04	4·24
Cohort 7	(1950–54)	3·91	4·32	4·32	4·21
Cohort 8	(1955–59)	3·14	3·81	4·20	3·87
Cohort 9	(1960–64)	2·73	3·15	3·59	3·41
Total		3·86	3·79	3·58	3·73

Average number of working members by cohort

Birth year		1984	1989	1994	Total
Cohort 1	(1920–24)	1·19	0·74	0·34	0·69
Cohort 2	(1925–29)	1·86	1·18	0·70	1·26
Cohort 3	(1930–34)	2·00	1·92	1·27	1·74
Cohort 4	(1935–39)	1·79	2·08	2·02	1·96
Cohort 5	(1940–44)	1·56	1·78	2·11	1·81
Cohort 6	(1945–49)	1·49	1·55	1·80	1·61
Cohort 7	(1950–54)	1·40	1·47	1·59	1·50
Cohort 8	(1955–59)	1·38	1·38	1·47	1·42
Cohort 9	(1960–64)	1·38	1·38	1·37	1·37
Total		1·60	1·58	1·54	1·57

Figure A illustrates the age profile of saving rates in the pooled 1984, 1989, and 1994 NSFIE data. The upper line represents the standard measure of saving rates (=savings divided by disposable income) by age, the lower line indicates the average of individual saving rates. The trend remains more or less the same until age 60, then the two lines diverge significantly as income and wealth distributions get worse after age 60. It should be noted that the variance of saving rates gets larger as households become older, and the results of the very old should be interpreted with care.

Indeed, unlike a typical average saving pattern over a life cycle, a large pooled microeconomic survey indicates the plurality of saving behaviours among the 110 194 households. Among them, 81 721 households have positive savings, while 28 473 households have negative savings. Here, negative savings imply that such households consume more than their disposable income. They are financed either by past savings or consumer loans.

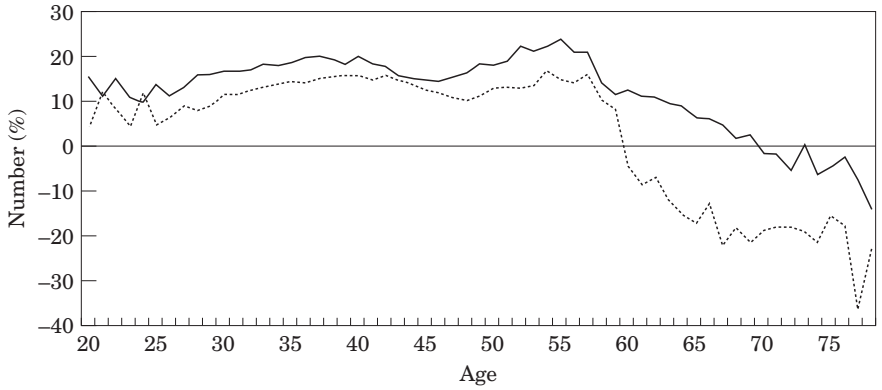

FIGURE A. Age profile of saving rate. —— Total savings/total disposable income; · · · · · average of individual saving rate.

Households with negative savings, therefore, do not face any liquidity constraints. In addition, not all households with positive savings are liquidity constrained as the average propensity to save of these households is quite high.†

Figure B illustrates the average saving rate by cohorts. The saving pattern remains stable up to age 54, and declines steadily afterwards. A noticeable point is that the saving rate of the baby-boomer cohort dropped in 1994 while that of most neighbouring cohorts went up.

Table 3 shows summary statistics of disposable income, savings and saving rate by cohorts. Table 3 indicates that cohort 4 is the highest saver because this cohort reaches the highest point in the wage-profile, i.e. age 55–59. But if we look at the saving rate, the level is more or less the same for cohorts 4–9. The saving rate of the oldest cohort is substantially lower than the other cohorts. This pattern corresponds with Figure B.

In order to identify whether each cohort belongs to the same population, it is natural to conduct an analysis of variance (ANOVA). Table 4 reports ANOVA results for the saving rate against cohort and year.‡ Although the variance of savings rate against cohort differs from each other, that against year is much smaller in general. The regression result of the same

† Ban and Takagi (2000) use the 1984, 1989 and 1994 NSFIE to construct synthetic panel data and examine the effect of liquidity constraint on household consumption. They obtain no evidence of liquidity constraint among the Japanese households. Their strong result may stem from a functional form they use. Further elaboration is needed.

