

# A NOTE ON THE LIFE-CYCLE PATTERN OF SAVING IN JAPAN\*

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## *Introduction*

Among the several explanations suggested by Professor Shinohara for the high saving ratio in Japan<sup>1</sup> is one based on the hypothesis that young people save more than the old and the fact that the Japanese population has a relatively young age structure. This hypothesis was rejected by Kanamori<sup>2</sup> and, following him, by Komiya<sup>3</sup> and Mizoguchi.<sup>4</sup> Kanamori's argument, as summarized by Komiya, is that "households of the aged show a higher propensity to save than those of the young even after income size differences between the two age groups are removed" and that "if the ratio of the old were larger, the rate of saving would be higher in Japan."<sup>5</sup> In this note I will first show that more recent data do not support Kanamori's view and then proceed to consider other effects on the life cycle of saving.

## *The Effect of Age and Income*

Kanamori's proof is based on a comparison between the saving-income relation of the whole population and the average income and saving of each age group.<sup>6</sup> He finds that age groups up to the age of 30 have lower saving than that expected from their average income while the saving of higher age groups exceeds the amount prescribed by their income. Regarding the difference between the two as representing the effect of age it appears that this effect is negative for low age groups and positive for the high ones.

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<sup>1</sup> Miyoshi Shinohara, *Growth and Cycles in the Japanese Economy*, Kinokuniya Tokyo, 1962.

<sup>2</sup> Hisao Kanamori, "Nihon no Chochikuritsu wa Naniyue Takai ka" (Why is the Saving Ratio in Japan High), Economic Planning Agency, *Keizai Geppō*, November 1961.

<sup>3</sup> Ryūtarō Komiya, "The Supply of Personal Savings" in Ryūtarō Komiya (ed.), *Postwar Economic Growth in Japan*, University of California Press, Berkeley, 1966.

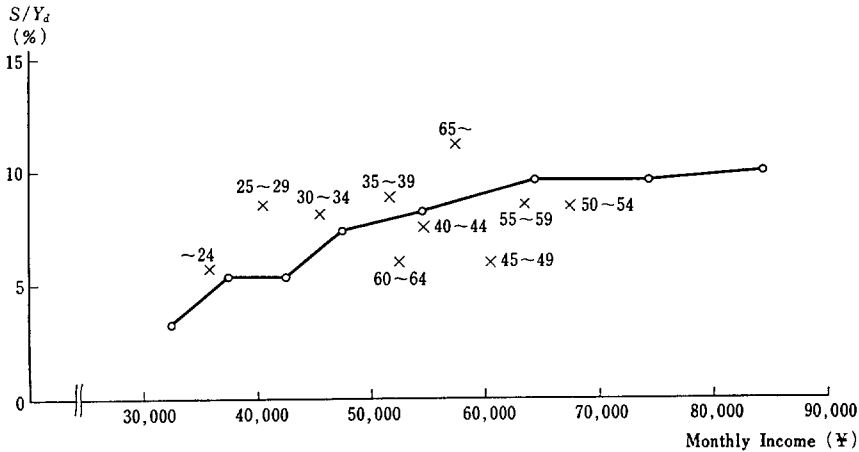
<sup>4</sup> Toshiyuki Mizoguchi, "On the High Personal Saving Ratio in Japan," *Hitotsubashi Journal of Economics*, Vol. 8, No. 2, February 1968.

<sup>5</sup> Komiya, *op. cit.*, p. 172.

<sup>6</sup> The data are for worker households and are taken from the 1959 Family Saving Survey (Chochiku Dōkō Chōsa). This proof can be found in Komiya, *op. cit.*

Using the same technique I present in Chart 1 saving ratios by income and age groups for worker households taken from the 1964 National Survey of Family Income and Expenditures (which will be referred to as the Survey).

CHART 1. SAVING RATIO BY INCOME AND AGE



Source: Office of the Prime Minister, 1964 National Survey of Family Income and Expenditures, Vol. 1, Tables 1 and 8.

The  $x$ 's represent the average income and saving ratio of each age group. The dots, connected by the solid line, represent the average saving ratio of families in each income group. We see that households with a head of age 39 or less save more, and those of age 40 to 64 save less, than predicted from their average income. This result raises some doubt as to the previous conclusion, although, as Kanamori himself admits, the statistical method used does not reveal the pure effect of age.<sup>7</sup> A more refined method is called for to eliminate the effect of income.

Fortunately the Survey includes a table where worker households are classified by age and income, which can be utilized for this analysis.<sup>8</sup> One shortcoming of the Survey for the purpose of studying saving behavior is the fact that it was conducted during only three months, September through November, and does not include the months in which bonus is paid and most of the saving is done. Since bonus payments are highly correlated with income it is reasonable to believe that this omission influences mainly the income effect, having little bearing on the effect of age.

