NBER WORKING PAPER SERIES

ASSET HOLDINGS AND THE LIFE CYCLE

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Working Paper No. 614

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge MA 02138

January 1981

This study was funded by NSF grant No. SES 7914209. The views expressed here are those of the authors and should not be attributed to the NSF nor to the NBER. We are grateful to Tony Atkinson, Roger Gordon, Jerry Hausman, Angelo Melino and Nicholas Stern for many helpful discussions and comments. They should not be held responsible for any errors that remain. The research reported here is part of the NBER's research project in Capital Formation. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

Empirical studies of the life cycle savings model have tended to reject the hypothesis of a "hump-shaped" pattern for the wealth-age profile. In this paper we show, using new data on net worth for 12,734 families, that there is evidence that wealth declines after retirement provided that we control for differences in permanent income and take account of sample selection bias. The estimated rates of decumulation are consistent with a life cycle model in which there is uncertainty about the date of death.

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ASSET HOLDINGS AND THE LIFE CYCLE[†]

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1. Introduction

This study has two aims. The first is to examine the behaviour of wealth-holdings over the life cycle, and to estimate the wealth-age relationship using cross-section data. The second is to investigate the dependence of this relationship upon provisions for pensions and social security. Previous studies of the life cycle model have tended to reject the hypothesis of a "hump-shaped" pattern for the wealth-age profile. Lydall (1955) presents data from the 1953 Oxford Institute of Statistics Survey which show no significant tendency for wealth to decline with age. Moreover, these data take no account of the "cohort effect" by which older generations would be expected to receive lower real lifetime incomes than younger generations. Allowing for the cohort effect in Lydall's data would result in wealth being a continuously increasing function of age. Exactly such a result has recently been obtained by Mirer

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[†] This study was funded by NSF grant No. SES 7914209. The views expressed here are those of the authors and should not be attributed to the NSF nor to the NBER. We are grateful to Tony Atkinson, Roger Gordon, Jerry Hausman, Angelo Melino and Nicholas Stern for many helpful discussions and comments. They should not be held responsible for any errors that remain.

(1979) in a study of 2713 married couples over the age of 65 using data from the 1968 Survey of the Demographic and Economic Characteristics of the Aged. Using a simple regression of wealth on age, Mirer found that allowing for a cohort effect led to a positive coefficient on age. These sample survey studies support the observation from estate tax statistics that observed wealth is an increasing function of age (Atkinson (1971), Atkinson and Harrison (1978) and Shorrocks (1975) for the UK, Brittain (1978) for the US).[1] In addition simulation studies (e.g. White 1978) have cast doubt on the ability of the life cycle model to explain aggregate savings.

There are, however, serious problems with the interpretation of these results. First, in none of the studies could the wealth-age relationship be controlled for the effect of differences in permanent income. To investigate this requires data on earnings and other characteristics for each observation in the sample.[2] Secondly, no account was taken of wealth held in the form of rights to future pensions (both private and old age security financed by the state).[3] Thirdly, the life cycle model implies a nonlinear relationship between the ratio of wealth to permanent income and age which may be badly approximated by simply adding age and age squared to a linear regression (as suggested by the asymmetric nature of the hump as typically drawn). Finally, the results may have been affected by sample selection bias.[4]

In this paper we show that controlling for permanent income and taking account of sample selection biases, it is possible to observe a hump-shaped profile for wealth over the life cycle. But it appears also that there are two groups of people with low (but positive) and negative levels of net worth, respectively, for whom the simple life cycle model is inappropriate, either because of low earnings and capital market constraints or because of the size of unexpected shocks or surprises in the value of their net worth. We shall examine also the role of provisions for pensions and old age social security in the pattern of wealth holding over the life cycle.

The data used in this study refer to 12,734 Canadian families in 1977 and come from the Statistics Canada micro-data tape "Income (1976), Assets and Debts (1977) of Economic Families and Unattached Individuals" which contains data collected as a supplement to the 1977 Survey of Consumer Finances.[5] Unless otherwise stated all tables are derived from this tape and money figures are expressed in Canadian dollars. The survey covers a stratified random sample of the non-institutional population (using a multiple sample frame to allow high income households to be oversampled), and the data base provides a particularly rich source of information on individual holdings of assets and liabilities as well as on household incomes, and other personal and household characteristics. A family or household will be defined here as a group sharing a common dwelling and related by blood or marriage. Of the 12,734 households in the sample 2833 are single-person households and the remainder are family units. The assets data refer to market values in May 1977 and the income data to the calendar year 1976. To protect the identity of certain "special family units", primarily those with very high incomes, various of their characteristics (including age) are not recorded in the tape.[6] For this reason the 139 special family units were excluded from the econometric analysis. Since our main interest is in estimating equations in which the dependent variable is net worth, neither this omission nor the stratification of the sample leads us to expect sample selection bias. We do, however, adjust for sample selection bias below when estimating equations in which the dependent variable has been truncated.

The plan of the paper is as follows. In section 2 we examine the data on net worth and, in particular, the characteristics of those with very little wealth. The basic model to be estimated is set out in section 3. Estimates of permanent income are constructed in section 4, and an econometric model of the wealth-permanent income ratio estimated in section 5. The role of pensions and social security wealth is examined in section 6.

2. The Data on Net Worth

Before turning to the econometric model it is worth examining the data on net worth. These are available for each of the 12,734 households in the sample. The definition of net worth includes the market value of cash, deposits, bonds, stocks and shares, registered savings plans, other financial assets, vehicles, owner-occupied houses and other real estate, equity in a business or farm, less debts of various kinds.[7] It excludes social security and some pension wealth (of which more in section 6), consumer durables other than cars, life insurance policies, and other "assets" such as the expected value of future inheritances and support from relatives or children. Information on pensions and life insurance premiums are available and will be used in the econometric model below.

Table 1 shows the distribution of net worth in our sample. This is given both for the unweighted and weighted samples where the latter employs weights reflecting sampling ratios and estimated non-response, (the two distributions differ significantly only for the top decile). Not surprisingly, the distribution is highly skewed with the top 1 per cent of households owning 17.5 per cent of total household net wealth and the top 5 per cent owning 37.6 per cent. It is also striking that a substantial fraction of the sample had very low net worth. 10.8 percent of households had nonpositive net worth and 25.3 percent of households had net worth of less than $2,500 in 1977.[8] This pattern is similar to that reported by Diamond (1977) and Diamond and Hausman (1980) for the US. Using data from the National Longitudinal

Survey of Mature Men (a sample of 5020 males aged between 45 and 59) Diamond and Hausman found that in 1966 19.7 per cent of men in this age group reported net worth of less than $1,000 (a figure comparable with our $2500 allowing for inflation and the exchange rate). In themselves these figures do not consititute evidence against the life cycle hypothesis because net worth excludes the value of pension rights (in both private plans and social security). But they are suggestive of the idea that at least a fraction of the population does not save in accordance with the life cycle view of "rational" behaviour.