‡ By focusing on the saving rate, we can avoid the price change effect, given that price changes affect savings and disposable income in more or less the same way.

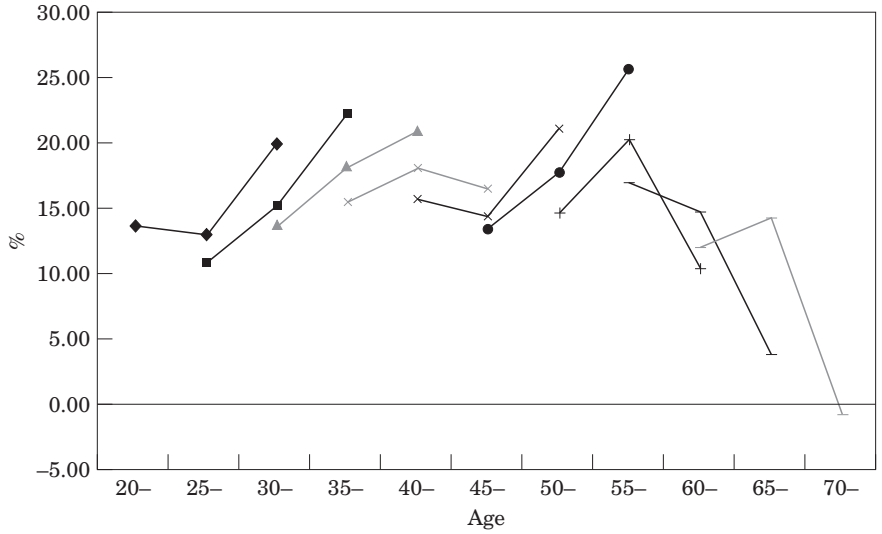

FIGURE B. Monthly saving rate by cohort.

ANOVA indicates that values and the significance of coefficients by different cohorts are quite heterogeneous (i.e. cohorts 1–3 vs. cohorts 4–9) and that values of coefficients by year turn out to be insignificant. No time effect is found. Table 5 shows results of the ANOVA against cohort over all years (1984–1994) as well as in each year. The ANOVA in 1984–1994 indicates that the main source of heterogeneity comes from cohorts 1–3. Cohorts 4–9 seem quite homogeneous over all years. To be more precise, the degree of heterogeneity is similar. However, if we look at the ANOVA each year carefully, there are some signs of heterogeneity even among cohorts 4–9. In 1984, cohort 1 was the only outlier, in 1989, cohorts 1–2 and cohorts 6–7 become outliers, and in 1994, cohorts 1–3 and cohort 6 were the outliers. An interesting finding here is that cohort 6, the baby-boomer generation, starts behaving differently as early as in their 40s in 1989 and 1994.

The baby-boomer generation deserves special attention because it comprises the largest demographic group. We need further research to identify the members' heterogeneous behaviour with econometric tests.†

It is noteworthy that in the U.S.A., the unprecedented economic boom in the 1990s has enabled the boomer generation to accumulate their wealth (see Sterling & Waite, 1998) in the forms of

† This task is left to the conference volume of international comparisons of household saving to be published by Academic Press.

real estate, pension funds, and stocks. Conversely, the protracted Japanese economic recession in the 1990s has made very little room for the baby-boomers to accumulate their wealth for after retirement by themselves and through firms' retirement severance pay funds.†

4. Construction of social security wealth

Another important issue in household saving is to identify whether or not the social security system affects household saving. This question was originally raised by Feldstein (1974) and extended by many authors. In case of Japan, Takayama (1992a,b) conducted an econometric estimation of consumption expenditure, using the

TABLE 3 *Summary statistics by cohort*

Disposable income (Euro)

Birth year		MEAN	SDV	MIN	MAX
Cohort 1	(1920–24)	1535·42	926·36	40·07	7481·07
Cohort 2	(1925–29)	1909·93	1009·23	16·09	8208·84
Cohort 3	(1930–34)	2241·15	1039·83	95·76	8199·63
Cohort 4	(1935–39)	2514·10	1064·17	43·15	8220·92
Cohort 5	(1940–44)	2461·37	1005·08	74·87	8190·32
Cohort 6	(1945–49)	2236·43	889·58	111·97	8128·83
Cohort 7	(1950–54)	2060·50	806·77	89·49	8171·90
Cohort 8	(1955–59)	1944·78	762·57	154·25	7930·41
Cohort 9	(1960–64)	1870·41	686·76	132·74	7833·18