The model is

$$(S/Y_d)_{i,j} = M + A_i + Y_j + U_{i,j}$$

where  $S$  is saving, defined as Income minus Expenditures,  $Y_d$  Disposable Income = Income minus Non-Living Expenditures,  $M$  a constant term,  $A_i$  the effect of the  $i$ -th age group,  $Y_j$  the effect of the  $j$ -th income level and  $U_{i,j}$  an error term. No linear relation is assumed

<sup>7</sup> Because of the non-linearity of the saving function and the distribution within each age group it is possible that the saving ratios for all age groups will be above the solid line. This was found to be the case for all households according to the 1964 Survey data.

<sup>8</sup> The Survey includes also non-worker households, but a table by age and income is given only for worker households. The data used in the present analysis are for households with two or more persons.

between the dependent variable  $S/Y_d$  and the independent variables  $A$  and  $Y$ . In order to estimate  $M$ ,  $A_i$  and  $Y_j$  a weighted regression<sup>9</sup> was run on dummy variables attached to each level (except one) of age and income.<sup>10</sup> The results are presented in Table 1. As is well known, only the contrast between different levels of age and of income can be estimated and no meaning should be attached to the absolute values.

TABLE 1. ESTIMATES OF AGE AND INCOME EFFECTS (%)

Age	$A_i$	Income (¥)	$M+Y_j$
-24	0	10,000- 14,999	-12.01
25-29	1.33	15,000- 19,999	-15.86
30-34	-.59	20,000- 24,999	- 6.53
35-39	-1.16	25,000- 29,999	.37
40-44	-3.22	30,000- 34,999	4.45
45-49	-4.90	35,000- 39,999	6.72
50-54	-3.14	40,000- 44,999	6.94
55-59	-3.70	45,000- 49,999	9.14
60-64	-5.51	50,000- 59,999	10.28
65+	1.24	60,000- 69,999	12.10
		70,000- 79,999	12.36
		80,000- 89,999	12.84
		90,000- 99,999	13.31
		100,000-119,999	16.84
		120,000-139,999	19.25
		140,000-159,999	21.70
		160,000+	27.32

$R^2 = .701$

The effect of income is monotonically increasing (except for one case at income group 15,000-19,999), namely people save a higher percentage of their disposable income when their income goes up. The age effect is less consistent but shows a general downward trend from age group 25-29 to 60-64, although there are fluctuations around this trend. The last age group 65+ shows a very high age effect which, if not caused by sampling errors, calls for further study. However, it is clear that after eliminating the income effect we find that the young save more and Kanamori's conclusion must be rejected.<sup>11</sup>

<sup>9</sup> The weights used were not the actual number of households in the sample but an adjusted number given in the *Survey*. The adjustment was done to take account of the difference in sampling ratios. The first two income groups (-4,999; 5,000-9,999) showed very great fluctuations in the saving ratio and were not included in the analysis. These two groups include less than 0.2% of the total adjusted number of households.

<sup>10</sup> For a description of the method see D. B. Suits, "Use of Dummy Variables in Regression Equations," *Jour. Amer. Stat. Assoc.*, Vol. 52, December 1957, pp. 548-551. Since we have only a two way classification no account can be taken of the interaction between age and income.

<sup>11</sup> A study based on the same data but a different statistical method to eliminate the effect of income was done by Kinoshita. By combining the two age groups 60-64 and 65+ he found a continuous increase in the corrected saving ratio from age 45 to 60+. Nevertheless, his results are consistent with mine in showing that the saving ratio of the first age groups is higher than that of the last ones. See Sōshichi Kinoshita, "Keizai Kōdō no Keiryō Keizai Moderu ni kan suru Kenkyū (I)" (An Econometric Model Analysis of the Japanese Economy), Nagoya University, January 1967.

### *The Life-Cycle Pattern of Saving*

Formulations of the life cycle hypothesis of saving generally start from an individual but are then regarded as pertaining to households.<sup>12</sup> This shift from an individual to a household is done without taking into account the differences between the two and the changes in the household which accompany a change in the age of the household's head. In particular, as shown in Table 2, there is a change in the number of household members and the number of earners per household. Household size increases up to age 45-49 when children are born and shows a decline when they leave the house. The rise during the first age groups also reflects the shift of the position of "household head" to younger people.<sup>13</sup> The number of earners decreases up to age 30-34 when working wives leave the labor force after giving birth, increases up to age 55-59 when wives re-enter the labor force and children start to earn, and declines subsequently when children leave the household. These changes have an impact on the saving behavior which was included in the "age effect" of the previous section. I shall now introduce them explicitly into the analysis.

