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Saving and Labor Supply Behavior of the Aged Households in Japan

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1. Introduction

It has long been suggested that one of the major causes of the internatioanlly high saving rate of the Japanese households lies in the high saving propensity of the aged households. (Kanamori [1961], Komiya [1963], Shinohara [1963], Mizoguchi [1973], and more recently, Horioka [1984].) As compared with the situation where the aged households dissave or save little, they are contributing substantively to the country's household saving.

Early opinions differed, however, as to why the aged households exibited a high saving rate. Kanamori suggested to interpret this as expressing the strength of the traditional culture and morality. Komiya instead suggested that it reflected the labor market practice of seniority wages giving high earnings to the aged workers, while at the same time, the consumption needs declined as households aged, and furthermore, those aged people who are retired were subsumed by the children's households. Shinohara [1963] suggested an additional interpretation that, since the dispersion in employee earnings between the large-size and the small-size firms increase as workers aged between the large-size firms and the small-size firms, the high saving rate of the elderly reflects the behavior of the high income earners with a higher propensity to save.[1] Komiya's last point implicitly meant that the observed high saving ratio of the elderly was partly an artifact due to the sample selection problem. This possible bias has been emphasized again by

Ando et. al. [1986] and Hayashi [1986], who then jointly took up detailed anatomy of the merged households.

Mizoguchi [1973], just on the eve of the rapid expansion and increase of the public pension coverage and benefits in Japan, suggested that the delay in the full implementation of the public pension system and the concomitant high labor participation rate of the elderly lay as the major reason for the fact. The aspect of labor supply has been taken up by Ishikawa [1987], who, through cross-classification of the micro data, showed that the saving rates, even when income class is controlled for, indeed varied much between the working and non-working households, the latter showing a small degree of financial dissaving.

This paper examines closely the two routes by which the aged individuals affect the overall household saving. First, it extends my previous analysis by presenting a more detailed analysis on the interrelationship between the labor supply and the saving behavior of the independent aged households. Second, it evaluates the degree by which the subsumed elderly people within the young generation's households affect the latter's saving rate. We would then hope to answer to the following questions. Does the declining employment ratio of the aged in Japan reduce the saving rate of this group, and if so, by how much? Does the traditional extended family really acts as a preserver of household saving?

The brief outline of the paper is as follows. Section 2 gives a broad overview of the demographic and economic characteristics, and their time-series changes, of the aged population in Japan and confirms three distinctive characteristics noted above: first, the (internationally) high ratio of the aged persons living in children's or kin's dwelling units; second, their high labor force participation rate, and third, their high propensity to

save.

Section 3 examines a net impact the first characteristic described above have on the saving behavior of the young generations. While there is some evidence that the presence of aged parents reduces the saving rate of the young household as a whole, its negative effect is washed away when we take account of another evidence that the aged parents greatly assist in home-ownership of the young.

Section 4 in turn analyzes the labor supply and saving behavior of the aged population that maintain independent households. By estimating a simultaneous employment probability cum saving equations system, we show that the two decisions are indeed endogenous, that, ceteris paribus, the working households save 13 per cent more than the non-working households as a proportion of non-interest income (evaluated at the mean of income distribution), which together with the high propensity to work, raises the observed average saving rate of this age class. The detected endogeneity, implies, however, that any exogenous shock towards reduction of employment invites an offsetting increase in the saving rate, leaving the saving rate of this class virtually unchanged.

Section 5 gives a summary of the analysis and discusses problems for future inquiry.

2. Characteristics of the Aged Population

According to the 1985 Population Census, there are 12.5 million people aged 65 and over in Japan, and this group constitutes 13.2% of the nation's population aged 15 and over. As the total figures in Table 1 show, this group has been increasing steadily both in absolute and relative terms.[2] Quite a similar picture holds for the number of households. In 1985 there

are 9.3 million households which has at least one member aged 65 and over, and this constitutes just about a quarter of the entire households.

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Table 1 around here
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Table 1 also shows the overtime changes in the classification of household types. (The upper part of the table refers to the number of households falling into each category, while the lower part of the table refers to the number of aged individuals belonging to each category of household.) In 1985, in terms of the numbers of individuals, roughly half of the aged individuals belong to independent generation families (either 'institutionalized', 'single person' or 'independent (core) family'), while the rest of the aged population live with younger generation families (as 'two generations' or 'three generations' families).[3] Although the proportion of the aged people living with their children's families is still (internationally) very high, we observe a clear time trend such that: (i) both single person household and independent (core) family of the aged generation are increasing, and (ii) three generation families are rather rapidly decreasing. In fact, the rates of change in the relative composition of household types that have been observed for the last fifteen years are so steady that, other things being equal, the proportion of independent generation families will outnumber two- and three generation households put together within the coming decade.

Turning to the labor force participation rate of the aged individuals, we observe from the Labor Force Survey that the participation rate for men aged 65 and over was just about 50 percent in 1970, and has been declining since until it reached 37 percent in 1985.[4] (See also Seike [1986] for detailed analysis of the figures.) Still the figure is internationally very

high. In fact, the comparable figures for men aged 65-69 are 65 % for Japan (1980), 28 % for the U. S. (1980) and 17 % for France (1977), while for women aged 65-69 the corresponding figures are 27 % for Japan, 15 % for the U. S. and 9 % for France. (Economic Planning Agency, [1981] Table II-4-5.)

The decline in the labor force participation rate certainly seems to have been influenced by the spread of the public pension system. Table 2, compiled from Ministry of Labor [1981] (which is a report on the special large scale sample survey conducted in 1980 on the employment condition of the aged) shows how individuals aged 65-69 evaluate their own life sources. While detailed response is available only for healthy individuals (constituting 83.3 per cent and 78.9 percent for men and women, respectively), 20.8 per cent of men and 16.5 per cent of women evaluate that they are healthy, living economically independent of their children, and are supported primarily by pension benefits. These numbers are certainly adjusted upwards when we add individuals who are ill but otherwise fall to the same category. This data source has been put to close statistical scrutiny by Motokawa and Mori [1981], Seike [1986], Tachibanaki and Shimono [1985], all showing cross-sectionally statistically significant effect of public pension benefits on labor supply.

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Table 2 around here
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Furthermore, as reported by Seike [1986, pp. 11-12], recipients of a major category of public pension benefits (Rorei-nenkin within the Kosei Nenkin system) increased from roughly half a million people in 1970, two million in 1980 and then three million people in 1984, while, at the same time, the average amount of benefit per recipient (including those receiving reduced benefits because of the earnings test) increased from 14 thousand yen

per month in 1970 to 100 thousand yen per month in 1980, and then to 116 thousand yen per month in 1984. (In real terms this means a three-fold increase between 1970 and 1984.) Since the average monthly consumption level for the aged couples in 1984 is 174 thousand yen (NSFIE, Vol. 7, Table 44), such a benefit level indeed seems to provide an incentive for the recipients to retire from the labor force. Note, however, that the number (3 million) of recipients of that benefit is yet relatively small as compared with the total aged population of the aged of 12.5 million, and this no doubt corresponds to the fact that a large part of the aged population works to earn their living.[5]

The decline in the rate of labor force participation and the concomitant decline in the employment ratio also seems to have been caused by the demand side of the labor market. Although Seike gives a careful remark that the tightness of the job market for the aged, as measured by the job vacancy/job desire ratio, has not changed much for the recent twenty years (with the exception just before the first oil shock), with the ratio hovering around .1, such an observation cannot be viewed as a conclusive evidence that the demand side does not play in the decline of the labor force participation ratio. This is because the job vacancy/job desire ratio measure (that is calculated on the basis of individuals and jobs registered in the public employment offices) does not reflect the existence of the discouraged workers.[6]

Table 3, again compiled from the same Ministry of Labor survey, provides a check as to how large the discouraged workers might possibly be. Among individuals aged 65-69, 16 percent of men and 15 percent of women are not working and yet simultaneously "desiring work". The lower half of the table gives the reasons reported by this group of individuals for not currently

working. About a third is because of illness, and clearly this sub-group is rightly out of the labor force. Among the rest, just about a half of men and a third of women (8.5 percent of the total men and 4.8 percent of the total women, both aged 65-69) states that they are somehow discouraged. It is worth noting that 4.1 per cent of the total men population complains that they cannot utilize their accumulated skill and experience. Unfortunately, we do not know if these "discouraged" individuals for non-health reasons are actually seeking work or not, which is the major criterion for being included or excluded from the labor force statistics. Yet the hypothesis that the aged individuals are increasingly falling into the category of discouraged workers (thus excluded from the labor force) seems to be worth tested further.