Savings (Euro)

Birth year		MEAN	SDV	MIN	MAX
Cohort 1	(1920–24)	113·23	820·46	−4950·55	5605·71
Cohort 2	(1925–29)	230·67	879·00	−4848·59	4623·18
Cohort 3	(1930–34)	341·28	934·76	−5262·27	5802·11
Cohort 4	(1935–39)	483·11	923·81	−5017·97	6041·74
Cohort 5	(1940–44)	426·01	861·00	−4299·09	5825·97
Cohort 6	(1945–49)	371·85	743·11	−5113·78	5249·52
Cohort 7	(1950–54)	378·20	670·99	−5090·56	5281·86
Cohort 8	(1955–59)	358·24	671·98	−5008·89	4930·23
Cohort 9	(1960–64)	333·38	690·71	−4822·60	5972·76

(*Continued overleaf*)

† We have to be careful about the conceptual differences of the baby-boomer generations in the U.S.A. and in Japan. In the U.S.A., the baby-boomer includes those who were born from 1946 to 1968, while in Japan, it usually includes only those who were born from 1946 to 1949, i.e. cohort 6 in this paper.

TABLE 3 *(Continued)*

Saving rate

Birth year		MEAN
Cohort 1	(1920–24)	7·37
Cohort 2	(1925–29)	12·08
Cohort 3	(1930–34)	15·23
Cohort 4	(1935–39)	19·22
Cohort 5	(1940–44)	17·31
Cohort 6	(1945–49)	16·63
Cohort 7	(1950–54)	18·35
Cohort 8	(1955–59)	18·42
Cohort 9	(1960–64)	17·82

Note: Nominal Yen value is converted into Euro in the following way.
(1) The 1990 based GDP deflators for 1984, 1989 and 1994 are used to yield the weighted average deflator by household population. That is, 91·5* (1984 number of households/total number of households) +97·8* (1989 number of households/total number of households) +105·3* (1994 number of households/total number of households) = 98·728
(2) This weighted average (98·728) is deflated by the 1998 value (103·7). We obtain 0·9520 which is the deflator for the 1984–1994 nominal value to be converted into the 1998 value.
(3) Disposable income and savings in each cohort are deflated by 0·9520 and then converted into Euro by the 1998 Euro-Yen exchange rate (1 Euro = 159·57 Yen).

present value of public pension benefits (*GSSW*) as one of the explanatory variables in the 1979 and 1984 NSFIE. Estimated values of the parameter for *GSSW* are significantly positive. For workers' households, the figures are about 1·2% in 1979 and 2·4% in 1984, implying that the presence of social security wealth caused annual consumption expenditure to increase by 1·2% and 2·4% of *GSSW* in 1979 and 1984 respectively.

The model can be refined by allowing the effect of human capital variables to vary by age. The presence of social security wealth is estimated to increase 1984 consumption expenditures of workers' households by about 1·5% of *GSSW*. This increase in consumption expenditure would be equivalent to 13·9% and 12·0% of disposable income in 1979 and 1984 respectively.

The Japanese public pension program increases working households' propensity to consume, viz., the evidence confirms the hypothesis that social security wealth discourages personal savings in Japan.

Note, however, that the public pension system has been changed many times and will be reformed again and again in the future. Benefits and contributions will be more closely balanced; the social security wealth of each individual will also be reduced in the near

TABLE 4 *Analysis of Variance*

Saving rate against cohort and year

Source	Partial SS	df	MS	F	Prob > F
Model	7 419 673·47	10	741 967·35	305·19	0·0000
Cohort	7 416 192·81	8	927 024·10	381·31	0·0000
Year	18 930·43	2	9465·21	3·89	0·02
Residual	267 875 168·00	110 183	2431·18		
Total	275 294 841·00	110 193	2498·30		

Number of obs = 110 194 Root MSE = 49·3083.