To explore this further, Table 2 shows some of the characteristics of low wealth-holders. Five such groups are distinguished. The first consists of households with negative (strictly speaking, nonpositive) total net worth. If we compare this group with the sample as a whole (column 6) we see that it does not contain a substantially larger than average proportion of households with low earnings. Nor is negative net worth associated with positive pension wealth. Over 70 per cent of households with negative net worth had no private pension plan and the same proportion had no life insurance policies. The significant difference between households with negative net worth and the sample as a whole is that in the former 75 per cent of heads of household were aged less than 40, whereas the figure for the total sample is just over 40 per cent.

The second column refers to households with a low but positive level of total net worth. Age of head of household is much less important for this group, but low earnings now appear to be a significant contributory factor to low levels of wealth. Households in this group are also much less likely to be in a pension plan or have life insurance policies than either the sample mean or, indeed, those with negative net worth. Very similar conclusions apply to low (but positive) wealth-holders in the period leading up to retirement when we would expect wealth to be at its peak. Column 3 shows that this group has similar attributes to the second group.

Total net worth includes the value of equity in owner-occupied housing and because it is sometimes difficult to borrow against this, it may be that a better measure of resources available to finance retirement consumption is net worth excluding equity in housing. Columns (4) and (5) show the characteristics of households with low worth corresponding to columns (1) and (2) when net worth is defined to exclude equity in owner-occupied housing. The change in definition makes very little difference to the results and demonstrates again the difference between households with negative net worth and those with a small but positive level of wealth.

It is, therefore, tempting to conclude that the population may be divided into three groups. First, there is a group with negative net worth who do not appear to differ significantly from the rest of the population in terms of economic characteristics, but who are in the early stages of the life cycle. Observed negative net worth results from a combination of the failure to record all items of wealth (the value of durables such as furniture is not recorded whereas the corresponding consumer debt is included) and the shocks to asset values which result from uncertainty. The second group owns very small (but positive) amounts of wealth. Although it undoubtedly contains some households more characteristic of the first group, the main attributes of households with small amounts of wealth are low earnings, the fact that they are much less likely to have a private pension plan or life insurance policy than on average, and, as we shall see below in section 5, a lower level of educational attainment. In these respects they are much less successful economically than the group with negative net worth which suggests that membership of the latter group is a short-lived phenomenon whereas ownership of small amounts of wealth is a characteristic which persists. This could be for a variety of reasons. Some households may not plan for the future (are"backward-looking" rather than "forward-looking"), may simply be unable to manage their own financial affairs, or may receive such low earnings that the optimal life-cycle consumption plan implies that retirement consumption is less than or equal to the expected value of old age social security payments. The third group constitutes the rest of the population (over 75 per cent in our sample), and we wish to test the hypothesis that for this group the life cycle model describes their savings behaviour.

Two distinct criticisms of the life-cycle model have been made in the literature. On the one hand, it has been argued that the simple life-cycle model cannot account for anything like the level of aggregate savings which are in fact observed leaving a major role for bequests White 1978, Kotlikoff and Summers 1981). On the other hand, it has been observed, as here, that there is a large number of households owning amounts of wealth which, on the face of it, appear incompatible with the need to finance that part of retirement consumption not financed by pensions or social security. In this paper we investigate whether, even if these criticisms are valid, nevertheless the behaviour of the majority of households is consistent with the predictions of the life cycle model.

3. Wealth and the Life Cycle

The life cycle model of consumption (Modigliani and Brumberg 1954, Modigliani and Ando, 1963) implies a nonlinear relationship between the ratio of wealth to permanent income and age. For particular assumptions about the utility functions of households, this relationship is very tightly parameterised, and is the result of deducing the behaviour of wealth from the earnings profile and optimal consumption plan implied by the life-cycle model. Assuming perfect certainty and making specific assumptions about preferences (taking utility to be additively separable over time and an isoelastic function of total consumption in each period), Blinder, Gordon and Wise (1980) estimated the life-cycle model using data for 4,133 older white males from the Longitudinal Retirement History Survey. Because of the tight parameterisation they found the model hard to estimate with imprecisely determined parameters which implausibly implied negative bequests. One obvious problem is the assumption of perfect certainty. Uncertainty exists about future earnings, rates of return on savings, and various demographic factors, such as length of life, age of marriage and number of children (as well as the future earnings of and number of children born to one's own children). The effect of increased uncertainty about the future upon present consumption is, in general ambiguous. For example, greater uncertainty over the length of life leads to a conflict between the desire to save more for a possibly longer future life and the desire for certain consumption in the present (Yaari 1965, Champernowne 1969,

and Davies 1980).
Levhari and Mirman 1977/ Similar considerations apply to uncertainty about future earnings (Hall 1978, Eden and Pakes 1980) and interest rates (Sandmo 1970, Levhari and Mirman 1977).

Only in special cases will it be possible to obtain an explicit solution for the time path of wealth. This suggests that it is difficult to place many a priori constraints on the nonlinear function describing the age pattern of the ratio of wealth to permanent income. But if we assume that households expect to experience a period of retirement during which they will receive no labour earnings, then for most plausible earnings profiles we would expect the ratio of assets (defined as wealth excluding the present value of future earnings) to permanent income to first increase with age and then to decline after retirement. It is the existence of evidence for this hump-shaped pattern which previous studies have denied and which is the focus of this paper. The lack of convincing theoretical restrictions suggests examining a fairly general functional form for the wealth-age profile which we may write as

$$\log\left(\frac{W}{Y}\right) = f(A, X) + u \tag{3.1}$$

where $\frac{W}{Y}$ is the ratio of assets or net worth to permanent income

A is the age of the head of household

X is a vector of observable variables which influence the wealth-age relationship, and will include permanent income if preferences are non-homothetic.

u is an error term representing unobservable variables and deviations of household preferences from the mean.

The dependent variable is measured in logarithms both to avoid problems of heteroscedasticity in estimation and because permanent income, Y, is unobservable. In section 4 we describe the construction of an instrument for Y and to obtain consistent estimates of the parameters of (3.1) it will turn out to be convenient to adopt the logarithmic specification for the dependent variable.[9]

The data for the net worth of each household in the sample include the value of accumulated assets in registered retirement savings plans but exclude the present value of rights to future pension or social security payments, although there is information on contributions to and receipts from such schemes. In equation (3.1) W should include the value of pension rights. Clearly, there are no market values for pension rights and we prefer to use estimates of pension wealth as explanatory variables in an equation for net worth excluding pension wealth. This procedure serves two purposes. First, it reduces the noise in the measurement of net worth; since aggregate pension wealth is of the same order of magnitude as all other forms of personal wealth taken together, to add this to observed net worth would lead to substantial measurement error in the dependent variable. Secondly, it enables us to test the hypothesis that additional pension wealth leads to offsetting reductions in personal saving. The way in which (3.1) is modified for pensions and social security is discussed in detail in section 6 below.

The error term u allows not only for random preferences but also for the fact that the age-earnings profile of individuals may differ from the average experience. With cross-section data for a single year we cannot estimate an earnings profile for each individual, and differences from the mean are subsumed within the error term.[10] This weakness of cross-section data (in comparison with longitudinal studies) is, we hope, compensated for by the quality of the data for net worth.

