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DISSAVING BY THE ELDERLY, TRANSFER MOTIVES AND LIQUIDITY CONSTRAINTS

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ABSTRACT

Two explanations have been proposed for the observed slowness of wealth decumulation by the elderly in the literature: the precautionary saving induced by (uninsurable) uncertainty about the time of death or by the possibility of major catastrophes in old age that require large outlays; the desire to pass part of the accumulated assets on to one's heirs. We reconsider the issue of wealth decumulation by the elderly and assess the presence of a transfer motive, drawing on Italian data. We show that if intergenerational transfer of assets takes place well before the time of death, induced for instance by existence of liquidity constraints on younger families, then tests for the presence of a transfer motive based on the relative speed of decumulation of elderly households with and without a potential bequest motive might have little discriminatory power. We suggest that in this case one should look at the whole pattern of asset accumulation and decumulation. We also offer an alternative test of the bequest motive based on life insurance purchases.

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1. Introduction

The stripped-down version of the life cycle model implies that older consumers should start decumulating assets right after retirement at a rate sufficient to achieve zero wealth by the time of death. Of course, this extreme pattern of behaviour only obtains under highly restrictive assumptions, such as lack of uncertainty about the time of death, the absence of health uncertainty or the absence of a bequest motive. Relaxing either assumption might still lead to decumulation of assets as households get older, though at a slower rate.

Several studies, for various countries, provide evidence on this issue.[1] By and large, there does appear to be asset decumulation by the elderly though at a much lower rate than would be implied by a life cycle model without uncertainty or bequests. Thus, as is pointed out by Ando and Kennickell (1987), the traditional characterization of the no-uncertainty-no-bequests life cycle model is clearly rejected by the data. While there is a fair consensus on this

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1. Modigliani (1988) and Kotlikoff (1988) in their debate on the role of intergenerational transfers, provide a summary of the literature and an assessment of the empirical evidence. Overall, it appears that some asset decumulation takes place but at a much slower speed then that implied by the stripped-down version of the life cycle model. Brugiavini (1987) reaches the same conclusion using Italian cross sectional data. She finds that, some decumulation of assets takes place after retirement but at speeds inconsistent with the simple life cycle model. Ando and Kennickell (1987), pointed out that in the U.S. the pace of wealth decumulation is too slow to be accounted for by death uncertainty alone.

statement, there is much less agreement on the reason for the observed slowness of decumulation. As already mentioned, two main explanations have been proposed: the precautionary saving induced by (uninsurable) uncertainty about the time of death or by the possibility of major catastrophes in old age that require large outlays; the desire to pass part of the accumulated assets on to one's heirs. Discriminating between these two possibilities is important as the first is fully consistent with the life cycle theory and its implications for aggregate saving while the second might impose significant departures from that model.[2] Ando (1985) and Hayashi, Ando and Ferris (1988) find that in Japan the elderly dissave and argue that the observed dissaving is not due to life cycle consumption smoothing but to substantial inter vivos transfers. In contrast, Hurd (1987, 1989) argues the absence of a bequest motive in the U.S., finding that elderly households potentially having a bequest motive, i.e. those with adult independent children, dissave proportionally more than elderly households without children. Thus, the slow rate of decumulation of the elderly would be due to mortality risk.

In this paper we reconsider the issue of wealth decumulation by the elderly and assess the presence of a transfer motive, drawing on Italian data. As we will show, if there are incentives to anticipate bequests well before the time of death, as provided for instance by the existence of

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2. A bequest motive does not necessarily hamper the aggregate implications of the life cycle theory. Provided that the fraction of the total life time resources allocated to bequests depends on the donor's position in the distribution of income and not on the level of resources in his possesion, the well known form of the aggregate consumption function as a linear, homogeneous function of labor income and wealth is left unchanged. This feature was first observed by Modigliani and Brumberg many years ago. See Modigliani (1986) for a review of issues related to this point.

borrowing constraints on the children, Hurd's test might have little power in discriminating among alternatives explanations of the slow decumulation by the elderly.

We start in Section 2 discussing a potential weakness of tests of the bequest motive based on the relative speed of wealth decumulation of elderly households with and without potential heirs. They, in fact fail to recognize that when liquidity constraints are likely to be relevant inter vivos transfers might be an alternative to post mortem bequests. We argue that to assess the existence of a bequest motive, or more generally of a transfer motive, one should look at the entire pattern of wealth accumulation and decumulation.