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Table 3 around here
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Finally, we note the generally high saving rates of the aged households. According to the 1980 Family Income and Expenditure Survey (FIES), employee households whose head is aged 65 or above have the average propensity to save (out of disposable income) of 13.6 percent. While this is 10 percentage points lower than the peak average propensity to save, shown by households with heads aged 40-44, it is still a far cry from the textbook characterization of the aged people that dissave.[7]

Two-fold criticisms have been mounted to such an observation. First, because of the Statistics Bureau's criterion of identifying the household head as the principal earner of the household, much of the aged persons that are living with their children become hidden in the children's households. Therefore, the possible dissaving of the aged does not show up on the scene. (Komiya [1963].) Second, there is a tendency that the high income or large

wealth holding individuals form independent core families. In fact, Ando et. al. [1986] gives a piece of evidence in that the Probit equation of the aged individual(s) living with their children carries a negative significant coefficient on the wealth level of the aged. These two factors are adduced as giving a serious upward bias to the saving rate of the aged households.

These are valid criticisms. The aged households in the official statistical classification contain independent nuclear families as well as two or three generation families (à la Population Census) whose oldest generation is rich enough to surpass the income of the younger parents (or of the non-married children in the case of old nuclear families). In contrast, households whose head belongs to a younger age class may be nuclear families, or two or three generation families which contain an older generation parent (or parents) who earn(s) less than the younger generation. If we also take account of Ando et. al. [1986]'s and Hayashi-Ando-Ferris [1988]'s evidence that the elderly people that form independent nuclear families are on average more wealthy than similarly aged individuals, then there is an inherent selection bias to render the aged households in the official classification prone to be high income and high saving households.[8]

Unfortunately because of the data deficiencies of FSS that (i) the age of individual household members are not known and therefore independent nuclear families vis-a-vis extended families are not identifiable, (ii) the composition of income earned and assets owned by individual household members are not known, and (iii) single person households are excluded entirely from the sample, we cannot directly evaluate the magnitude of this selection bias and devise ways to avoid them. Whether a randomly chosen elderly individual is saving or dissaving is thus not answerable by our data.[9]

The effect of the elderly population on the overall household saving

can, however, still be analyzed using the official statistical classification of household age groups by separating the problem into two steps; first, evaluate the extent to which the elderly people subsumed in the young generation's household affect the latter's saving behavior as a whole, and second, evaluate the determinants of the saving behavior of the aged households as they appear on the surface of the sample data. There are three basic presumptions for justifying such a research strategy. First, the subsumed elderlies in the young generation household are economically inactive population (who have ceased to be independent economic decision makers), whereas the aged household heads appearing in the data, no matter whether they are living with or not living with children, are economically active population. Second, whether or not a particular elderly person or couple is economically inactive (subsumed) is determined by non-economic factors such as condition of health, death of a spouse, and closeness of personal affection between the members of different generations. Third, the variables we consider as determinants of saving, in particular, the employment status and the factors which in turn determine that status (which is the focus of our study below) involve household choices that occur strictly within the realm of the economically active status. Thus whether a household head chooses to be employed or retired is unrelated with his or her becoming subsumed in the children's household.

To the extent that the second assumption does not stricltly hold in reality so that economic factors actually influence the probability of the elderly becoming economically inactive, our research leaves some room of bias in the analysis of each step.[10] Yet in view of our chosen focus, not to answer whether the elderly is saving or dissaving per se, but to explain the sources of variations in the saving behavior among the economically active

elderly population, the validity of the analysis depends more on the less questionable third assumption. Therefore, as a first approximation we shall conduct the following analysis by ignoring the above possible bias, and then leave the analysis of its impact for a future occasion with a richer set of data.

The following section deals with the effect of the subsumed aged parent(s) on the young age headed household's saving rate. The analysis of the economically active elderly is relegated to Section 4.

3. The Effect of the Presence of the Elderlies on the Saving Behavior of the Young Age Headed Households

Available data limitations restrict us to use two kinds of cross tabulated tables in the 1984 NSFIE. The samples are for employees (excluding corporate managers) only. The first table cross-classifies households by the household head's age, by who is working in the household (WKSPOUSE=1 if spouse is working, =0 if not; WKOTHERS=1 if member other than spouse is working, =0 if not), and by the presence of children and the aged members (CHILDREN=1 if children are present, =0 if not; PARENT=1 if the aged parent(s) are present, =0 if not). The second table, on the other hand, cross classifies households by the income level (DY)[11], by the homeownership status (HOME=1, if owner, =0 if renter, and in addition, DETACHED=1 if owner of an independently detached house, = 0 if not), and by the presence of children and the aged members (CHILDREN and PARENT defined above).

The result of the weighted OLS regressions of the average saving propensity on these dummy variables is shown in Tables 4 and 5. Table 4 shows that the supposed negative effect of the presence of the aged parents on the saving of the household increases as the age of the household head rises (for

the age group 50-59, the effect is to lower the saving ratio by 1.9%), but that the effect is hardly statistically significant.

Table 5 is more informative. When we control the house ownership status (HOME and DETACHED), in addition to income (DY), a statistically significant negative effect appears. Thus the presence of the aged parents amounts to lowering the saving rate by 1.5 to 1.7 percent in net after the specified controls (see regressions (3) and (4)).

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Tables 4 and 5 around here
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It may not be appropriate, however, to evaluate its effect under the control of the homeownership status. For it is often suggested that the parents living together with a child's family offer their own house to live. Actually 92.9 percent of the households with parents living together (i.e., for which PARENT=1) in the sample hold an independently detached house, while only 53.4 percent of the nuclear households (i.e., PARENT=0) hold an independently detached house.[12] A more direct evidence is given by regressions (5) through (7) that take the net financial asset/(monthly) disposable income ratio (NFAY) as the dependent variable. As can be seen from regression (5) (and also from regressions (6) and (7)) NFAY decreases significantly for owner-dweller households (note also that ownership of an independently detached house recovers about two-thirds of this negative effect), and we can easily allude to (i) the substitution of real assets for financial assets, and/or (ii) the incurrence of financial debt, as the likely causes. However, regressions (6) and (7) reveal that the presence of the aged parents significantly offsets this decrease . Moreover, the fact that the estimated coefficient on PARENT x DETACHED in (7) is larger than that on PARENT in (6) with virtually no changes in the coefficients of the other variables indicates

that the effect of the presence of the aged parents occurs in combination with homeownership, or more specifically, the independently detached house ownership. A natural interpretation of this is that the effect in question arises because parents provide the house (or the detached house), thereby alleviating the financial burden of house-ownership for the child's household. Indeed the sum of the coefficients on DETACHED and PARENT x DETACHED in (7) almost completely offsets the coefficient on HOME.

Thus it would be a significant over-estimate of the negative effect of the presence of parents on saving to believe in the figures of -1.5 to -1.7 percent obtained in regressions (3) and (4). The polar alternative of excluding the controls on household ownership altogether (regression (1)) suggests that this effect is completely zero. While the truth must lie somewhere in between, it is most likely that the effect is nil and statistically insignificant.

All the foregoing discussions based on Tables 4 and 5, however, is subject to the qualification that all the relevant explanatory factors on saving are effectively controlled, whose validity is surely to be questioned. Notice that the age and the size of the working members in the household, which have been controlled in obtaining Table 4, are not controlled in obtaining Table 5, and conversely, that the income and homeownership status, which have been controlled in obtaining Table 5, are not controlled in obtaining Table 4. While the final resolution must await the future availability of the original micro data, we may note that (i) the bias arising from not controlling for homeownership is very small, as argued in the previous paragraph, and that (ii) the age and the size of the working members are significantly correlated with the income for worker households, thus making the bias arising from not controlling for these variables probably very small. In short, we expect our discussion to survive through

the expansion of the set of explanatory variables.

Our tentative conclusion is thus as follows. The presence of the aged parents does not affect the saving rate of the younger generation households that accommodates them. The primary reason appears to be that the parents tend to provide the young with a house (and more likely an independently detached house) to live, which offsets the otherwise negative effect (estimated at around -1.5 to -1.7 percent) on the merged household's saving.

4. A Simultaneous Equations Model of the Employment and Saving Behavior of the Aged Households

In my previous work (Ishikawa [1987]), I have made a cross-tabulation analysis of the saving propensity of the (economically active) aged households using the FSS micro data (for the period 1976-84). Its main finding is that, even controlling for income (i.e., two year average of disposable income), the saving rate is greatly affected by the presence of a working elderly in the family. Households with no working members on average save very little and financially dissave (albeit at a small rate), while those with working members continually save at a relatively high rate. (See footnote 7 for numbers.)