The hypothesis which we wish to test is that the <u>partial</u> derivative of f with respect to A is positive for values of A up to the age of retirement and negative thereafter. The function f is highly nonlinear and even in a world of perfect certainty cannot be approximated satisfactorily by, for example, a quadratic function of age. Hence we shall take f to be a piecewise function of age such that the functional forms for each piece allow sufficient flexibility to enable us to test the hypothesis of a hump-shaped pattern for the behaviour of wealth. The function will be assumed to consist of six pieces corresponding to predetermined age ranges where we define the following dummy variables for the head of household i

$d_{1i} = 1$ if $A_i < 30$, zero otherwise

$d_{2i} = 1$ if $30 \leqslant A_i < 40$, zero otherwise

$d_{3i} = 1$ if $40 \leqslant A_i < 50$, zero otherwise

$$d_{4i} = 1 \text{ if } 50 \leqslant A_i < 60, \text{ zero otherwise} \qquad (3.2)$$

$$d_{5i} = 1 \text{ if } 60 \leqslant A_i \leqslant 75, \text{ zero otherwise}$$

$$d_{6i} = 1 \text{ if } 75 < A_i, \text{ zero otherwise}$$

Given that the dependent variable in (3.1) is measured in logarithms we will assume that the function f is piecewise linear over most of its range (corresponding to a constant rate of accumulation of wealth within an age bracket), but is nonlinear over the crucial period within which retirement occurs. Thus between the ages of 60 and 75 we assume a quadratic form which allows us to test whether a maximum occurs and, if so, to estimate the age at which this happens.[11] We define the following variables for each household

$$V_{1i} = d_{1i}(A_i - 15) + 15\sum_{j=2}^{6} d_{ji}$$

$$V_{2i} = d_{2i}(A_i - 30) + 10\sum_{j=3}^{6} d_{ji}$$

$$V_{3i} = d_{3i}(A_i - 40) + 10\sum_{j=4}^{6} d_{ji}$$

$$V_{4i} = d_{4i}(A_i - 50) + 10\sum_{j=5}^{6} d_{ji} \qquad (3.3)$$

$$V_{5i} = d_{5i}(A_i - 60) + 15d_{6i}$$

$$V_{6i} = d_{5i}(A_i - 60)^2 + 225d_{6i}$$

$$V_{7i} = d_{6i}$$

The final variable is simply a dummy variable because in our sample the age of head of household is not recorded if 76 or above.

With these definitions it is possible to estimate the nonlinear piecewise function by the following linear regression

$$\log\left(\frac{W_i}{Y_i}\right) = a_o + \sum_{j=1}^{7} a_j V_{ji} + u_i \qquad (3.4)$$

The value of a_o is the log of the ratio of wealth to permanent income at age 15; which is approximately the youngest age at which working life could begin. The values of a_1 through a_4 measure the annual growth rates of wealth in the first four age ranges, and a_5 and a_6 measure the nonlinearity in the growth rate during the retirement period. If there is a hump-shaped profile then a_6 must be negative, and the maximum is reached at age $A_i = 60 - a_5/2a_6$.

In order to estimate equation (3.4) we need estimates of permanent income for each household in the sample, and it is to these that we now turn.

4. Estimating Permanent Income

In order to estimate the model of asset holdings over the life cycle given by (3.4) we need estimates of permanent income for each individual in the sample. We shall denote by Y_i the permanent income of individual i, by E_i his or her earnings in the sample year, and by A_i his or her age in the sample year. The model for permanent income (defined as normal age-adjusted annual earnings) is [12]

$$\log Y_i = Z_i\gamma + s_i - c(A_i) \qquad (4.1)$$

where Z_i is a vector of observable variables for individual i (such as education and occupation), γ is the associated parameter vector, and s_i is an unobservable variable measuring characteristics such as skill, drive, or good fortune which is constructed such that its mean value in the population is zero and has variance σ_s^2. The final term, c(A), is a cohort effect which reflects the fact that, for given Z, younger generations are better off than their elders because of technical progress and capital accumulation.

Current earnings differ from permanent income for two reasons. One is the existence of an age-earnings profile over the life cycle, and the other is the transitory component of earnings. Hence we have that earnings in year t are given by

$$\log E_{it} = \log Y_i + h(A_{it} - \bar{A}) + u_{it} \qquad (4.2)$$

The function h measures the age-earnings profile (assumed constant across the population), and $\bar{A}$ is some "standard" age with respect to which permanent income is defined. The transitory component of earnings, denoted by u_{it}, is assumed to have zero mean, variance σ_u^2, and to be uncorrelated with s_i. Combining (4.1) and (4.2) gives the following earnings equation

$$\log E_{it} = Z_i\gamma + g(A_{it}) + s_i + u_{it} \tag{4.3}$$

where $g(A_{it}) = h(A_{it} - \bar{A}) - c(A_{it})$

The error term in (4.3), $s_i + u_{it}$, has zero mean and variance $\sigma_s^2 + \sigma_u^2$. The u_{it} may be correlated across households in which case OLS estimates of (4.3) are unbiased though inefficient.

Permanent income is unobservable and so we must construct an instrument for permanent income which takes into account the fact that it will be used in the estimation of (3.4). Estimation of the earnings equation (4.3) provides estimates of γ and the function g. It is clear that the age-earnings profile and the cohort effect cannot be separately identified from estimation of g, and so we shall use data from outside the sample to impose a cohort effect. The details of this will be discussed below and we shall proceed on the assumption that we have estimates of both the h and c functions.

There are now two ways in which we could estimate permanent income. The first is based on equation (4.1) and the second on equation (4.2). From the parameter estimates of γ and the function c we could estimate permanent income as

$$\log Y_i^e = Z_i\gamma - c(A_{it}) \tag{4.4}$$

This estimate omits the unobservable individual effect s_i.

The alternative is to use the information contained in the observation of current earnings, and to estimate permanent income by current earnings adjusted to the "standard" age for the estimated age-earnings profile.

$$\log Y_i^e = \log E_{it} - h(A_{it} - \bar{A}) \tag{4.5}$$

This second estimate includes the unobservable transitory component of earnings. A more efficient estimate can be obtained by taking a weighted average of (4.4) and (4.5), and we shall assume

$$\log Y_i^e = \alpha\{\log E_{it} - h(A_{it} - \bar{A})\} + (1 - \alpha)\{Z_i\gamma - c(A_{it})\} \tag{4.6}$$

Substituting from (4.3) we have

$$\log Y_i^e = Z_i\gamma - c(A_{it}) + \alpha(s_i + u_{it}) \tag{4.7}$$

The error in the estimate of permanent income is, from (4.1) and (4.7)

$$\eta_{it} = \log Y_i^e - \log Y_i = \alpha u_{it} - (1 - \alpha) s_i \qquad (4.8)$$