TABLE 2. INCOME, HOUSEHOLD SIZE AND NUMBER OF  
EARNERS BY AGE GROUPS (1964)

Age (1)	Average Income (1000 ¥) (2)	Household Size (3)	Earners per Household (4)	Number of Households (Adjusted) (5)
average	52.9	4.06	1.56	32,427
-24	36.8	3.05	1.75	589
25-29	40.4	3.09	1.44	3,381
30-34	45.5	3.79	1.40	6,315
35-39	51.7	4.25	1.41	7,159
40-44	54.7	4.44	1.45	4,936
45-49	60.7	4.45	1.63	3,981
50-54	67.7	4.37	1.94	3,173
55-59	63.3	4.13	2.09	1,731
60-64	52.4	3.92	2.01	823
65+	57.3	3.66	1.97	339

Source: *Survey*, Vol. 1, Table 8.

Ideally for a complete analysis we need a tabulation of  $S/Y_d$  according to all the four categories,<sup>14</sup> but the data are given only in a two way tabulation by age and income. However, for every combination of age and income we also have the average number of household members and the average number of earners per household, and this information can

<sup>12</sup> E. g., F. Modigliani and A. Ando, "The Life-Cycle Hypothesis of Saving," *American Economic Review*, Vol. LIII, No. 1, March 1963, pp. 55-84.

<sup>13</sup> As defined in the *Survey*, "household head" is the household member with the highest income and not the nominal head.

<sup>14</sup> For such an analysis, concerning wage differentials, see my "The Effect of Socio-Economic Factors on Wage Differentials in Japanese Manufacturing Industries," *Kikan Riron Keizaigaku* (The Economic Studies Quarterly), Vol. XVII, No. 1, September 1966.

also be taken into account.

The model is as follows:

$$(S/Y_d)_{ij} = M' + A'_i + Y'_j + b_1 H_{ij} + b_2 E_{ij} + U'_{ij}$$

where  $M'$ ,  $A'_i$ ,  $Y'_j$  and  $U'_{ij}$  are as before,  $H_{ij}$ -the average household size and  $E_{ij}$ -the average number of earners for the group of workers belonging to age  $i$  and income strata  $j$ . Again, no linear relation is assumed between the dependent variable  $S/Y_d$  and the variables  $A$  and  $Y$ , but this assumption is made with respect to  $H$  and  $E$ . As before, dummy variables are defined for age and income groups and a regression of  $S/Y_d$  is run on both the dummy and the "real" variables. The results are presented in Table 3.

TABLE 3. ESTIMATES OF AGE, INCOME, HOUSEHOLD SIZE AND NUMBER OF EARNERS EFFECTS (%)

Age	$A_i$	Income (¥)	$M + Y_j$
		10,000- 14,999	-13.05
-24	0	15,000- 19,999	-15.84
25-29	3.02	20,000- 24,999	- 6.87
30-34	3.32	25,000- 29,999	.53
35-39	4.05	30,000- 34,999	4.59
40-44	2.40	35,000- 39,999	6.88
45-49	- .20	40,000- 44,999	6.93
50-54	- .25	45,000- 49,999	9.05
55-59	-2.25	50,000- 59,999	10.24
60-64	-4.24	60,000- 69,999	12.07
65+	1.92	70,000- 79,999	12.41
		80,000- 89,999	12.67
		90,000- 99,999	13.43
		100,000-119,999	16.61
		120,000-139,999	19.89
		140,000-159,999	22.35
		160,000-	29.55

Household size:  $b_1 = -2.897$

Number of earners:  $b_2 = 5.032$

$R^2 = .707$

The inclusion of the two variables, household size and number of earners, does not cause any marked change in the effect of income. Household size has a negative effect on saving and an increase in one household member reduces the saving ratio of the household by approximately 3 percentage points. The reason seems to lie both in the reduced ability to save with a greater family (assuming, of course, the same income) and a reduced desire for certain types of saving (for instance for old age).<sup>15</sup> On the other hand there are some items of saving which tend to increase when the family grows, such as saving for education or

<sup>15</sup> Komiya suggests that in Japan having children is considered a measure to provide for security at old age. See R. Komiya, *op. cit.*, p. 176, Footnote 39.

marriage. It is important to point out that in our study no account is taken of the composition of the household, which may be of considerable importance in its effect on saving.<sup>16</sup> The number of earners is positively correlated with the saving ratio, an increase by one earner causes the saving ratio to rise by 5 percentage points. The reason may well be the reverse relation between the two variables, namely saving being the independent variable and the number of earners the dependent one. This is the case, for example, when wives go to work in order to increase the family's savings. Another psychological reason may lie in the fact that families regard the income of the family's head as the "regular income" to be used for current expenses, while the income of other family members is regarded as an "extra income" to be saved for specific purposes.

In order to get a better idea of the effect of the four factors on the saving ratio I used the data of Table 2 to calculate the contribution of each factor to the saving ratio by age groups, and the results are shown in Table 4 and Chart 2. As mentioned above, no significance should be attached to the absolute level of each variable, which was chosen arbitrarily, but only to the change from one level to another.