Theoretically the most well-known hypothesis that links the high employment rate to the high saving rate of the households is the proto-type life cycle saving hypothesis. Within that framework the employment period and the saving period are equated a priori, and the retirement from work immediately means the start of asset decumulation. Obviously, therefore, the more delayed the retirement is, the higher the average saving rate of households above any specified age becomes. But then the question simply reduces to explanation of delayed retirement for Japanese households. (Recall Mizoguchi

[1973]'s argument noted earlier that the high employment ratio among the elderly associated with the low public pension benefit levels was the major reason for their high saving rate.) Furthermore it would easily lead to the prediction that the ongoing decline in the labor force participation rate would bring about a decrease in the saving rate of the elderly (although it may simultaneously invite a greater effort at saving for the younger aged households.)

Once we allow for the existence of a precautionary motive and/or a bequest motive besides the basic consumption smoothing motive, however, there is no necessity that the employment period is identical with the saving period.[13] Employment and saving would both serve to the same ends. In such a circumstance, the decline in the employment ratio, or equivalently, the tendency for earlier retirement, may not necessarily lower the saving rate of the aged households. To anticipate our conclusion, this is indeed the picture that we obtain from our data.

In order to examine the possible interaction between the employment and the saving behavior of the household, we shall estimate a simultaneous equations model, consisting of a Probit equation explaining the 1-0 choice of employment by the household head, and the saving ratio equation which includes this qualitative dummy variable as a jointly endogenous variable. Using this model, we wish to see:

(a) to what extent the actual degree of labor supply by the elderly contributes to the saving rate of the aged households as a whole?
(b) if employment is endogenous in explaining the saving propensity, or if it is truly exogenous, and
(c) to what extent is the future saving behavior of the aged affected in the advent of various institutional changes regarding the support for the elderly, e.g., changes in social security institutions.

The Model

The model we consider is expressed by the following.

$$DLP^*_i = Z_i\gamma - u_i \tag{1}$$

$$S_i = X_i\beta + DLP_i \cdot \alpha + v_i \tag{2}$$

$$DLP_i = 1 \quad \text{if } DLP^*_i \geq 0$$

$$= 0 \quad \text{if } DLP^*_i < 0 \tag{3}$$

The subscript i refers to each household (i = 1, ... , N). DLP^*_i measures the potential labor supply pressure of the household. Although DLP^*_i is not directly observable, we interpret the ex post observation that the household is actually employed (namely $DLP_i = 1$) to have arisen because the potential pressure has surpassed a certain threshold value, which is chosen here to be 0. As seen from (1), $DLP^*_i \geq 0$ is equivalent to $Z_i\gamma \geq u_i$. Z_i is a vector of the observable explanatory variables, while u_i is the unobservable disturbance (error) term. S_i is the total saving rate as defined by the sum of financial saving and real saving (mainly housing investment) divided by the disposable income, (X_i, DLP_i) is the vector of explanatory variables, and v_i is the unobservable error term. The contents of the vectors Z_i and X_i are specified later.

As for the error terms (u_i, v_i) we suppose that they are independent for each i, and that they follow an identical joint normal distribution:

$$(u_i, v_i) \sim N[(0,0), \Sigma]$$

where

$$\Sigma = \begin{bmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{bmatrix} \tag{4}.$$

We also suppose that the explanatory variables (X_i, Z_i) are statistically independent of (u_i, v_i). As usual with the standard Probit analysis, the

variance of u_i is normalized to 1. ρ is the correlation coefficient between u_i and v_i. As is easily seen from (1) - (3), any joint endogeneity between S_i and DLP_i is reflected in the correlation between these error terms. On the other hand, $\rho = 0$ implies that (so long as X_i is independent of v_i) DLP_i is independent of v_i, and hence, it is exogenous in the explanation of S_i.

Our strategic concern in the estimation is the coefficients α and ρ. Because we allow the error terms to be mutually correlated, the entire model (1)-(3) is e the assumption (4) in obtaining the maximum likelihood estimate for the coefficient vector $(\alpha, \beta, \gamma, \rho, \sigma^2)$. We shall not go into the detail of the methodology, but rather satisfy ourselves by writing down the concentrated log-likelihood function that can be derived as follows:

$$\begin{aligned}
&\log L(\alpha, \beta, \gamma, \rho, \sigma) \\
&= -\frac{N}{2}\{\log(2\pi + 1)\} - N \log \sigma \\
&\quad + \sum_{i=1}^{N} \Big\{ DLP_i \cdot \log \Phi\Big(\frac{Z_i\gamma}{\sqrt{1-\rho^2}} - \frac{\eta}{\sigma^2} v_i \Big) \\
&\qquad + (1 - DLP_i) \cdot \log \Big[1 - \Phi\Big(\frac{Z_i\gamma}{\sqrt{1-\rho^2}} - \frac{\eta}{\sigma^2} v_i \Big)\Big] \Big\}
\end{aligned}$$

where

$$\eta = \frac{\rho\sigma}{\sqrt{1-\rho^2}}, \qquad v_i = S_i - X_i\beta - DLP_i \cdot \alpha$$

and $\Phi(\cdot)$ expresses the cumulative distribution function of a standardized normal variable. We employed an iterative optimization procedure in obtaining the actual estimates.[15] A similar model has been developed by Lee and Trost [1978] in a slightly more general context of the switching regression models and has been applied to the estimation of the household's choice of owner-renter housing tenure choice. Our model is formally a special case of that model.

Data

The database for our study is the six reinterview sets of the Family Saving Survey (FSS) micro data for 1976-77, 1979-80 through 1983-84, obtained by formal permission from the Statistics Bureau. Each household in the sample was interviewed at the end of each year for two consecutive years. In our study the flow variables such as disposable income (YAVR), disposable non-interest income (WAVR) and saving (SAVR) refer to the two year average of real quantities. All the household attributes (see Table 6 below) in addition to the employment status (DLP) refer to those of the second year. All the stock variables, the financial asset (FA), the financial debt (FD) and the net financial asset (NFA = FA - FD), refer to the real value at the end of the first year. All the real values refer to the respective nominal values deflated by the consumption price index (that is normalized as 1 in 1980). The variable S_i appearing in (2) is calculated as $SAVR_i/YAVR_i$. By employing the two-year average magnitudes we expect that some part of each household's year to year variations in flow variables is eliminated. (Nevertheless the remaining variations in the saving rate among households still appears to be large.)

Our samples are restricted to those with the household head (= major earner) aged 65 and over. That the head is working, $DLP_i = 1$ (not working, $DLP_i=0$) is judged by the size of the working member being greater than zero (equal to zero, respectively). We do not distinguish between the workers and the self-employeds.[16]

The most major defect of the data for our present purpose is that it does not have any direct information on the pension benefit receipts of each household. Of course, because our sample periods extend over many years,

some portion of the variations, in particular, over-time variations in the number of recipients as well as the individual benefit levels get reflected in the data. Time variations may be picked up by dummy variables, D80 (=1 for 1979-80 samples) through D84 (=1 for 1983-84 samples), but the remaining individual variation must be pushed to the error term u_i, and thus leave some interpretative ambiguity unresolved.

Much imputation work was necessary in order to make this data set usable for our purpose. It is briefly explained in the Appendix. All sample data are pooled in the estimation task except for allowing yearly shifts in the constant term of the employment probability equation. The average characteristics of the sample households are summarized in Table 6 below.

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Table 6 around here
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Specification of Explanatory Variables

In view of the available data, we have chosen the vector Z in the Probit equation to consist of

Z = [1, METRO, SIZE, HOME, AGE, SQAGE, FA, FD, Yearly Dummies (D80, D81, D82, D83, D84)],

where all variables other than those previously defined and SQAGE (= AGE squared) are explained in Table 6. In contrast to the previous studies addressed to the employment behavior of the aged individuals (references given below), the important variables missing from the above list are the amount of pension benefits received and the condition of health, which are repeatedly found to be significant explanatory variables. The potential market wage offered to the household head is desirable, yet ignored here because no information on the head's past employment history nor on schooling are available. All these variables are thus pushed into the individual error term u_i.

Among these non-observable variables, perhaps the most troublesome is the amount of pension benefits. Although, as previously noted, a part of the total variation is expected to be caught by the yearly dummies, the remaining variations among individual households may not be statistically independent of the variables in Z. In particular, these individual variations are likely to be positively correlated with the amount of financial asset (FA), for the variable portion of the benefit depends on the earnings level and the length of job tenure at the time of retirement, and we observe among households a positive correlation between annual earnings and accumulated financial assets. The qualification of this argument is that it is based on the presumption that households do not substitute expected pension wealth for non-pension financial wealth. In fact, the time-series and crosssection evidence of this substitution effect is at best very weak (see Sasaki and Tachibanaki [1985] and references therein[17]) and we can safely ignore it. In any case, we must exercise care in interpreting the coefficient of FA.