Regression result

Source	SS	df	MS
Model	7 419 673·47	10	741 967·35
Residual	267 875 168·00	110 183	2431·18
Total	275 294 841·00	110 193	2498·30

	Coef.	Std. Err.	t
Constant	13·8504	0·6262	22·1190
Cohort			
1	−30·3530	0·9142	−33·2010
2	−19·8734	0·8221	−24·1750
3	−9·7254	0·7843	−12·4000
4	−0·4566	0·7590	−0·6020
5	−0·7512	0·7315	−1·0270
6	−0·6764	0·7179	−0·9420
7	0·3437	0·7229	0·4750
8	0·0212	0·7658	0·0280
9	(dropped)		
Year			
1984	0·4281	0·3753	1·1410
1989	−0·6102	0·3554	−1·7170
1994	(dropped)		

Number of obs = 110 194 R-squared = 0·027.
F(10 110 183) = 305·19 Adj R-squared = 0·0269.
Prob > F = 0 Root MSE = 49·307.

future by raising the normal retirement age to 65 or more and by decreasing real levels of monthly benefits. The future prospects of these reforms might have encouraged household savings.†

† Although we have not conducted a similar econometric analysis using the 1989 and 1994 NSFIE, high saving rates among those aged over 55 might be evidence of precautionary savings due to uncertainty in the public pension system. See Takayama (2000a) for the latest public pension reform plan.

According to our framework, the following identity is defined:

$$\begin{aligned} &\text{Income} - (\text{tax and social security contributions}) \\ &\quad = \text{disposable income} \\ &\quad = \text{consumption and savings} \end{aligned} \tag{1}$$

Social security contributions are further divided into public pension contributions, health insurance, and other social insurance. Let us define discretionary savings as savings in the RHS of equation (1) and mandatory savings as (public pension contributions

TABLE 5 *Decomposition of Analysis of Variance*

Saving rate against cohort (1984–94)

Source	Partial SS	df	MS	*F*	Prob > *F*
Model	7 400 743·04	8	925 092·88	380·49	0·0000
Cohort 1	2 681 494·04	1	2 681 494·04	1102·90	0·0000
Cohort 2	1 431 715·40	1	1 431 715·40	588·87	0·0000
Cohort 3	374 276·74	1	374 276·74	153·94	0·0000
Cohort 4	530·46	1	530·46	0·22	0·6404
Cohort 5	1920·96	1	1920·96	0·79	0·3741
Cohort 6	1637·27	1	1637·27	0·67	0·4119
Cohort 7	790·73	1	790·73	0·33	0·5685
Cohort 8	7·28	1	7·28	0·00	0·9564
Cohort 9	0·00	0			
Residual	267 894 098·00	110 185	2431·31		
Total	275 294 841·00	110 193	2498·30		

Number of obs = 110194 Root MSE = 49·3083.

Saving rate against cohort (1984)

Source	Partial SS	df	MS	*F*	Prob > *F*
Model	591 055·91	8	73 881·99	46·71	0·00
Cohort 1	78 289·80	1	78 289·80	49·50	0·00
Cohort 2	902·85	1	902·85	0·57	0·45
Cohort 3	748·84	1	748·84	0·47	0·49
Cohort 4	515·80	1	515·80	0·33	0·57
Cohort 5	4014·32	1	4014·32	2·54	0·11
Cohort 6	3929·58	1	3929·58	2·48	0·12
Cohort 7	611·96	1	611·96	0·39	0·53
Cohort 8	1536·82	1	1536·82	0·97	0·32
Cohort 9	0·00	0			
Residual	50 919 054·80	32 193	1581·68		
Total	51 510 110·70	32 201	1599·64		

Number of obs = 32202 Root MSE = 39·7704.

(*Continued overleaf*)

TABLE 5 *(Continued)*

Saving rate against cohort (1989)

Source	Partial SS	df	MS	F	Prob > F
Model	2 533 497·45	8	316 687·18	99·03	0·00
Cohort 1	680 710·30	1	680 710·30	212·86	0·00
Cohort 2	356 944·14	1	356 944·14	111·62	0·00
Cohort 3	6842·06	1	6842·06	2·14	0·14
Cohort 4	17 409·86	1	17 409·86	5·44	0·02
Cohort 5	4147·25	1	4147·25	1·30	0·25
Cohort 6	46 627·71	1	46 627·71	14·58	0·00
Cohort 7	38 805·49	1	38 805·49	12·13	0·00
Cohort 8	6068·27	1	6068·27	1·90	0·17
Cohort 9	0·00	0			
Residual	119 290 482·00	37 302	3197·96		
Total	121 823 979·00	37 310·00	3265·18		

Number of obs = 37311 Root MSE = 56·5506

Saving rate against cohort (1994)