To choose the optimal weight (α) we note that log Y appears linearly in the equation for asset holdings given by (3.4). Hence we should choose α such that the error in the measurement of permanent income η_{it} is uncorrelated with our instrument for permanent income as defined in (4.7). This is equivalent to the condition that

$$E\{\eta_{it}(s_i + u_{it})\} = E\{(\alpha u_{it} - (1 - \alpha)s_i)(s_i + u_{it})\}$$
$$= 0 \qquad (4.9)$$

Since s_i and u_{it} are (by assumption) uncorrelated the condition becomes that

$$\alpha\sigma_u^2 - (1-\alpha)\sigma_s^2 = 0 \qquad (4.10)$$

The optimal weight to use in the construction of (4.7) is therefore

$$\alpha = \frac{\sigma_s^2}{\sigma_s^2 + \sigma_u^2} \qquad (4.11)$$

Using this value of α, and estimates of γ and the cohort effect, we may construct an instrument for permanent income and obtain consistent estimates of the parameters of the wealth equation (3.4). With longitudinal data on earnings it is possible to estimate a fixed effects model, and hence obtain estimates of σ_s^2 and σ_u^2 as well as γ from (4.3).[13]

Unfortunately, this procedure is not open to us because we do not have observations on household earnings for more than one year. We shall, therefore, assume a value for α based on the results of the few studies which have used longitudinal data to estimate the relative magnitudes of σ_s^2 and σ_u^2. The value of σ_s^2 clearly depends on the variables contained in the Z vector; the more relevant observable variables there are, the smaller will be the residual variance. Lillard and Willis (1978) examined data for 1144 male heads of households for seven years from the University of Michigan Panel Study of Income Dynamics, and found that for a simple set of explanatory variables in the earnings equation (race, years of schooling and work experience) the implied value of α was 0.606. With a more comprehensive set of explanatory variables including education, occupation, region, labour force status and local labour market conditions, the implied value was 0.471. Similar results were found by Lillard (1977) for a sample of World War II veterans and by Lillard and Weiss (1979) for a sample of American scientists. In the earnings regressions which we report below, we employ a fairly comprehensive set of explanatory variables, comparable with that used by Lillard and Willis, except that we have no data on local labour market conditions. When constructing estimates of permanent income, therefore, we shall assume a value for α of 0.5.

The earnings equation (4.3) was estimated separately for male heads of households and for wives. Households headed by a woman were deleted from the sample because a substantial fraction of these were headed by elderly women, probably widows. Permanent income of these households is determined primarily by the lifetime earnings of the deceased husband on which their widows were not asked to provide information. Deleting households headed by a woman and also special family units (for whom data on age and characteristics such as occupation were not recorded), reduced the sample from 12,734 to 10,118 households.

Equation (4.3) implicitly assumes that individuals are in "full-time"employment. The individual effect, s_i, may include variation in individual tastes for leisure, but it does not allow for systematic changes in annual hours worked resulting from spells of unemployment during part of the year, temporary lay-offs, or part-time work by wives or in retirement.[14] Hence the earnings equation was estimated for all individuals whose annual earnings were greater than $2,000. Earnings data relate to the calendar year 1976. The mean levels of earnings of men and wives in both the truncated sample and the excluded group are shown in Table 3. Significant numbers of both men and women had very low levels of earnings, although the proportion is much higher for wives because of non-participation in the labour force. Only 34.3 per cent of wives had earnings of more than $2,000. The difference in the mean age of men with earnings above and below $2,000, suggests that for men part-time work in retirement is a contributory factor to low levels of observed earnings.

The truncation of the dependent variable induces sample selection bias, and this was corrected for using the two-stage procedure proposed by Heckman (1976, 1979).[15] In the first stage the parameters of the probability that an individual will be in the truncated sample are estimated from a probit analysis of the full sample. From these estimates the values of the inverse of Mills'ratio are computed for each observation in the truncated sample. The second stage is to estimate (4.3) by OLS with the inverse of Mills' ratio as an additional explanatory variable. This procedure gives consistent estimates of the parameters γ and of the g function (provided the latter is linear in parameters).[16]

Maximum likelihood estimates of the probit model for earnings of $2,000 or less are shown in Table 4. The coefficients are all highly significant. Very young or old workers are more likely to have low or no earnings, as are those with little education, single men, women with young children, and those in households able to rely on investment income as the main source of income. In addition, low current earnings may reflect spells of unemployment and part-time work rather than potential earnings.

The second-stage OLS estimates of the earnings equation (4.3) adjusted for sample selection bias are shown in Table 5.[17] The g function was approximated by a cubic function of age. The age coefficients are significant and imply that earnings (unadjusted for the cohort effect) reach a maximum at age 43.21 for men and 37.5 for women. Allowing for the imposed cohort effect described below implies a pure age effect on earnings (the h function in (4.2)) with a maximum at age 52.2 for men and no maximum for wives before retirement age.

A full discussion of the coefficients of the earnings equation is not relevant to the aim of this paper, although the parameter estimates are of interest in themselves. For our purposes, we simply note that the correction for sample selection bias means that the coefficients reported in Table 5 are consistent estimates of the γ vector. To estimate permanent income the "standard" age was taken to be 45, and the cohort effect was estimated as follows. It was assumed that one half of the growth rate of real earnings was accounted for by improvements in education, changes in occupational structure, and other factors used as explanatory variables in the earnings equation, and that the other half was accounted for by technical progress and capital accumulation. The latter is the cohort effect. Data on growth rates in earnings and consumer prices in Canada were obtained from Podoluk (1968) and Statistics Canada (1978a). These give annual growth rates of real earnings attributable to the cohort effect of 0.75 per cent before 1936, 1.25 per cent in 1936-1946, 1.5 per cent in 1946-1956, and 1.75 per cent in 1956-1976.[18]

As explained above, our estimate of permanent income for each individual is given by (4.7) with a value for α of 0.5. In other words, permanent income is equal to the age-adjusted structural component of earnings given by observable variables, plus one-half of the residual in the earnings equation. This gives an estimate of permanent income for each individual in the sample included in the earnings regressions. But 1,873 of the 10,118 male heads of households were omitted from the regression because their current earnings were $2,000 or less. For these individuals, permanent income was predicted by the structural component alone given by equation (4.4). For wives the same procedure was adopted but here we made an explicit adjustment for non-participation in the labour force at various stages of the life cycle. Permanent income of wives was estimated as

$$Y_i^w = Y_i^e \text{ prob}(E_i > 2{,}000) + \bar{E}_w \text{ prob}(E_i \leq 2{,}000) \tag{4.12}$$

where Y_i^e = permanent income estimate given by (4.7)

$\bar{E}_w$ = mean earnings of those with $E \leq 2{,}000$ (= $160.8)

and the probabilities of earnings being above and below $2,000 were computed for each wife in the sample from the probit estimates of Table 4.[19] Household permanent income is the sum of the estimates for husbands and wives.[20] Mean estimated permanent income of men is $15,928 and of wives is $7,451.