The aged households in our sample on average saved 9.7 per cent of their disposable income, its composition being 7.2 percent for financial saving and 2.5 percent for real (mostly housing) saving. While explanation of the composition of saving is also an interesting subject for study, the results for estimating the same model with the financial saving rate as the dependent variable generally go parallel with those for the total saving rate, and hence are omitted from this paper.

As for the explanatory vector X in the saving rate equation, we take:

$$X = [1, \text{SIZE}, \text{HOME}, \text{METHOME}, \text{AGE}, \text{NFAY}, 1/\text{YAVR}].$$

In this list, 1/YAVR corresponds to the constant term in the customary linear savings function. NFAY is defined as NFA (= FA-FD) divided by YAVR.

Estimation Result (1): Determinants of Employment Status

The result of estimating equations (1)-(3) simultaneously is given in Table 7. (Note that Rho and Sigma in the table mean the coefficients ρ and σ, respectively.)[18] The table gives estimates for two versions; one in which equation (2) excludes NFAY (Model I), and another in which the same equation includes NFAY (Model II). So long as the estimated coefficients of the employment equation are concerned (i.e., the portion above the dotted horizontal line in Table 7, and similarly for Table 8 below), there is virtually no change between the two versions. With the exception of those for DOWNR and for earlier yearly dummies (D80, D81 and D82), the estimated coefficients are all statistically significant (at least) at 5 % level.

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Table 7 around here
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Our result conforms well with the previous studies. (Motokawa and Mori [1981], Seike [1982], Tachibanaki and Shimono [1985], all based on the same micro data set of the Ministry of Labor survey [1981]). The fact that AGE has a negative coefficient and that SIZE and FD both have positive coefficients requires little explanation. The positive coefficient on METRO is perhaps most naturally construed as reflecting the existence of larger opportunities for work in major metropolitan areas. Increasingly large negative coefficients on yearly dummies are consistent with the existence of the declining time trend in the labor force participation rate among the aged people discussed earlier (and whose major reason might very well be the increased public pension benefits in recent years).

Most notably, our result confirms the property found in previous studies in that the level of financial asset (FA) is associated positively with the employment probability. Previously such an association was found even after

explicitly taking account of the negative impact of the public pension benefits. (See Motokawa and Mori [p. 12, Figure 6 and p. 13, Table 4], Tachibanaki and Shimono [p. 245, Table 5], Seike [p. 20, Table 2].) Given our supposition stated earlier that the financial asset holding and the public pension benefit is positively correlated, our own estimate must be understating this positive impact.[19]

In any case, this positive association requires an interpretation. The only interpretation so far attempted to this finding is that of Seike [1982, p. 22]. He referred to the Greenberg and Kosters study of the negative income tax experiment in suggesting that the positive coefficient may be a reflection of the differences in the preference fields among households concerning financial accumulation (or simply put, differences in the accumulation motive). Namely, comparing among households with similar income, highly "accumulation motivated" households are more likely already to have accumulated a larger financial asset, on the one hand, and they are naturally prone to supply more labor, on the other. (Cf. Greenberg and Kosters [1973, p. 20 and pp. 30-35]) It should be noted that Seike merely suggested this as a plausible hypothesis; he has yet to verify it against the data. Although a rigorous empirical testing of the above hypothesis requires data of each household's employment and earnings history, which is beyond our reach, we shall attempt a tentative evaluation of it and, at the same time, suggest an alternative interpretation to this hypothesis. For our convenience, let us call the hypothesis the "motivational difference" hypothesis.

Estimation Result (2): The Saving Behavior of the Aged Households

The estimated coefficients for the saving rate equation can be read off from the lower part of Table 7. There are two reasons why we estimated two versions, one without NFAY (Model I) and another with NFAY (Model II).

First, it would facilitate a provisional test of the "motivational difference" hypothesis. Second, it shows whether or not the saving rate depends, in addition to the income level, on the composition of income or the wealth level itself.

We start by discussing the first. Suppose motivational differences for accumulation lie at the heart of the differences in the employment probability that remain even after various household attributes are controlled for. Since NFAY coupled with controls on the income level, ownership of real wealth (HOME and METHOME), and other household attributes becomes a proxy variable for the strength of accumulation motive, we should expect the following for the coefficients of Model I and Model II. (i) The estimate of α for Model I is positive, while that of α for Model II diminishes, if not to zero; (ii) the estimated coefficient for NFAY for Model II must be positive.

When we look at Table 7, we find that (i) is satisfied. In fact, α for Model I is .137 and is statistically significantly different (at 1 % level) from zero, but once we add NFAY to the equation, α is reduced to .0909 and loses statistical significance. On the other hand, (ii) does not hold. The estimated coefficient on NFAY (for Model II) becomes -.0142 and is statistically significant at 1 % level. Hence, we conclude provisionally that the motivational difference hypothesis is not supported by our data. In the following, we shall assume that, once the income level are controlled for, not much difference in the accumulation motive remains among the aged households.[20]

We turn now to the second question. The result that the saving rate depends on NFAY suggests that the saving behavior might depend not only on total disposable income, but also on the composition of income between the earned income and the interest income. But if this is indeed the case, then

our equation (2) cannot be judged the appropriate model to evaluate the effect of the employment behavior on saving. Hence we try a slightly different form of equation (2):

$$S_i = X_i\beta + DLP_i \cdot (WAVR_i/YAVR_i) \cdot \alpha' + v_i \qquad (5)$$

where $WAVR_i/YAVR_i$ expresses the proportion of non-interest (disposable) income in the total (disposable) income. We thus suppose that employment affects saving to the extent that it raises the non-interest component of the income. The meaning of this modification is perhaps more easily understood by rewriting (5) as follows. By summarizing the term $X_i\beta$ by δ_i, and using the identity $1 = (WAVR_i/YAVR_i) + (PAVR_i/YAVR_i)$, where $PAVR_i$ denotes (after tax) interest income, we obtain:

$$S_i = (\delta_i + \alpha' \cdot DLP_i)(WAVR_i/YAVR_i) + \delta_i(PAVR_i/YAVR_i) \qquad (5').$$

Effectively we are assuming that the saving propensity from the non-interest income depends on whether $WAVR_i$ is, in fact, obtained by employment or obtained from non-employment sources (mainly pension benefits). (Note that in our data, $PAVR_i$ is directly observable, while $WAVR_i$ is obtained as a residual from $YAVR_i$.) In the former case, the saving propensity becomes $\delta_i + \alpha'$, while in the latter case it is δ_i. Of course, were we to have direct observation on pension benefits, a more refined formulation (that separates $WAVR_i$ into the true earnings component and the pension benefit component) would become meaningful. However, given the data limitation, we regard (5′) as a first order approximation. This approximation, however, is buttressed somewhat by the institutional datum of the presence of the earnings test in obtaining qualification for actually receiving benefits. (Its empirical importance has been attested by Seike [1982]).

The result of simultaneously estimating the new system (1),(5) and (3) is reported in Table 8. Again two versions, one without NFAY (Model III),

and another with NFAY (Model IV) are given. The coefficients for the employment equation are virtually unchanged as compared with the previous table. The most important result concerning the saving equation is that, even for the case where NFAY is included (i.e., Model IV), the coefficient α' (of DLP_i) maintains a statistically significant (at 1 % level) positive value. ρ also assumes a statistically significant (again at 1 % level) positive value, the point estimate being .20 for Model III and .13 for Model IV. This is a clear evidence that employment status variable acts as an endogenous variable in the determination of the saving behavior, which facilitates our answer to the query (b) raised in the beginning of this section. For other coefficients, the estimates do not vary much between Model III and Model IV. The coefficient on NFAY itself takes, even under the new formulation, a statistically significant negative value of -.011.

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Table 8 around here
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All variables but HOME and METHOME are statistically significant. (While the ownership of a house tends to raise the saving rate, its effect is not statistically significant.) The feature that the size of the household (SIZE) diminishes the saving rate is common for all age groups, and obviously, it represents the increase in living needs. The positive coefficient on AGE is somewhat surprising (especially vis-à-vis the pure life-cycle hypothesis), yet it is also most naturally explained by the fact that living needs decline with the proceeding of age. (Note here that in Japan, direct medical bills for individuals aged 70 and above are heavily aided by the social security system.) The small but negative coefficient on NFAY seems to suggest that households have some accumulation target in mind, rather than pursuing indefinite accumulation.