Source	Partial SS	df	MS	F	Prob > F
Model	7 132 082·83	8	891 510·35	382·38	0·00
Cohort 1	2 027 815·70	1	2 027 815·70	869·76	0·00
Cohort 2	1 890 821·82	1	1 890 821·82	811·00	0·00
Cohort 3	1 359 567·47	1	1 359 567·47	583·14	0·00
Cohort 4	4638·21	1	4638·21	1·99	0·16
Cohort 5	3·32	1	3·32	0·00	0·97
Cohort 6	36 154·09	1	36 154·09	15·51	0·00
Cohort 7	1607·83	1	1607·83	0·69	0·41
Cohort 8	10 605·99	1	10 605·99	4·55	0·03
Cohort 9	0·00	0			
Residual	94 825 187·90	40 672	2331·46		
Total	101 957 271·00	40 680·00	2506·32		

Number of obs = 40681 Root MSE = 48·2852.

− public pension benefits + contributions to the severance pay fund + interests from social security wealth + interests from accumulated severance pay). For statistical simplicity, here we take mandatory savings simply as public pension contributions minus public pension benefits (i.e. net public pension contributions), and ignore contributions to the severance pay fund, interests from social security wealth, and interests from accumulated severance pay. Then, it is obvious from the construction of equation (1) that discretionary savings are negatively correlated with mandatory savings. In addition, we calculate the crude ratio between mandatory savings and discretionary savings for different age groups. The results are given in Table 6.

TABLE 6 *The crude ratio between mandatory and discretionary savings (%)*

		1984	1989	1994	1984–94
Cohort 1	(1920–24)	−315·55	−434·00	6510·88	−779·75
Cohort 2	(1925–29)	−30·14	−277·11	−1646·01	−264·71
Cohort 3	(1930–34)	25·82	−7·42	−270·87	−48·25
Cohort 4	(1935–39)	32·34	24·55	14·92	21·34
Cohort 5	(1940–44)	26·96	31·95	27·34	28·48
Cohort 6	(1945–49)	25·24	22·81	32·68	27·36
Cohort 7	(1950–54)	25·57	21·81	24·12	23·56
Cohort 8	(1955–59)	32·54	26·57	23·37	24·88
Cohort 9	(1960–64)	11·79	31·98	28·09	28·38
Average		8·66	−9·20	−14·36	−7·79

Source: National Survey of Family Income and Expenditure, 1984, 1989, and 1994.
Note: The mandatory savings are defined as a difference between public pension contributions and its benefits, i.e. net public pension contributions. Those aged over 60 receive public pension benefits so that mandatory savings become negative.

It is apparent that the ratio becomes significantly negative for those aged over 60, i.e. cohorts 1–3. Cohort 1 in 1994 shows a substantially high positive value, which is because saving itself is negative, so that the ratio becomes positive. There is no surprise in the fact that cohort 1 in 1994 receives rather large net benefits. That is, mandatory savings do matter with the old households. The ratio becomes negative in the overall average in 1989 and 1994. This implies that the balance of public pension system as a whole becomes negative.

In the near future, generous public pension benefits in Japan are to be reduced, while the contribution rate may be permanently frozen at the current level or be reduced through a partial shift of funding to a consumption-based tax. At the same time, we should encourage private initiatives including a private, personal saving account for retirement, through the use of powerful tax incentives.† In addition, generational accounting results from Japan (see Takayama, Kitamura & Yoshida, 1999, and Takayama & Kitamura, 1999) also indicate that we cannot afford to provide generous public pension benefits to the boomer cohort and that further public pension reforms would be inevitable, if the public pension scheme is to be kept running.

† A Japanese version of the 401K plan is to be introduced in the near future. See Takayama (2000b).

To construct social security wealth (SSW) as a measure for mandatory savings, we need to use the baseline equation as follows,

$$SSW_{t+1} = (1 + \rho)SSW_t + \tau_t - b_t, \tag{2}$$

where SSW = social security wealth, ρ = internal rate of return, τ_t = public pension contribution, b_t = public pension benefits.

First, the stream of public pension contributions can be calculated from the age-earning profile multiplied by historical public pension contribution rates over the period of 1960–1999. Second, the stream of public pension benefits is to be adjusted annually with inflation and is added up to the average life expectancy (from 2000 to 2022). Third, we have to set $SSW_{t+R} = 0$, such that the internal rate of return equates two streams; public pension contributions and benefits under the Pay-As-You-Go system. At the age of retirement, 60 in year 2000, SSW in Japan is estimated to equal 34·21 million Yen (214 400 Euro if 1 Euro = 159·57 Yen) and the nominal internal rate of return is 8·7% per year.