5. The Wealth-Age Profile

With the estimates of permanent income for each household constructed in section 4, we may now examine the wealth-age profile. Table 6 shows the ratio of net worth to permanent income by age range for both the "full sample" of 10,118 households headed by a male and the 8279 households headed by a male and with total net worth greater than or equal to $2,500. The ratios are given for two net worth series, total net worth and net worth excluding the value of owner-occupied housing. The striking feature of Table 6 is that for both the full and the truncated samples, and for both definitions of net worth, there is clear evidence of a hump-shaped pattern in the ratio of wealth to permanent income. Wealth accumulation is rapid in the age range 30-55, reaches a plateau in the pre-retirement phase, and then decumulation occurs in retirement. In all four columns of Table 6 the maximum value of wealth is found in the age bracket 60-64. There is a puzzling dip in the ratio of wealth to permanent income for the group aged 55-59. One possible explanation is that this group was starting its working life when World War II began, and may thus have been particularly adversely affected by the disruption to their early work experience.

Figure 1 shows the age profile of the ratio of wealth to permanent income for the full sample for both definitions of net worth. The hump-shaped pattern is clearly evident.

The percentage reduction in total net worth between ages 60-64 and the age bracket over 75 is 26.3 per cent for the full sample and 20.9 per cent for the sample of those with net worth greater than or equal to $2,500. The corresponding figures for net worth excluding equity in owner-occupied housing are 39.4 per cent for the full sample and 35.3 per cent for the truncated sample. These figures represent quite substantial rates of decumulation, particularly when it is remembered that the net worth figures exclude pension and social security wealth. Both the full and truncated samples exhibit the hump-shaped pattern, although the behaviour of wealth in the early stages of the life cycle appears more plausible for the truncated sample.

The next step is to estimate the wealth equation given by (3.4)

Since the dependent variable is measured in logarithms the model cannot be estimated on the full sample. Moreover, in section 2 we argued that the population may be composed of several groups displaying different types of savings behaviour. We therefore report the results of estimating (3.4) on the truncated sample of households with total net worth greater than or equal to $2,500.[21] To correct for sample selection bias thus induced we use the two-stage procedure employed for the earnings equations in Section 4. Table 7 shows the maximum likelihood estimates of the probit model for low wealth holdings. The estimated coefficients reinforce our earlier remarks regarding the difference between households with negative and those with small but positive amounts of wealth, and low educational attainment as well as low earnings are seen to be correlated with the latter rather than the former. Estimates from the final column were used to construct values of the inverse of Mill's ratio for each household which were used in the estimation of the wealth models shown in Tables 8 and 9.

Table 8 gives estimates of (3.4) for total net worth and Table 9 gives estimates of the same models for the definition of net worth excluding equity in owner-occupied housing. In both cases the sample was truncated by the dependent variable.[22] Column 1 of Table 8 shows estimates of the basic life-cycle equation (3.4) for homothetic preferences. All of the coefficients have the predicted sign (though not all are significantly different from zero at conventional significance levels) and wealth increases with age at a decelerating rate until a maximum is reached at age 68. After this point wealth is a decreasing function of age. Columns 2 and 3 show the effects of introducing additional explanatory variables. Farm families possess greater wealth than is predicted by the simple model which may reflect the importance of land prices to the value of such families' net worth. Unemployment has a depressing effect on wealth, and household size appears to have little significant influence on wealth-holding. Measured wealth does not include the value of life insurance policies, and we know only the number of persons in each household covered by life insurance. We might expect that, ceteris paribus, the more members covered the less would be the level of household wealth invested in other assets. But in fact the coefficient on the life insurance variable is positive, suggesting rather that purchase of life insurance is correlated with a greater than average preference to save (resulting perhaps from a higher than average degree of risk aversion).

In column 3 we test the hypothesis that the ratio of wealth to permanent income is independent of the level of permanent income. Homotheticity appears to be rejected. The higher is permanent income, the lower is the ratio of wealth to permanent income. But this may simply reflect a positive correlation between permanent income and the provision of private or public pensions as we shall see when pensions and social security wealth are discussed further in section 6.

The coefficient of the inverse of Mills' ratio, and its small standard error, show that truncation of the sample would, if no correction were made, lead to biassed estimates. A test of the null hypothesis of no sample selection bias can be performed by making use of the result that the square of the t-statistic of the inverse of Mills' ratio is the Lagrange multiplier statistic (Melino, 1979). This is asymptotically equivalent to the likelihood ratio and Wald tests, and from the χ^2 distribution the null hypothesis is rejected by all four columns in both Tables 8 and 9 at conventional significance levels.

The annual rate of decumulation of wealth is given by the derivative of (3.4) with respect to age. For ages between 60 and 75 the rate of decumulation is $-(\alpha_5 + 2\alpha_6(A-60))$. At age 75 the annual rates of decumulation implied by the first three columns of Table 8 are, respectively, 1.40 per cent, 1.09 per cent, and 1.40 per cent. These are small and are inconsistent with a pure life-cycle model in which date of death is certain. But they are remarkably close to the values computed by Davies (1980) in a numerical simulation of a life-cycle model with uncertainty about date of death. Assuming constant relative risk aversion Davies found rates of decumulation between ages 65 and 85 of around 2 per cent per annum. Allowing for the ommission of social security wealth, which is falling in value after retirement age, our econometric estimates are very close to the simulated values. Other numerical simulations by Diamond (1977) found that the ratio of wealth to permanent income at age 60 would, under "plausible" assumptions, lie between 2 and 6 depending on parameter values and social security coverage. The mean value of the ratio for the 60-64 age range in our sample is 4.56. Hence the behaviour of the "average" household in our sample appears to fit well with the life-cycle model of saving allowing for an uncertain date of death. There is, however, a great deal of variation in household behaviour. Of the 669 households where the head was in the age range 60-64, 249 (37.2 per cent) had wealth to permanent income ratios below 2. The behaviour of this group is less easy to reconcile with the life-cycle model unless these households anticipated very high replacement ratios from pensions and social security (for which there is no evidence in the data).

6. Pensions and Social Security Wealth

The most important component of wealth on which we do not have observations is the value of the right to future pension and old age social security payments. Social security in Canada provides flat-rate benefits to those aged 65 and over and benefits are linked to the consumer price index.[23] Full indexation has been effective since 1972. Other pension schemes include the Canada and Quebec pension plans which cover almost the entire labour force; benefits are related to previous earnings and are indexed. In contrast private pension plans are rarely indexed. An alternative vehicle for private pension provision is Registered Retirement Savings Plans (RRSP). These were introduced in 1957 and increased rapidly in the 1970's after the limit on tax-deductible contributions was raised. Sums invested in RRSP are included in our measure of household net worth. The two main forms of pension wealth which are omitted are, therefore, flat-rate social security and earnings-related pension plans (which may be either private or Canada and Quebec pension plans). For the former we have information on receipts for retirees, and for the latter we have information on both receipts and eligibility.