TABLE 4. THE EFFECT OF AGE, INCOME, HOUSEHOLD SIZE AND NUMBER OF EARNERS ON THE SAVING RATIO BY AGE GROUPS (%)

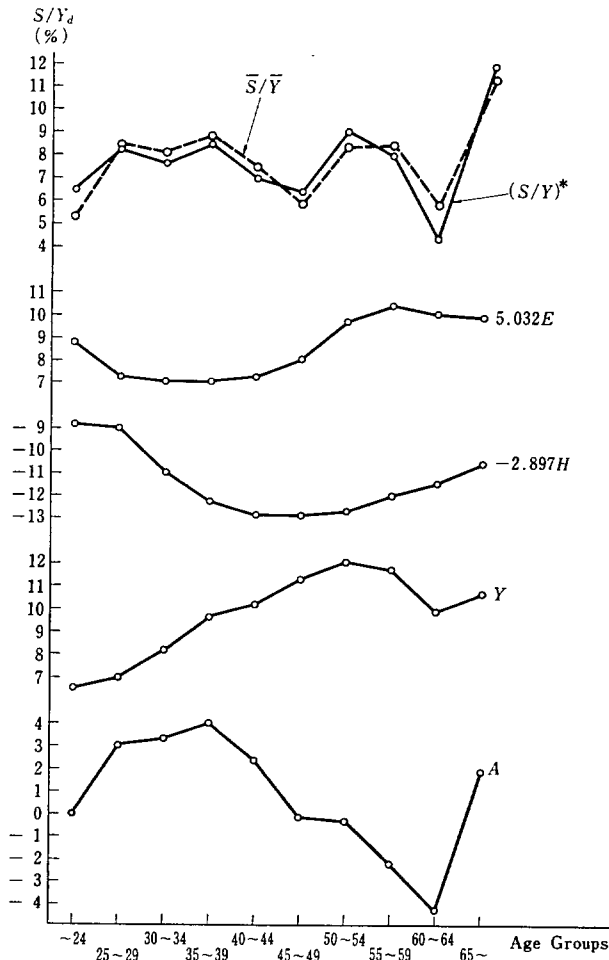
Age	Age Effect	Income Effect	Household Size Effect	No. of Earners Effect	Expected Saving Ratio $(S/Y)^*$ (6) = (2) + (3) + (4) + (5)	Observed Saving Ratio $\bar{S}/\bar{Y}$
(1)	(2)	(3)	(4)	(5)		(7)
-24	0	6.56	- 8.84	8.81	6.53	5.29
25-29	3.02	6.91	- 8.95	7.25	8.23	8.36
30-34	3.32	8.20	-10.98	7.04	7.58	8.21
35-39	4.05	9.72	-12.31	7.10	8.56	8.85
40-44	2.40	10.19	-12.86	7.30	7.03	7.54
45-49	- .20	11.28	-12.89	8.20	6.39	5.98
50-54	- .25	12.16	-12.66	9.76	9.01	8.45
55-59	-2.25	11.76	-11.96	10.52	8.07	8.46
60-64	-4.24	9.82	-11.36	10.11	4.33	5.97
65+	1.92	10.66	-10.60	9.91	11.89	11.35

The difference between the observed and expected values (columns (6) and (7)) can be attributed to three main causes. First, the effect of the error term  $U$ , as is the case in every regression analysis. Secondly, the fact that  $Y$  is given by income strata rather than as a continuous variable, and the income effect is found by extrapolation. Thirdly, the observed saving ratio is not equal to the average of the values used in the regression computations. This is because the ratio of the averages,  $\bar{S}/\bar{Y}$ , is not equal to the average of the ratios,  $\bar{S}/\bar{Y}$ . Considering these points the similarity between the expected and observed values seems surprisingly close.

The effect of income is to increase the saving ratio up to age 50-54 and cause a mild

<sup>16</sup> For a study including this factor see Richard F. Kosobud and James N. Morgan (ed.), *Consumer Behavior of Individual Families over Two and Three Years*, The University of Michigan, 1964, p. 111.

CHART 2. EFFECT OF AGE, INCOME, HOUSEHOLD SIZE AND NUMBER OF EARNERS ON SAVING RATIO BY AGE GROUPS



Source: Table 4.

decline later. The U-shaped household effect has its minimum point at age 45-49, while the change in the number of earners causes a decline in the saving ratio up to age 30-34, an increase to age 55-59 and a very small decrease from there.

The "pure" age effect (after elimination of income, household size and number of earners) increases the saving ratio up to age 35-39 and reduces it to age 60-64. As before there is an unexplained jump at the last age group, but as a rule we find that the "desire to save" of young people is greater than that of the old.