Accordingly, we document in Section 3 the pattern of wealth accumulation and decumulation by Italian households, drawing on the 1989 Bank of Italy Survey of Household Income and Wealth (SHIW). Italy, in this respect, may well be an ideal case, with its typically strong family ties and the widespread belief that the bequest motive is important. On the other hand, as documented by Guiso, Jappelli and Terlizzese (1993a), liquidity constraints due to the imperfectly working of the consumption loan and mortgage markets are widespread, which makes the anticipation of bequests to the time when the liquidity constraint is binding, worthwhile. The use of cross-section data to make inferences on the pattern of wealth over age of a representative household can be highly misleading unless proper account is taken of the fact that households of different ages are also different households and that households' behaviour might differ substantially according to composition. Thus, we adjust for differences in productivity among cohorts, and deal with the issue, first raised by Shorrocks (1975), of the wealth-mortality correlation. We also discuss various adjustments to account for several sources of bias, including the merging of elderly individuals

into younger households and, more importantly for the Italian case, the tendency of young consumers to live in their parents' houses long after they start working. The main result here is that some decumulation appears to take place, roughly after retirement, though at a slow rate. However, while according to wealth data the elderly decumulate assets, saving as gauged by income and consumption data is persistently positive at all ages after retirement. While this finding, as argued by Hayashi, Ando and Ferris (1988), is consistent with inter-vivos transfers to the younger generations, we also observe that this discrepancy may be partly generated by differential capital gains and losses on financial assets and liabilities induced by inflation.

We then rely, in Section 4, on the pattern of wealth and savings documented in Section 3 to test the existence of a transfer motive looking at its implication on the pace of wealth accumulation and decumulation. In Section 5 we offer additional evidence on the presence of a transfer motive, based on information on life insurance purchases and on the relative economic condition of parents and independent working children. Section 6 brings several loose ends together and concludes.

2. Testing the existence of a bequest motive

A possible way to assess the existence of a bequest motive is to contrast the behaviour of households with and without a potential bequest motive, that is households with and without children. Exploiting this idea, Hurd (1987, 1989) finds, using panel data on wealth and consumption from the U.S. Retirement History Survey, that elderly households with

living children decumulate faster than those without.[3] He interprets his results as evidence against the presence of a bequest motive.[4] This interpretation, however, is granted only if, as assumed by Hurd, bequests take place at the death of the donor. This imposes a strong restriction on the timing of the transfer. In assessing the presence of a bequest motive one should recognize that bequests are transfers between generations and allow for the possibility that they might take place before the death of the donor. As a result, it might well be that those with a stronger bequest or transfer motive actually decumulate faster than those with a weaker motive. For instance, as argued by Cox (1990), if young households are subject to liquidity constraints, their parents have a strong incentive to anticipate planned bequests to the time when the borrowing constraint is binding. Therefore the observed decumulation of wealth could reflect transfers from the older to the younger generation. Thus, Hurd's finding that elderly households with living children decumulate more than those without cannot be taken as conclusive evidence against the bequest motive; it might in fact be interpreted as evidence in favour of the existence of a transfer motive.

Laitner (1993) studies the interaction between liquidity constraints and intergenerational transfers in a general equilibrium overlapping generations model with altruistic consumers. Looking at stationary equilibria, he shows that the presence of liquidity constraints might give

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3. A similar result was obtained by Borsch-Supan (1991) using the Socio-Economic Panel for Germany while Ohtake (1991) using cross sectional data for Japan finds that elderly households with living children dissave significantly less that households without children.

4. Even accepting that there is no bequest motive, it is not clear why elderly households with living children should decumulate faster than those without. On this point, Hurd provides no interpretation.

rise to substantial inter vivos transfers from parents to their children, while at the same time younger households might accumulate faster in anticipation of their intention to make a transfer later in life.

This suggests that to assess the existence of a bequest motive, or more generally of a transfer motive, one should look at the entire pattern of wealth accumulation and decumulation. The accumulation behaviour of working parents with dependent children can be contrasted with that of households without children. If a transfer motive is present, the former should accumulate wealth faster than the latter; at a later stage, when children become independent adults and some of them are liquidity-constrained, parents with non-dependent children will rapidly decumulate assets to provide their children with liquidity.

Before tackling directly these issues in Section 4, we document in the next section the wealth accumulation and decumulation behaviour of Italian households.

3. The age pattern of wealth

Column 1 of Table 6.1 shows the cross-section pattern of wealth over age. The data used are drawn from the 1989 Survey of Household Income and Wealth (SHIW). Which contains detailed data on households' characteristics, earnings, income from capital, and financial and real assets.[5] It also contains information on the age and economic status of any children living outside the parent's house, which will be exploited further on.