Social security wealth (SW) is the present value of future receipts from old age social security. Since benefits are indexed we shall assume that the expected real benefit is equal to its current level which, for household i is denoted by S_i. Let the probability of death at any future date of someone presently aged A_i be $p(A_i)$, and the real discount rate be r.[24] Social security wealth is then given by

$$SW_i = S_i \int_0^\infty e^{-[r+p(A_i)]t} \, dt = \frac{S_i}{r + p(A_i)} \qquad A_i \geq A_R$$

$$\qquad (6.1)$$

$$= \frac{S_i}{r + p(A_i)} \cdot e^{-[r+p(A_i)](A_R-A_i)} \qquad A_i < A_R$$

where A_R is the age of retirement which in this case is 65.

$$\log\left(\frac{SW_i}{Y_i}\right) = \log\left(\frac{S_i}{Y_i}\right) + z(A_i) \qquad (6.2)$$

A similar equation defines pension plan wealth PW as a function of the actual or expected pension P with the discount rate now incorporating the rate at which benefits are expected to fall behind the level of consumer prices. The values of S_i were taken to be actual receipts where $A_i > 65$, and the statutory rates of benefit where $A_i \leq 65$. Similarly for P_i, actual receipts were used for retirees and an expected pension was imputed for those in pension plans who were below retirement age. The imputation was based on a regression for pension receipts in terms of permanent income, age, and occupation, adjusted for sample selection bias.[25]

Pension wealth is not a perfect substitute for other forms of wealth, and we assume that total wealth (TW) may be expressed in terms of net worth, social security and pension wealth by a loglinear approximation

$$\log TW = \log W + \gamma \log SW + \delta D_1 \log PW \qquad (6.3)$$

where $D_1 = 1$ if the household is eligible for private or other pension plan, zero otherwise.

If we suppose that the life-cycle model given by (3.4) applies to total wealth, then we have that observed net worth is

$$\log\left(\frac{W_i}{Y_i}\right) = f(A_i) - \gamma \log SW_i - \delta D_1 \log PW_i \qquad (6.4)$$

where $f(A_i)$ is a nonlinear function of age.

Approximating the function f by the original piecewise nonlinear function the results of estimating (6.4) are shown in Column 4 of Tables 8 and 9. The coefficients of the age terms cannot now be interpreted in terms of the pure age profile of total wealth. Both pension wealth variables have the predicted negative sign and are significantly different from zero. The coefficient on permanent income is now insignificantly different from zero and the hypothesis of homothetic preferences cannot be rejected when we allow for pension wealth. These findings lend some support to the hypothesis that, ceteris paribus, social security and pension wealth reduce household saving, and are of interest because they are based on a data set comprising both young and old households in contrast with the several studies using data on heads of households in the immediate pre-retirement phase (Kotlikoff 1979, Blinder et al 1980, Diamond and Hausman 1980).

7 Conclusions

We have found that there is evidence that wealth declines after retirement once we control for differences in permanent income. Moreover this is true of net worth excluding the value of rights to future payments of pensions and social security. But the rate at which wealth declines after retirement is less than would be predicted by a life cycle model with neither bequests nor uncertainty about date of death. Our evidence is consistent, therefore, with either a significant bequest motive or uncertainty about date of death.

There is a tendency in the literature to identify the behaviour of all households with a single model. Our evidence suggests that different motives are likely to exist side by side. The estimated "life-cycle" model accounts for only 50% of the variance of the ratio of wealth to permanent income and although there is clearly a good deal of noise in the measurement of permanent income, it is likely that there is a distribution of motives for saving in the population. The observation that the wealth holdings of a majority of the population appear explicable in terms of a life cycle model is perfectly consistent with the evidence that a certain fraction of the population does not, for what ever reason, save adequate resources for retirement. Indeed, the evidence in our data set suggests that there is such a group - although we cannot rule out the possibility that households with little wealth plan to finance retirement consumption almost entirely out of indexed social security.

Finally, we may note that the existence of private pensions and social security both appear to have a negative effect on individual savings. The extent to which this leads to less national saving depends, of course, on the extent to which private and social pension schemes are funded.

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FOOTNOTES

1. Shorrocks (op.cit) found some evidence of a decreasing wealth-age relation, but this depended critically upon an adjustment for differential mortality (the rich live longer) which becomes significant only at quite advanced ages.
2. Two recent US studies using data on older men which did control for the effects of permanent income (Blinder, Gordon and Wise (1980) and Diamond and Hausman (1980)) found results which were not encouraging to the life cycle model of wealth accumulation. These studies are discussed further in section 2.
3. In particular, doubt is cast on the use of data from estate tax returns which by construction ignores pension wealth.
4. For example, estate tax data typically refer only to estates above a de minimis limit which excludes a large fraction of the population, and Mirer (op.cit) deleted from his sample all couples for which any wealth item was ambiguous, a criterion for selection which may be correlated with the level of wealth.
5. All computations on this data base were carried out by the authors and should not be attributed to Statistics Canada. Further details of the data base may be found in Statistics Canada (1979).
6. Data on incomes and wealth are recorded for this group.
7. The value of most bonds was recorded at face value.

8. The shares were computed using population weights for households.

9. The sample selection bias induced by restricting the model to positive levels of net worth is discussed, and corrected for, in section 5.

10. Blinder et al. (op. cit.) used longitudinal data with 4 observations on earnings, at two-yearly intervals to construct an estimated earnings profile for each individual in their sample.

11. Retirement before the age of 60 was negligible in our sample.

12. This definition excludes the annuity value of receipts of gifts and inheritances, on which no data are available in our sample, and also "super-normal" profits (and losses).

13. See Hausman (1978), Mundlak (1978), Hausman and Taylor (1980) for a discussion of the estimation of fixed effects models, and also Nickell (1980) for the biases involved in estimating such models when the dynamic structure is misspecified.

14. The transitory component of earnings, u, will pick up some of these effects, but it does not allow the density function of earnings to have a positive mass at particular earnings levels such as zero (for unemployment throughout the year) or a low but positive level corresponding to a conventional number of hours for part-time workers.

15. Essentially the same procedure was suggested by Lee and Trost (1978); see also the different approach recommended

by Amemiya (1973). The set of independent variables in the probit equations is not identical with that in the subsequent regression because earnings (and, later, wealth) below the truncation level are generated by a different model e.g. part-time work.

16. Although the parameter estimates are consistent, the estimated standard errors are biassed (but not necessarily downwards, see Greene (1981)). This is of little concern in the earnings equations which are used simply to construct an instrument for permanent income.

17. The computation of the inverse of Mills' ratio for each observation allows for the fact that the probit model of Table 4 is for the probability of not being in the truncated sample. In this case the inverse is $f(-X\beta)/F(-X\beta)$ where f and F are the density and distribution functions respectively of the standard normal variate.