Given that the average net financial assets (excluding SSW) for age 60–64 in 1994 was 20·42 million Yen (128 000 Euro), the estimated SSW 34·21 million (2 144 000 Euro) is very large indeed, although the actual SSW is expected to be even larger than the estimated SSW.

As is obvious, the SSW includes a component of intergenerational transfers. If we assume that the market rate of return from investment was 5·5% in nominal terms per annum, and that the discount rate for the future SSW will be 4·0%, then, the estimated

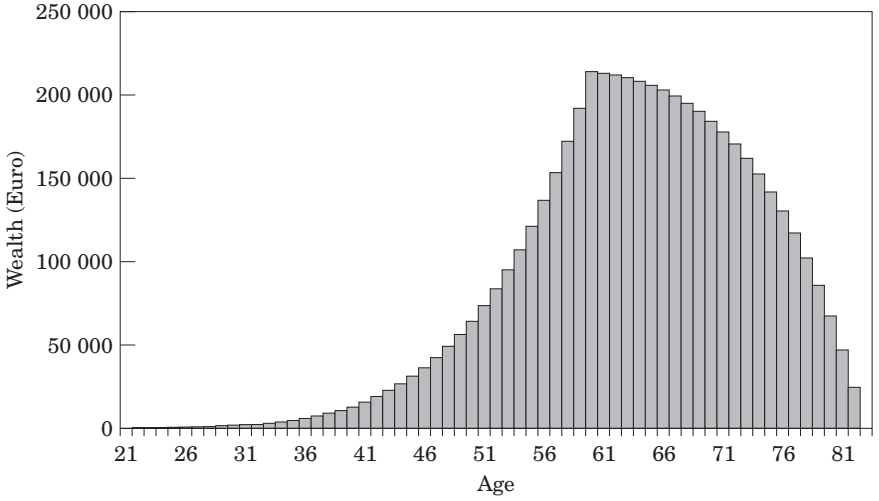

FIGURE C. Social security rate by life cycle. Note: We assume the exchange rate as 1 Euro = 159·57 Yen.

SSW will go up to 50·92 million Yen (319 000 Euro). This figure is rather common to the Japanese. Consequently, the component of intergenerational transfers in the *SSW* will turn out to be as much as 29·13 million Yen (1 825 000 Euro), in this case.

5. Conclusion

Unlike the previous cross sectional analysis of the NSFIE in Takayama and Kitamura (1994), this paper analyses Japanese household saving behaviour from a cohort point of view. We also use newer data (1984–1994 rather than 1979–1989) and refrain from several data adjustments as described in Section 2.

Our findings are as follows. (1) In general, our cohort analysis indicates that saving behaviour changes after age 55 but that cohort behaviour is not very different among cohorts younger than age 54. This does not imply homogeneity of younger cohorts; rather, the degree of heterogeneity is more or less the same amongst the younger cohorts. (2) However, according to the 1989 NSFIE, the baby-boomer cohort (age 40–44 in 1989) has already deviated from other younger cohorts. This phenomenon did not exist in the 1984 NSFIE when the baby-boomer cohort was of age 35–39. (3) Estimated social security wealth (*SSW*) under the Japanese environment is as much as 50·92 million Yen (319 000 Euro) at the age of retirement. The share of intergenerational transfers in the *SSW* is also very large.

The first point may be explained by the fact that the increase in heterogeneity after age 55 (and especially after 60) is mostly due to differences in lump-sum retirement severance payments or social security wealth. Variability of these benefits is much wider than that of regular monthly salaries as the firms' economic performances, welfare plans for retirement severance pay funds, and unions' bargaining powers differ substantially among firms and organizations.

The second point is important because the baby-boomer cohort consists of the largest demographic group. Hence, their behaviour significantly affects macroeconomic variables such as aggregate consumption, investment and income distribution.

This leads to the third point. When the baby-boomer generation reaches their late 50s and early 60s, variability of retirement severance payments, of social security wealth and of intergenerational transfers will be much wider than now. Intergenerational equity issues will inevitably be focused on the baby-boomer generation. It is quite crucial to set up institutional arrangements concerning intergenerational equity (e.g. public and private pension schemes) before the baby-boomer generation reaches their retirement age. This task is left to our future research project.

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