Based on the estimates of Model IV let us evaluate how much difference in the saving rate it makes between the households that work and those that don't. If we employ the sample average figures (for the dummy variables, the proportion of households that take the value 1) given in Table 6, the average δ_i becomes 4.1 percent, while the avearage value of $\alpha'(WAVR_i/YAVR_i)$ becomes 13.0 percent. Hence, evaluated on the basis of average household characteristics and the mean level of the income distribution, the average saving propensity for the non-working households is 4.1 percent, and that for the working households is 17.1 percent, with 13.0 percent difference between them. This is the contribution of employment per se, which facilitates our answer to the query (a). (Actually, however, the average income is lower for the non-working household, which is why they save very little [around 1.5 %] and financially dissave on average as noted earlier.)

In sum, employment raises household saving because the preference of households, shown (though tentatively) to be relatively homogeneous in nature, is structured in such a way that households treat employment earnings as a source of continued accumulation up till a certain level. The reason why Japanese households exibit such a preference must be explained on much deeper cultural grounds, but we can speculate that it might further be traced to the precautionary and/or bequest motive discussed in the opening part of the present section.

The Employment Behavior Again, and Some General Implications

How are we, then, to interpret the positive coefficient on the financial asset (FA) variable in the employment probability equation? We have previously noted that, within the confines of the present data, the motivational difference hypothesis is not positively confirmed. A natural

alternative, it seems to me, is to suppose that the level of financial asset (besides the METRO variable noted earlier) acts as a proxy for the household's accessibility to the employment opportunity. For, as we discussed in Section 2, the employment status of the aged individuals seems to depend equally as much on the demand side of the labor market as their own voluntary choice. And given the highly stratified labor market according to firm sizes and occupations, with large-sized firms and professional occupations having advantage not merely in terms of earnings levels throughout the employment tenure but also in locating employment opportunity after the mandatory retirement (which may not arise, of course, in the case of professional occupations), it is easily expected that the accumulated financial asset and employment probability are positively correlated, even under homogeneous preference structure. (We may regard Shinohara [1963]'s point to be echoed here.)

Our result shows that the aged households that are able to secure employment continue to save on average nearly four times as much as those households that are not employed. Although the resulting gap in the wealth level does not widen indefinitely, due to the decelerating factor we found (i.e., the negative coefficient on NFAY), and also due to the ultimate death of the household head, still a significant amount of gap arises in terms of bequeathable wealth to children among households. Inequality of wealth arising from the inequality in the employment opportunity for the aged is then transmitted over generations.

Second, let us return to the fact of the declining labor force participation rate. In terms of this trend, Japan is no exception among the developed countries. Although our own data cannot verify it directly, there are sufficient evidence from the past studies (referred to earlier) that the

recent increase in the public pension benefits, and the institutional earnings limitations in obtaining qualification for such benefits lie as a major factor explaining this trend. We have also discussed the imminent and growing difficulty on the part of the elderly to secure agreeable employment opportunities.

If these environmental changes are purely exogenous shocks, then we can employ our estimated model in predicting their effect on the saving rate of the aged households. Let us conduct a simple simulation experiment. Starting from the present employment rate (67 % for our sample), what happens to the saving rate when the exogenous shocks lower the employment rate by 10 percent or by 20 percent? (We assume there are no other changes in the observable exogenous variables such as household attributes.) The extent of the shocks can be evaluated as an upward shift in the mean value of the (marginal) distribution of u_i. Denote this by Δu. By reading off numbers from the cumulative normal distribution table the magnitude of Δu that changes the employment ratio from 67 % to 57 % or from 67 % to 47 % is obtained as .264 or .515, respectively. The effect on the saving rate is evaluated as the sum of (i) the <u>direct</u> effect of the change in the employment ratio as expressed by the term $(\alpha' \cdot (WAVR/YAVR) \cdot \Delta DLP)$ in (5), and (ii) the <u>indirect</u> effect that arises from the existence of a positive correlation between u_i and v_i. Table 9 shows the magnitudes of direct and indirect effects as calculated on the basis of our Model IV estimates. We observe that the two components almost exactly cancel each other, leaving the net effect on saving virtually zero. Hence, so long as the shocks on employment behavior are purely exogenous, they do not affect the saving rate at all.

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Table 9 around here
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While the above experiment is quite informative in that the current saving behavior of the aged households is very robust, we must exercise care in regarding the kind of institutional changes that we noted above as truly exogenous shocks. For major changes in the social security institutions are likely to affect their status of being economically active or inactive (to live independently or become subsumed in the children's households), in which case (as discussed at the end of Section 2) the coefficients of the saving propensity equation themselves would probably change. Such a consideration requires us to go beyond the maintained assumption of the present paper that the choice of the activeness status of the elderly is largely exogenous.

Perhaps a more apt interpretation of the above simulation exercise and, at the same time, of the meaning of the positive correlation between the error terms u_i and v_i lie in the following hypothesis that links the demand side of the labor market and the saving behavior; that the strong precautionary and/or bequest motives that govern the aged households at the root make the employment opportunity and the additional effort at saving to serve as substitutes in meeting these motives. Thus when employment is inadvertently cut back, one raises the saving propensity to compensate for the loss from the former. In fact, even though the public pension coverage and benefits have improved, those who can obtain sufficient benefits are fairly limited, and the risk of uncertain lifetime remains a major factor of concern. In addition, for those who desire to leave a moderate bequest, increased pension wealth may not constitute reason for reducing their personal saving activity. Rigorous testing of such an interpretation, which certainly requires a richer data set which at least includes pension benefits received by the aged households, is left for a future study.

5. Concluding Remarks

What is the impact of the elderly on the overall saving rate of Japanese households? We have approached the problem by dividing the elderly population into those who maintain an economically active status (including those that form independent nuclear households and those who live with children and yet earn high income) and those who are subsumed in the children's household and have become economically inactive.

For the former category of individuals, we have observed that under the control of the household income (and evaluated at the mean of the income distribution) there is a difference of about 13 percent in the propensity to save that is attributable to employment, and this difference supplies the leverage by which the internationally high labor force participation (and employment) ratio of the Japanese aged people can be translated into the high household saving rate. We must be cautious in making a simple calculation, however. This is because we have also observed that the employment behavior is endogenous in the determination of the saving behavior; more specifically, any exogenous shock that generates 10-20 percent decline in the employment ratio from the current level tends, at the same time, to generate an offsetting increase in the household saving behavior, leading to almost no change in the saving rate. (Cf. Table 9). Thus ultimately the cause of the high saving rate among the elderly (whose fact itself has been noted for more than 25 years) does not lie in the high employment ratio itself, but must be sought elsewhere. While we have hinted that a high precautionary motive and a high bequest motive probably play the major role, such an idea is yet no more than a speculation. We should obtain more mileage in locating this cause if we were able to analyze the source of the above endogeneity, but such a task must await the availability of a richer data.

For the second category of the aged individuals, we have tried to evaluate the effect of their presence on the young generation household's saving behavior. Although our analysis that is based on limited cross classified tables cannot be regarded as a conclusive one, we have arrived at a provisional conclusion that the presence of parents do not increase nor decrease the young generation household's saving rate. To be sure, we have found that when homeownership (in addition to income and the presence of children) is controlled for, their presence decreases the young generation's saving rate by 1.5-1.7 %, but at the same time we have also found that homeownership by the young generation is greatly aided (if not outrightly provided) by their aged parents. Therefore, when we take account of this latter effect, the total effect becomes nil. The 'family social security' system is thus quite an economical system in terms of preserving aggregate household saving.

As far as the overall household saving rate is concerned perhaps the most important problem that remains to be studied is the impact of changes in the social security system on the choice of living form by the aged (i.e., whether to 'live independently' or to 'live together'), in other words, how much it substitutes for the 'family' social security system. Another important subject is the problem of intertemporal substitutability, which, of course, lies at the heart of the neo-classical decision theory. So long as we admit some length for a planning horizon (if not life-long as the proto-type life-cycle hypothesis supposes), it becomes difficult to maintain that the saving behavior of the economically active elderly households can be studied independently of the saving behavior of the younger aged households. These topics (together with the investigation of single person households) are left for future studies.