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5. A full description of the SHIW is provided by Brandolini and Cannari in the methodological appendix to this volume.

Wealth appears to increase rapidly with age up to the age class 50-59 when it reaches a peak; it declines thereafter, with most of the decumulation taking place in the 15 years after retirement (age 60 for men and 55 for women). Wealth flattens subsequently, before declining substantially at very old ages. From these data one cannot, however, conclude for wealth decumulation by the elderly. As noted by Shorroks (1975), the study of the age-wealth relationship on the basis of cross-sectional data could be misleading. Examining individuals of different ages observed at a single point in time in order to extract information on the behaviour of a typical individual over age, can distort the behavioral pattern of the typical individual (household) unless proper account is taken of at least two factors.

First, in a growing economy individuals belonging to different cohorts also belong to different vintages of productivity and hence of lifetime resources. Thus, if growth is sufficiently rapid wealth decumulation will appear in the cross-sectional data even if none is present in the longitudinal profile.

Second since survival probability is likely to be correlated with wealth, the mean wealth of older cohorts overstates the wealth of the typical individual. This effect, of course tends to offset the cohort effect. Thus, to exploit a cross-section information to illuminate on the age pattern of wealth of the average individual, proper adjustments need to be made for cohort effects and the wealth-mortality correlation.

3.1 The growth-adjusted profile

The second column of Table 6.1 shows the growth-adjusted profile. The adjustment is made by dividing net

worth by a measure of permanent income that incorporates cohort effects (see the appendix for the details on the construction of permanent income). The adjustment for growth has substantial effects: first of all, the peak in wealth is reached after retirement, in the age class 65-69; second, the decumulation appears to take place only after age 69; third, in the 10 years following the peak in wealth only 13 percent of net worth is decumulated while the unadjusted figures show a decumulation of about 40 percent. However, the observed slow speed of decumulation might be due to the sample bias induced by the negative correlation between wealth and mortality. Thus, before reaching firm conclusions one needs to tackle this issue.

3.2 Adjusting for the wealth-mortality correlation

As noted by Shorroks (1975), the adjustment for the wealth-mortality correlation is potentially important. Clearly its empirical relevance depends on the extent of the effect of wealth on the probability of death. Unfortunately data on the wealth and characteristics of the deceased are not generally available. The panel component[6] of the 1989 SHIW does have information on those interviewed in 1987 who died between 1987 and 1989, but the size of the sample is too small to allow a reliable estimate of the correlation between wealth and mortality. However, some information is available from census data, and this can be used to estimate the wealth-mortality relationship. Table 6.2 displays the probability of death for various types of household computed by the Italian Central Statistical Institute (ISTAT) according to economic status and age of the deceased. Based on a set of criteria (see the note to the table), families

6. The panel component is a sample of 1208 families already interviewed in 1987. See the methodological appendix for details.

are classified in increasing order of affluence from Type 1 to Type 5.

The main feature, perhaps a surprising one, is that while there is a clear negative relation between the indicator of economic status and the probability of death at younger ages, there is little (if any) correlation at ages above retirement. In the age groups 65-69 and 70-74, the probability of death is initially increasing with the indicator of the economic condition of the household and declines only for the most well-off.

Indeed, mortality is lower for Type 1 households than for Type 5. This suggests that in so far as the classification of households by type is a monotonic function of wealth, the Shorrocks composition adjustment might have little effect on the age-wealth pattern after retirement since one should adjust the weights of households at both ends of the wealth distribution upwards.

To assess whether the indicator of family type is a good proxy for wealth or income, we have classified families in the SHIW using ISTAT's methodology and identified the five family types (see note b to Table 6.2). For each family type and age-class of the household head we have computed mean wealth. The results are shown in Table 6.2, with average income in parentheses. There is a very strong positive correlation between the family type indicator and both mean wealth and income, so the negative correlation between mortality and family type at young and middle ages carries over in terms of wealth and income. However, for the age-groups past retirement it is confirmed that the poorest households have a lower probability of death than the

richest.[7]

Using these figures and assuming that the mortality ratios are constant across age within each age class, it is possible to adjust the age-wealth profile for the correlation between wealth and mortality. This entails rescaling the weights of each family-wealth group with their survival ratio. The result of this adjustment is reported in the last row of the table. Not surprising the effect on the profile is negligible. While the estimate of the mean level of wealth at each age class is reduced, its pattern over age is unchanged. Thus we can conclude that at least in the Italian case, but probably for other countries as well, this adjustment is likely to be of little importance. We accordingly we ignore it.