18. The cohort effect is described by a piecewise linear function for $c(A_i)$ such that at the "standard" age (45) it has a zero value. With the figures for the growth rates of real earnings given in the text, the function is

Age	C(A)
$A_i \leqslant 35$	$-[(0.15 + 0.0175(35 - A_i))]$
$35 < A_i \leqslant 45$	$- 0.015(45 - A_i)$
$45 < A_i \leqslant 55$	$0.0125(A_i - 45)$
$55 < A_i$	$0.125 + 0.0075(A_i - 55)$

19. The variables used to compute the probabilities were the constant terms and the education and children dummies.

In the wives' earning regressions the sign of the coefficient of the occupational dummies reflects the fact that reported earnings of wives are high in farming (the default occupation) which is probably the result of tax planning.

20. Taking the arithmetic rather than the geometric sum of permanent income for husbands and wives will lead to some bias in the estimates of (3.4), but this is likely to be small because not all households contain wives and the mean permanent income for wives is much lower than that for men because of nonparticipation.

21. Figure 1 and Table 6 show, however, that the hump-shaped pattern is characteristic of both the full and truncated samples. Results for the full sample are available from the authors on request.

22. The values of the Mills' ratio used in Table 9 were computed from estimates of a probit model for $W' < 2500$, the results of which are available from the authors on request.

23. Income-tested guaranteed income supplement available to pensioners is included in the data for social security payments. Further details of pension provisions in Canada may be found in Statistics Canada (1978b) and Wolfson (1979).

24. This is the simplest method of modelling uncertainty about date of death; a more sophisticated model would treat $p(A)$ as a function of time as well as of age.

25. Details available from the authors on request.

TABLE 1 DISTRIBUTION OF NET WORTH

BY DECILES 1977

(dollars)

	Unweighted Sample		Weighted Sample	
Decile	Mean	Standard Deviation	Mean	Standard Deviation
1	-2,938.4	9299.9	-2,889.1	9556.1
2	459.4	397.3	299.8	288.8
3	3,184.9	1187.2	2,471.0	1006.2
4	8,943.9	2074.0	7,605.3	1964.4
5	17,519.8	2857.7	16,024.3	2897.8
6	28,082.9	3129.2	27,365.2	3418.8
7	39,872.4	3748.3	39,931.2	3835.1
8	56,050.4	5803.4	55,898.7	5598.5
9	84,982.7	13033.2	81,314.4	10992.9
10	358,611.9	686393.0	222,681.8	341391.3
All Sample	59,454	240,282.2	46,273.0	131,490.7
Median	22,632		21,754	

Number of households 12,734

TABLE 2 CHARACTERISTICS OF LOW WEALTH-HOLDERS

	Net Worth (W)			Net Worth excluding Equity in Home (W')		All Sample
	$W \leq 0$ (1)	$0 < W < 2500$ (2)	$0 < W < 5000$ and $50 < A < 65$ (3)	$W' \leq 0$ (4)	$0 < W' < 2500$ (5)	(6)
Number of Observations	1318	1664	303	2150	2745	12,734
Percentage in column with						
1. Age of Head of Household < 40	75.0	58.5	-	67.3	50.6	43.8
2. Household Earnings < $6,000	40.5	53.4	54.1	33.6	47.3	30.8
3. No Pension Plan	73.1	78.8	75.2	69.2	73.8	62.9
4. No Life Insurance	73.1	72.4	70.6	68.3	68.5	57.2

Note The percentage figures for the age of head of household refer to the total sample excluding the 139 special family units for whom age is not made available.

TABLE 3 CHARACTERISTICS OF THE TRUNCATED EARNINGS SAMPLE

	Men		Wives	
	E>2,000	E≤2,000	E>2,000	E≤2,000
Mean Earnings ($)	14,290.4	146.3	7,557.7	160.8
Mean Age (years)	40.36	61.20	36.77	43.21
Number of Observations	8,245	1,873	3,018	5,784

Note

Earnings are annual earnings in 1976.

TABLE 4 PROBIT MODEL FOR EARNINGS OF $2,000 OR LESS

(standard errors in parentheses)

Variable (X)*	Coefficient (β) Men	Wives
Constant	-1.647 (0.060)	-1.070 (0.033)
Age < 20	0.877 (0.051)	1.608 (0.031)
Age > 65	0.926 (0.010)	0.426 (0.020)
Did not work	2.767 (0.026)	2.994 (0.027)
Worked part-time	0.929 (0.030)	0.827 (0.026)
Education: none or elementary	0.419 (0.025)	0.446 (0.025)
Main source of household income is investment income	0.934 (0.021)	0.573 (0.019)
Married	-0.339 (0.061)	-
Number of children below age 7	-	0.200 (0.019)
Number of Children aged 7-11	-	0.195 (0.030)
χ^2	6086.4	6050.1
Number of observations	10,118	8,802

Note Prob$(E \leq 2000) = \text{Prob}(X\beta + u > 0)$; $u \sim N(0,1)$

The χ^2 value is 2 x (the loglikelihood of the estimated model minus the loglikelihood of a model with only a constant term). For men the number of degrees of freedom is 7 and for wives 8.

*The dummy variables take the value unity when the description applies to the individual, zero otherwise.

TABLE 5 SECOND STAGE OLS ESTIMATES OF LOG EARNINGS EQUATIONS

(standard errors in parentheses)

Variable	Coefficient Men	 Wives
Constant	6.435 (0.181)	8.154 (0.300)
Age	0.133 (0.013)	0.076 (0.023)
$(Age)^2 \times 10^{-3}$	-2.243 (0.314)	-1.739 (0.568)
$(Age)^3 \times 10^{-5}$	1.092 (0.235)	1.286 (0.454)
Educational Dummies		
9-10 years schooling	0.133 (0.018)	-0.072 (0.034)
11-13 years schooling	0.220 (0.018)	0.032 (0.032)
Some post-secondary	0.216 (0.025)	0.046 (0.044)
Post-secondary diploma	0.245 (0.023)	0.085 (0.038)
University degree	0.413 (0.026)	0.221 (0.047)
Occupational Dummies		
Managerial	0.503 (0.034)	-0.048 (0.081)
Professional and Scientific	0.303 (0.033)	-0.127 (0.069)
Clerical	0.198 (0.036)	-0.307 (0.067)
Sales	0.303 (0.032)	-0.428 (0.071)
Services	0.134 (0.032)	-0.487 (0.069)
Mining and Quarrying	0.302 (0.031)	-0.367 (0.083)
Product Fabricating	0.274 (0.031)	-0.384 (0.075)
Construction Trades	0.247 (0.030)	-0.904 (0.229)

(Cont..)