Appendix

We summarize the procedure by which the original Family Saving Survey micro data have been put to use in our estimation.[21]

1. Because the original data contain total annual before-tax income (called "annual income") as the sole information on the household income, we have used other information in decomposing earnings and asset (interest) income, and in estimating tax and social security contribution payments. (a) The asset income is estimated by utilizing the information of each household's componentwise financial assets (e.g., various bank and postal saving deposits, bonds, shares) holding at the beginning of each year, multiplying by corresponding rates of interest and return obtained from various sources of financial statistics, and then summing them altogether. (b) Before tax earnings (= non-interest income) are then calculated as a residual.[22] (c) Taxes on earnings are estimated by using the information on household size in calculating the tax base and then applying the tax tables of each year, separately for national and local taxes, and then summing them up. A proviso is that for self-employeds households, the actual taxable income (actually grasped by the tax authorities) is assumed to be 70 percent of the true taxable income on the basis of the studies by Ishi [1981] and Homma, Ihori, Atoda and Murayama [1984]. (d) Taxes on interest income are estimated on the assumption that (i) Postal and Zaikei (tax-exempt contract saving plans for salaried workers) savings escape taxes completely; (ii) Maruyu system (Tax exempted small-amount deposit and government debt holding) is used to its upper limit; (iii) taxes on securities generate on the part of the household a choice of the comprehensive income tax (Sogo Kazei) or the separate tax at the source (Gensen Bunri Kazei), and we have estimated them by supposing that the households are rational tax averters (whose concrete calculations followed the descriptions of Zeikin Dokuhon (Tax Reader) published by Daiwa Securities Ltd). (e) Finally, social security contribution and property taxes have been estimated by the relationship between the amount of contribution and annual income, and the data of property taxes paid by residential locations as reported by FIES (each year).

2. The estimated tax figures are then subtracted from before-tax income figures in obtaining disposable income, after-tax earnings (non-interest income), after-tax interest income.

3. The amount of saving is defined as financial saving and real investment. Financial saving is calculated by, obtaining, for each asset (and debt) item, the difference between the holding at the end of the year and that at the beginning of the year (or for items for which flow transactions during the year are reported, the net increment), and then summing up the differences. Note that FSS includes life-insurances that has the character of saving as a category of financial asset, while it excludes cash. The changes in cash holding have thus been ignored. For the second year as well as the first the financial asset holdings at the beginning of the year mean those as recalled by households at the end of the year, which admittedly contain memory errors.

4. From the original samples, we have deleted incomplete samples, and also excluded those households whose estimated consumption level (= disposable income - total saving) is less than 10 thousand yen, or whose reported total financial asset (and debt) figures between the two years (namely that at the end of the first year and that at the beginning of the second year as recalled at the end of the second year) differ substantially. The resulting sample size has become 1386.

5. We have diverted from the Statistics Bureau's practice by including the corporate managers in the group of workers.

6. All nominal figures are deflated by the consumption price index which sets 1980 as unity.

Footnotes

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1. Both of these suggestions are echoed in our interpretation of the estimated simultaneous equations model given in Section 4 below.

2. According to the Institute of Population Studies (Ministry of Welfare) projection, this relative size of this age group continues to grow at least for another thirty years. See Office of the Prime Minister [1979, p. 25, Table 1-2-1).

3. In the Population Census household types are classified by first

identifying the youngest couples in the household and then observe the kin relationship around them. This is to be contrasted with the practice throughout the consumption and saving surveys of the Statistic Bureau (FIES, FSS and NSFIE) that households are classified by age groups by identifying the principal earner of the household as the head (no matter he/she is young or old) and then classify households by the head's age.

4. The aged individuals are relatively more heavily present in the 'Agricultural', 'Mixed (agricultural and non-agricultural)' and 'Not Working' sectors. In fact, in 1985, every other household of these sectors includes at least one aged member, while the same probability for the 'Non-Agricultural' households is only 19 percent. Because of the small and still declining size of the 'Agricultural' and 'Mixed' sectors, however, these two sectors take up only 20 percent of the entire (non-institutionalized) aged individuals. At the same time, 23 percent of the aged individuals belong to the 'Not Working' households, which is a large increase since 1970. (All the figures above are from the Population Census.)

5. Another major category of the public pension system, Kokumin Nenkin, currently pays out the benefit of only about 50 thousand yen per recipient.

6. The official unemployment rate figures for men aged 65 and above (according to the Labor Force Survey, various years) exibit a picture similar to the job vacancy /job desire ratio figures. In fact, they are relatively constant at around 2% since the compilation of the unemployment rate figures for that specific age group began in 1975. For the age class 55-64, it has increased from 3.2% in 1975 to 5.2% in 1986. (For the age class over 55, for which we have figures from 1970, the unemployment rate has increased from 1.4% in 1970 to 4.2% in 1986, whereas the same rate for the age class 40-54 increased only slightly during the period in question, namely from .9% to 1.7%.) Why does there exist a sudden drop in the unemployment rate between the age class 55-64 and the age class 65 and over remains a puzzle. However, it is natural to interpret the significant rise of the unemployment rate for the age class 55-64 as a symptom indicating that the labor market for the elderly (i.e., those aged 65 and over) has increasingly become tight, in spite of the apparently stable and low unemployment figures for the same group noted above. It is plausible therefore to argue (though not a proof) that there exists a sizable group of discouraged workers among the elderly.

7. My own estimate using the FSS micro-data (for the period 1976-84) gives

the average figures 15.8 percent for the aged employee households (including corporate managers) and 11.5 percent for the self-employed households. (For the ages 35-44 group the average total saving rate is 19.1 percent for employees and 7.8 percent for self-employeds.) The average financial saving rates for the two groups are 8.5 percent and 4.7 percent, respectively. For non-working aged households, the average total saving rate is 1.5 percent and the average financial saving rate is - 6.9 percent, and we see an evidence of financial dissaving taking place. (Ishikawa [1987, Table 7-3].)

8. See Table 3c of Hayashi-Ando-Ferris, which shows that the sum of pension income and business income for old nuclear families is on average about twice that for the dependent old living with the children. (E.g., for nuclear families with the head aged 65-69, that sum is 175 thousand yen while that for the dependent old individuals aged 65-69 is 93 thousand yen.) The same table indicates that a part of this difference arises from the fact that the number of elderly members contained in the merged household is smaller that that of old nuclear families, and also by the fact that the former is more dominated by female members.

At the same time we must note the existence of wide disparity in income distribution among the elderlies living independently. In fact, our FSS data indicates that the aged households in official classification do contain in substantive frequencies the low income and non-working families. To be more specific, the sample frequency distribution of the aged households by type of employment (i.e., employees or non-employees), income classes (i.e., quartiles I-lowest, II, III and IV-highest, defined for each employment group and over all age groups), and the size of the working members in the household is given by the following.

For employee households:	19.3 (%) in the total sample			
	I	II	III	IV
One person working:	4.6	2.6	1.5	2.7
Two+ persons working:	1.1	0.9	1.1	4.8
Total	5.7	3.5	2.6	7.5 (%)
For non-employee households:	80.7 (%) in the total sample			
No person working	24.7	7.4	3.4	.8
One person working:	5.0	5.2	3.9	2.9
Two+ persons working:	4.0	4.6	7.2	11.1
Total	33.7	17.2	14.5	14.8 (%)

Hence, it is not really true that independent elderlies are uniformly rich individuals. Hayashi-Ando-Ferris also attests to this fact in Panel D of their Table 3c.

9. I am indebted to Fumio Hayashi for incisive comments on this problem that greatly clarified my thinking.

10. Notice that even if the elderly do need economic support from children, it can be realized by external remittances; poverty in itself does not constitute reason for living together. On the other hand, rich elderly individuals can hire nurses and/or housekeepers even if their health condition normally does not allow independent living. Also they are perhaps more conscious of preserving the sense of power and self-control. Thus they may aid the children's families to obtain housing in the immediate vicinity of their residence (often within the same land space) and yet obtain the same effect as living together, whereas the normal solution is to live together physically. These are presumably the sources of the positive correlation noted by Ando and Hayashi between the independence of living and the elderly's wealth holding (or income).

11. We assume that the disposable income (DY) is well correlated with the 'annual income', which is the original classification variable.

12. These numbers are corroborated by the Population Census (1985) data, where the house-owner ratio of the single person, independent households, two-generation households, and three generation households (i.e., the same classification as Table 1) are given as 63.8 %, 81.6 %, 94.8 %, and 95.4 %, respectively.

13. It is well known that existence of the bequest motive, either out of parental altruism (Yaari [1964, 1965]) or out of strategic and control motive (Bernheim, Shleifer and Summers [1985]), or existence of the precautionary motive within an environment characterized by the uncertainty of life-time and the lack of actuarially fair annuity insurance (Davies [1981]) can lead to continuation of saving even after retirement.