TABLE 5 Continued

Variable	Coefficient	
	Men	Wives
Transport	0.278 (0.030)	-0.288 (0.086)
Regional Dummies		
Quebec	0.075 (0.019)	0.092 (0.030)
Ontario	0.174 (0.018)	0.087 (0.029)
Prairies	0.171 (0.019)	0.049 (0.031)
British Columbia	0.275 (0.023)	0.119 (0.037)
Area Dummies		
Small towns (pop. < 15,000)	-0.061 (0.017)	-0.043 (0.027)
Rural	-0.144 (0.016)	-0.111 (0.024)
Marriage Dummy	0.216 (0.020)	-
Farm Family Unit	0.121 (0.035)	-
Inverse Mills Ratio	-0.280 (0.033)	-0.429 (0.026)
$\bar{R}^2$	0.260	0.211
Number of Observations	8245	3018

Note

The dummy defaults are; education: less than 9 years schooling; occupation: farming, fishing and forestry; region:Atlantic; area:urban with population $\geq$ 15,000

TABLE 6 RATIO OF NET WORTH TO PERMANENT INCOME BY AGE 1977

	FULL SAMPLE			NET WORTH > $2500		
Age	No. of Observations	$\frac{W}{Y}$	$\frac{W'}{Y}$	No. of Observations	$\frac{W}{Y}$	$\frac{W'}{Y}$
15-24	836	0.280	0.181	357	0.678	0.455
25-29	1350	0.656	0.338	928	0.981	0.523
30-34	1322	1.374	0.731	1066	1.745	0.941
35-39	1052	2.047	1.121	914	2.370	1.304
40-44	959	2.883	1.699	857	3.237	1.911
45-49	948	3.800	2.323	852	4.230	2.589
50-54	820	4.380	2.800	740	4.858	3.105
55-59	799	4.262	2.660	732	4.656	2.909
60-64	669	4.583	2.943	617	4.976	3.202
65-70	518	4.210	2.511	473	4.607	2.747
70-75	463	3.733	2.071	416	4.153	2.303
>75	382	3.377	1.782	327	3.935	2.072

Note W is total net worth; W' is total net worth excluding equity in own home; Y is estimated household permanent income

TABLE 7 PROBIT MODEL FOR LOW WEALTH HOLDINGS

(standard errors in parentheses)

Variable*	Coefficient		
	$W \leq 0$	$0 < W < \$2,500$	$W < \$2,500$
Constant	2.793 (0.895)	1.996 (0.917)	4.227 (0.823)
log Y	-0.421 (0.291)	-0.278 (0.299)	-0.477 (0.268)
Household Earnings < \$6,000	0.097 (0.156)	0.301 (0.158)	0.353 (0.145)
Number of persons unemployed	0.161 (0.077)	0.127 (0.078)	0.229 (0.072)
Age < 40	0.807 (0.174)	0.393 (0.181)	0.885 (0.160)
Self-Employed	-0.198 (0.081)	-0.877 (0.102)	-0.607 (0.080)
Home-owner	-1.373 (0.081)	-1.562 (0.082)	-1.899 (0.082)
Farm Family +	-0.209 (0.053)	-1.431 (0.098)	-0.406 (0.055)
Married	0.225 (0.073)	-0.132 (0.072)	0.019 (0.067)
Education:Secondary or above	-0.178 (0.117)	-0.293 (0.120)	-0.361 (0.108)
Nos. below limit	895	944	1839
Nos. above limit	9223	9174	8279
$\chi^2(9)$	1662.9	1967.0	4118.5

* Dummy variables take the value unity when the description applies to the household, zero otherwise. Individual variables refer to the head of household.

\+ A family in which any member receives more than 50% of his income from self-employment in farming

TABLE 8 NET WORTH REGRESSIONS : TRUNCATED SAMPLE

$W \geq 2500$

(standard errors in parentheses)

Dependent Variable is $\log\frac{W}{Y}$

	(1)	(2)	(3)	(4)
Constant	-0.912 (0.099)	-1.055 (0.097)	1.935 (0.353)	4.426 (0.437)
V1	0.073 (0.008)	0.079 (0.007)	0.075 (0.007)	0.087 (0.007)
V2	0.056 (0.005)	0.054 (0.004)	0.047 (0.005)	0.048 (0.004)
V3	0.039 (0.005)	0.041 (0.005)	0.035 (0.005)	0.035 (0.005)
V4	0.005 (0.006)	-0.002 (0.005)	-0.004 (0.005)	0.001 (0.005)
V5	0.016 (0.015)	0.028 (0.014)	0.022 (0.014)	0.005 (0.014)
V6	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)
V7	-0.019 (0.091)	0.003 (0.086)	-0.009 (0.086)	-0.056 (0.085)
Farm Family Dummy		1.309 (0.042)	1.255 (0.043)	1.203 (0.043)
Number of Persons Unemployed		-0.026 (0.017)	-0.057 (0.017)	-0.055 (0.017)
Number of Adults in household		-0.024 (0.012)	-0.008 (0.012)	0.032 (0.013)
Number of Persons with Life Insurance		0.030 (0.011)	0.041 (0.011)	0.047 (0.011)
log Y			-0.286 (0.033)	-0.068 (0.035)
Social Security				-0.605 (0.047)
Private Pensions				-0.023 (0.003)
Inverse of Mills' Ratio	-1.413 (0.038)	-1.282 (0.037)	-1.347 (0.038)	-1.407 (0.038)
SE of equation	0.874	0.783	0.776	0.756
$\bar{R}^2$	0.385	0.450	0.455	0.469
Degrees of freedom	8270	8266	8265	8258

TABLE 9 NET WORTH REGRESSIONS : TRUNCATED SAMPLE

$W' \geq 2500$

(standard errors in parentheses)

Dependent Variable is log $\frac{W'}{Y}$

	(1)	(2)	(3)	(4)
Constant	-0.206 (0.157)	-1.367 (0.160)	1.879 (0.489)	3.734 (0.595)
V1	0.012 (0.011)	0.049 (0.010)	0.047 (0.010)	0.065 (0.010)
V2	0.040 (0.007)	0.055 (0.007)	0.047 (0.007)	0.050 (0.007)
V3	0.029 (0.007)	0.042 (0.007)	0.035 (0.007)	0.036 (0.007)
V4	0.010 (0.008)	-0.0004 (0.0075)	-0.002 (0.007)	0.003 (0.007)
V5	0.034 (0.021)	0.037 (0.020)	0.029 (0.020)	0.016 (0.020)
V6	-0.001 (0.002)	-0.002 (0.001)	-0.002 (0.001)	0.0004 (0.0015)
V7	0.003 (0.128)	0.038 (0.120)	0.025 (0.119)	-0.081 (0.117)
Farm Family Dummy		1.865 (0.061)	1.809 (0.062)	1.668 (0.061)
Number of Persons Unemployed		-0.013 (0.028)	-0.050 (0.028)	-0.045 (0.028)
Number of Adults in Household		-0.033 (0.018)	-0.011 (0.018)	0.032 (0.018)
Number of Persons with Life Insurance		0.025 (0.015)	0.034 (0.015)	0.050 (0.015)
log Y			-0.317 (0.045)	0.022 (0.049)
Social Security				-0.674 (0.066)
Private Pensions				-0.050 (0.004)
Inverse of Mills' Ratio	-1.330 (0.063)	-0.441 (0.073)	-0.434 (0.072)	-0.534 (0.072)
SE of equation	1.457	1.276	1.267	1.218
$\bar{R}^2$	0.215	0.313	0.318	0.345
Degrees of freedom	6646	6642	6641	6634

FIGURE 1

RATIO OF WEALTH TO PERMANENT INCOME: AGE PROFILE