14. If we were solely interested in obtaining consistent estimates for the coefficients of the model, then Heckman [1974]'s two step estimator should suffice. However, since that procedure is known to underestimate the standard error of coefficents, and since our major interest lies in testing whether or not there exist non-zero correlation between the error terms, we proceed to estimate the model simultaneously.

15. Maximization is done by taking as the basis of the correction matrix the sample covariance matrix of the gradient vector, noting the property that asymptotically it converges to the true Hessian matrix. This is known as the B.H.H.H. algorithm. The actual computation was done by writing down a program routine (following Bernht, Hall, Hall and Hausman [1974]) within the SAS (Version 5) Matrix Procedure. Convergence was always assured for the results presented in Tables 7 and 8 below.

16. Although there is a tendency for an individual working as a self-employed from young ages to continue to work automatically (unless becoming ill), there is also a group of self-employeds who have turned themselves from the group of employees after mandatory retirement. (According to Ministry of Labor [1981], among men, this group constitutes around 6 % of individuals who were employees at age 55.)

17. Using the time series of FIES and FSS data Sasaki and Tachibanaki estimated the public pension wealth (the expected present value of the Kosei Nenkin and Haigusha Kokumin Nenkin benefits), and then regressed the (private) net financial wealth on the (estimated) lifetime disposable income and the pension wealth. While the authors conclude that there is on the whole some substitutability, this conclusion is far from persuasive; first, while their result shows there exists around 20 % substitutability between the net financial wealth and the Kokumin Nenkin wealth (and this is their major ground for the above conclusion), there is none between the net financial wealth and the Kosei Nenkin wealth, which is itself 5-7 times as large as the Kokumin Nenkin wealth; and second, their cohort time series regressions are quite unstable. It is more approapriate to interpret their result as showing little evidence of substitutability. The authors also cite independent studies by Noguchi and Yoshikawa whose conclusions concur with this evaluation.

18. We have also estimated the Probit equation and the saving rate equation separately, the latter using the standard OLS method. The estimated coefficients of both equations are similar except for that of DLP in the saving propensity equation, which carries the value .0678 (.0284) for model I and the value .0472 (.0288) for model II (where the numbers in the parentheses are the estimated standard errors). For either model the coefficient estimate of DLP is just about a half of the maximum likelihood estimate given in Table 7. This is expected because of the existing positive correlation between u_i and v_i.

19. On the other hand, there may also be a bias working in the opposite direction. Diamond and Hausman [1984] argued that there may exist taste differences among individuals concerning retirement, and naturally those who wish to retire early are likely to have accumulated large financial wealth. This would result in a negative correlation between FA and the error term, rendering an upward bias in the estimated coefficient of FA. Diamond and Hausman's own test (i.e., the Instrumental Variable estimate in Table 7, p. 97) did not show, however, that there actually existed a large bias in the direction they argued. While their result indicated the existence of some simultaneity, once the simultaneity is controlled for the amount of financial wealth lowered, rather than raised, the probability of retirement. This finding is qualitatively the same as our finding. It thus appears that the evidence for the magnitude of the bias that Diamond and Hausman argued is yet to be shown.

20. The validity of this test depends on our supposition that any difference in total wealth among housholds gets also reflected in the difference in net financial wealth. If there exists a substantial degree of substitution between the real wealth and financial wealth (e.g., owning a second house by drawing down financial assets), then this supposition does not hold. (I am indebted to Takatoshi Ito for raising this point.) Because our data contains only a very imperfect measure of real wealth holding, we cannot directly verify this supposition. However, since the borrowing capacity is normally limited for most of the elderly population (an exception is the very rich who might also have a high net financial wealth any way), and since the redemption of past debts is completed for much of them, we expect this supposition to be a good first approximation of the reality for the elderly households. Needless to say, this does not mean that the same supposition holds good for much younger age households.

21. For the general characteristics of this survey, see the editor's guide to the Japanese household saving data.

22. As Ando et. al. [1986, p. 43] suggests, there is a possibililty that the reported "annual income" figures do not include interest and dividend income that are not obtained in cash. Therefore, we have prepared another data series that is based on the assumption that "annual income" equals "annual before-tax earnings". However, since the results based on two series do not differ much, we only report one.

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Table 1: Changes in the Demographic Characteristics of Household Types for Population Aged 65 and Above, 1970-1985

(Unit = Ten Thousand Households or Persons, Figures in Parentheses Are Percent of Total)

	1970	1975	1980	1985
Number of Households Containing Elderly Persons				
Single Person Family	41.0 (7.0)	60.0 (8.7)	84.6 (10.5)	116.0 (12.5)
Independent Nuclear Family	161.8 (27.6)	208.3 (30.6)	257.1 (31.8)	317.2 (34.3)
Two Generations Family	34.5 (5.9)	47.7 (6.9)	56.6 (7.0)	64.4 (7.0)
Three Generations Family	349.9 (59.6)	370.0 (53.8)	409.5 (50.7)	427.5 (46.2)
Total	587.2 (100.0)	688.1 (100.0)	807.8 (100.0)	925.2 (100.0)
Proportion to All Households	(21.7)	(22.0)	(23.7)	(25.4)

Number of Elderly Persons				
Institutionalized	23.2 (3.1)	33.2 (3.7)	45.1 (4.2)	57.6 (4.6)
Single Person Family	41.0 (5.5)	60.0 (6.8)	84.6 (7.9)	116.0 (9.3)
Independent Nuclear Family	211.6 (28.6)	281.5 (31.8)	356.6 (33.5)	454.4 (36.4)
Two Generations Family	42.2 (5.7)	59.3 (6.7)	70.9 (6.7)	82.0 (6.6)
Three Generations Family	421.3 (57.0)	452.5 (51.0)	507.5 (47.7)	536.8 (43.1)
Total	739.3 (100.0)	886.5 (100.0)	1064.7 (100.0)	1246.8 (100.0)
Proportion of Entire Population with Age 15 and over	(9.3)	(10.4)	(11.9)	(13.2)

Source: The Population Census, 1970, 1975, 1980, 1985.
Notes: Each category of household may contain kins other than parents as additional members. Households that consist only of brothers and sisters are classified as 'independent nuclear family'.

Table 2: Sources of Living as Evaluated by Individuals Aged 65-69, 1980

(Unit = Percent)

Sources of Living	Men			Women		
	Total	Working	Not Working	Total	Working	Not Working
Healthy						
Support by Self or Spouse	62.2	48.1	14.1	30.6	15.9	14.7
Earnings More Than Half of Total Individual Income	39.3	39.3	-	12.6	12.6	-
Earnings Zero or Less Than Half of Total Indiv. Income	22.9	8.8	14.1	18.0	3.3	14.7
Major Non-Earnings Income Source:						
Pension Benefits	20.8	7.7	13.1	16.5	3.0	13.5
Others	2.1	1.1	1.0	1.5	0.3	1.2
Support by Children	14.7	6.8	7.9	32.3	8.6	23.7
Earnings More Than Half of Total Individual Income	4.9	4.9	-	5.0	5.0	-
Earnings Zero or Less Than Half of Total Indiv. Income	9.8	1.9	7.9	27.3	3.6	23.7
Major Non-Earnings Income Source:						
Pension Benefits	9.5	1.8	7.7	26.5	3.5	23.0
Others	0.3	0.1	0.2	0.8	0.1	0.7
Support by Other Means	4.0	1.2	2.8	5.8	1.3	4.5
Ill or Ill-laden	16.7	3.5	13.2	21.1	2.0	19.1
Not Classifiable	2.4	1.7	0.7	10.2	2.2	8.0
Total	100.0	61.8	38.7	100.0	30.0	70.0

Source: Compiled from Ministry of Labor [1981], Table 16.

Table 3: The Labor Force Participation Status and the Reasons for not Working Currently of the Individuals Aged 65-69, 1980

(Unit = Percent)

Labor Participation Status		Men		Women	
Working	(1)	61.3		30.0	
full-time	(2)	(50.2)		(15.1)	
Not Working	(3)	38.7		70.0	
Willingly Retired	(4)	(22.7)		(55.1)	
Desiring Work	(5)	(16.0)		(14.9)	
(5)/(3)	(6)	0.413		0.213	
Reason Those Desiring Work Are Not Working Currently					
All Reasons	(7)	16.0	100.0	14.9	100.0
Illness	(8)	5.3	33.1	5.2	34.8
Family Circumstances	(9)	0.8	5.3	3.6	24.1
No Desirable Job Available	(10)	8.5	53.0	4.8	32.5
.Skill and Experience Inapplicable	(11)	(4.1)	(25.7)	(.9)	(6.0)
.Working Hours Unsuitable	(12)	(1.3)	(8.0)	(1.0)	(6.8)
.Pay Insufficient	(13)	(0.4)	(2.5)	(.1)	(1.0)
.Other Reasons	(14)	(2.7)	(16.8)	(2.8)	(18.7)
Other or Reasons Not Classifiable	(15)	1.4	8.5	1.3	8.5

Source: Ministry of Labor [1981], Tables 2 and 10.

Table 4: The Effect of the Presence of Aged Parents on the Saving Rate of the Merged Households.

1. Working Members and Head's Age Controlled. Employee Households with Head's Age 30-59, 1984

(Dependent Variable = Total Saving Rate)

	(1) Age 30-39	(2) Age 40-49	(3) Age 50-59	(4) Age 30-59
Constant	.127 (6.63)**	.105 (6.92)**	.082 (7.19)**	.124 (10.2)**
AGE40S	-	-	-	-.019 (-2.43)*
AGE50S	-	-	-	-.041 (-3.91)**
WKSPOUSE	.083 (7.65)**	.066 (9.28)**	.068 (6.09)**	.072 (10.3)**
WKOTHERS	.015 (0.59)	.037 (3.26)**	.121 (9.15)**	.069 (6.40)**
CHILDREN	-.022 (-1.12)	-.007 (-0.48)	-.039 (-2.76)*	-.014 (-1.24)
PARENT	.002 (0.14)	-.010 (-1.12)	-.019 (-1.43)	-.013 (-1.52)
D. F.	9	9	9	35
Mean Dep.	.137	.134	.132	.135
SSR	.00320	.00154	.00385	.01690
R2-adj.	.825	.883	.906	.787

Source: NSFIE, 1984 (Vol. I, Part 1, Table 23.)
Notes: .Figures in parentheses give t-ratios, * and ** indicate statistical signifi cance at 5 % and 1 %, respectively.
.'Employees' do not contain corporate managers.

Table 5: The Effect of the Presence of Aged Parents on the Saving Behavior of Merged Households.

2. Income Level and Homeownership Controlled. Employee Households, 1984.

Dependent Variable	S (Total Saving Rate)				NFAY (Net Finan. Asset/Disp. Income)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	.238 (9.88)**	.172 (11.7)**	.176 (12.0)**	.176 (12.1)**	33.3 (13.1)**	32.1 (14.1)**	32.4 (14.2)**
HOME	-	.0754 (6.49)**	.0614 (9.90)**	.0753 (6.61)**	-18.7 (-9.32)**	-18.7 (-10.4)**	-18.5 (-10.3)**
DETACHED	-	-.0191 (-1.75)	-	-.0157 (-1.45)	12.7 (6.71)**	11.4 (6.71)**	11.0 (6.39)**
CHILDREN	$.161 \times 10^{-4}$ (-.490)	-.0191 (-2.55)**	-.0185 (-2.51)**	-.0186 (-2.53)**	-10.4 (-8.01)**	-10.5 (-9.11)**	-10.5 (-9.07)**
PARENT	$.815 \times 10^{-6}$ (-.030)	-	-.0165 (-2.33)*	-.0150 (-2.11)*	-	5.49 (4.92)**	-
PARENT x DETACHED	-	-	-	-	-	-	5.67 (4.83)**
1/DY	-30.6 (-6.07)**	-19.3 (-6.46)**	-20.3 (-6.80)**	-20.2 (-6.80)**	-3396.2 (-6.57)**	-3092.3 (-6.64)**	-3131.1 (-6.71)**
S. E. R2-adj.	.0375 .351	.0261 .685	.0258 .693	.0257 .696	4.51 .628	4.03 .703	4.05 .701

N = 97 Mean of the Dependent Variable (S) = .130
(NFAY) = 8.09

Source: NSFIE, 1984 (Vol. I, Part 1, Table 32.)
Notes: Same as Table 4.

Table 6: Mean Sample Characteristics of the FSS Data for Households with the Head's Age 65 and Over, 1976-1984

Attributes	Variable	Sample Mean
Sample Size	N	1386
Household Attributes		
Head's Age	AGE	70.9
Size of Household	SIZE	3.07
Dweller Status and Location of Residence		
House Owner	HOME	.844
Residence in Major Metropolitan Area	METRO	.530
House Owner in Major Metropolitan Area	METHOME	.428
Employment Status		
Being Employed	DLP	.673
as Employee (Corporate Manager Included)		.199
as Self-Employed		.474
Income, Financial Asset and Debt		
Disposable Income	YAVR	355.0
After-tax non-interest income	WAVR	317.9
Non-Interest Income Ratio	WAVR/YAVR	.906
Financial Asset/Disposable Income Ratio	FA/YAVR	2.38
Net Financial Asset/Disposable Income Ratio	NFAY	2.27
Rate of Saving		
Total Saving Ratio	S	0.097
Financial Saving Ratio	FS	0.072

Note: For YAVR and WAVR, income is measured in terms of ten thousand 1980 Yen. Major Metropolitan Area refers to Keihin, Chukyo, Keihanshin, and Kita-Kyushu Metropolitan District.

Table 7: The Maximum Likelihood Estimates of the Employment and Saving Equations

(Dependent Variable = Saving Rate)
Based on Equations (1),(2), and (3)

Model	I		II	
	Coeff.	Std. Err.	Coeff.	Std. Err.
Constant	18.8	6.28	19.1	6.31
METRO	.269	.0835	.269	.0835
SIZE	.662	.0503	.663	.0503
HOME	-.0422	.108	-.0450	.108
AGE	-.486	.170	-.494	.171
SQAGE	.00285	.00115	.00291	.00116
FA	.000148	.0000502	.000154	.0000507
FD	.000889	.000280	.000880	.000279
D80	-.193	.158	-.188	.159
D81	-.135	.162	-.132	.162
D82	-.303	.161	-.298	.162
D83	-.415	.158	-.411	.159
D84	-.675	.156	-.668	.156
Constant	-.230	.201	-.158	.209
SIZE	-.0275	.00808	-.0284	.00917
HOME	.0293	.0383	.0355	.0379
METHOME	-.0171	.0226	-.00850	.0229
AGE	.00561	.00273	.00550	.00280
1/YAVR	-21.7	4.91	-24.1	5.00
DLP	.137	.0494	.0909	.0607
Rho	.149	.0586	.0916	.0850
NFAY			-.0142	.00394
Sigma	.364		.362	
log lkhd.	-1240.0		-1233.7	

Source: FSS Micro Data, N = 1386.

Table 8: The Maximum Likelihood Estimates of the Employment and Saving Equations

(Dependent Variable = Saving Rate)
Based on Equations (1),(5), and (3)

Model	III		IV	
	Coeff.	Std. Err.	Coeff.	Std. Err.
Constant	17.6	6.29	18.4	6.32
METRO	.271	.0836	.274	.0835
SIZE	.659	.0501	.665	.0496
HOME	-.0473	.109	-.0492	.108
AGE	-.455	.171	-.476	.171
SQAGE	.00265	.00115	.00279	.00116
FA	.000151	.0000500	.000158	.0000507
FD	.000975	.000274	.00115	.000256
D80	-.207	.158	-.202	.158
D81	-.134	.162	-.135	.162
D82	-.310	.161	-.305	.162
D83	-.415	.158	-.412	.159
D84	-.679	.155	-.673	.156
Constant	-.334	.174	-.245	.177
SIZE	-.0355	.00796	-.0335	.00810
HOME	.0288	.0381	.0334	.0379
METHOME	-.0147	.0225	-.00790	.0229
AGE	.00695	.00251	.00644	.00248
1/YAVR	-22.1	4.63	-23.9	4.74
DLP x (WAVR/YAVR)	.199	.0376	.143	.0442
Rho	.201	.0377	.136	.0481
NFAV			-.0113	.00432
Sigma	.365		.362	
log lkhd.	-1233.4		-1231.4	

Source: FSS Micro Data, N = 1386.

Table 9: The Effect of an Exogenous Shock to the Employment Behavior on the the Saving Behavior of the Aged Households

Changes in the Employment Ratio	Corresponding Δu	Direct Effect $= \alpha'(WAVR/YAVR) \times \Delta DLP$	Indirect Effect $= \rho\,\sigma \times \Delta u$	Change in the Average Saving Ratio
10 % decrease	0.264	-0.013	0.013	.000
20 % decrease	0.515	-0.026	0.025	-.001

Initial Value of the Employment Ratio = 0.67

Source: Based on Model IV Coefficient Estimates (Table 8).