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7. Some additional evidence on the wealth mortality correlation is available for Japan. Using 1985 and 1990 data on mortality by age and on average income in 47 Japanese regions, we found that while there is some negative correlation between income and mortality at ages before 60, the correlation disappears or even changes sign at older ages. These results are consistent with the Italian data and suggest that ignoring the Shorrocks adjustment in constructing wealth, income and consumption profiles from cross-sectional data is not likely to alter the results significantly. For the U.S., we have assembled from the census and vital statistics data similar to those for Japan, separated by race. The result suggests that there is little correlation between income and mortality at any age. However, for the U.S., variation in mean income among states is rather too small for the results to be reliable, requiring further work with more detailed data.

3.3 Adjusting for household composition

It is important to notice that in the computation of the age-wealth profiles presented in Table 6.1 one overlooks two possible sources of bias, arising from the fact that the age pattern of household wealth could reflect the pattern of saving of individuals living together but at very different points in the life cycle. The first type of problem, noticed by Ando (1985) and Hayashi et al. (1988), relates to extended families. If extended families are widespread, as in Japan, wealth decumulation of the elderly may be substantially underestimated since households with elderly individuals do not appear as such in the sample. This problem is likely to be much less significant in Italy. Table 6.3 reports information on the structure of Italian households by type. Extended households differ substantially in terms of accumulated assets and propensity to save, but only 4.3 per cent of the households in the sample are extended in the sense of dependent parents living with their children.[8] Further evidence on this phenomenon is given in Table 6.4, which reports information on elderly people moving in and out of their children's family based on data from the panel component of the 1989 SHIW. The probability of an extended family forming over a two-year period is around 2 percent. However, there is only a slightly lower probability of an elderly parent's leaving his children's house or of an extended family dissolving. In both cases, movements in wealth and disposable income are considerable; as they move in or out, these elderly persons bring not only their income but their assets as well with them. Nor is the merging phenomenon confined to poor parents. Rather, the income of such entrants is higher than average income in the survey.

8. The dominance of nuclear households in the Italian economy is not a recent phenomenon. Rather, as documented by Federici (1984) by the 19th century it was already the main form of family organization.

However, given the small number of extended families in the sample it is unlikely that adjusting for them will have a significant effect on the age-wealth profile; in fact, taking it into account increases wealth decumulation only sligtly.

The second possible source of bias relates to the presence of young workers still living with their parents, or of multiple-earner households with earners of different generations. In Italy, children tend to live with their parents long after they start working, in the meantime accumulating assets before becoming independent (or in order to do so). Ando, Guiso and Terlizzese (1992) found that young dependent workers are likely to build considerable wealth, so that the accumulation of the young could compensate for the decumulation by their parents. To allow for this possibility, we limit our analysis to the sample of pure nuclear households, i.e. households with husband and wife (if present) and non-working dependent children (if present).[9]

Column 1 of Table 6.5 reports the age-wealth profile for this adjusted sample, which comprises 5,405 households (8,274 in the original sample). The adjustment proves particularly important. The ratio of wealth to permanent income now peaks at age 65-69 and declines smoothly thereafter. In the ten years following the peak, 18 per cent of total wealth is decumulated. The annual rate of decumulation is 1.68 per cent. Thus, people are likely to die still honding considerable amounts of wealth.

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9. Limiting our investigation to "nuclear" families may introduce additional biases if the presence and absence of young working adults is systematically related to some characteristics of the host family, such as income, wealth, and the average propensity to save. However, there is no way to obtain any information on such a possibility from any known data base, since it would require extremely detailed accounts of household finances separated into activities of individuals.

3.4 Wealth decumulation and the conventional measure of saving

A puzzling feature of the evidence on wealth decumulation based on the analysis of the age-wealth profile, is that it is not confirmed by the data on saving, if the latter is defined as the difference between income and consumption. The last column of Table 6.5 shows that for the sample of pure nuclear households the saving rate is positive for all age-groups, albeit slightly declining in old age as predicted by the life cycle theory. Part of the difference between the two measures of saving presumably stems from sample selection bias[10] and from the likelihood that the survey underestimates household consumption more seriously than income. However, reasonable adjustments to consumption and income can hardly account for saving rates as high as 20 percent.[11] Further, this inconsistency between savings measured by changes in net worth and savings measured by income and consumption, is not specific to Italy. Hayashi, Ando and Ferris (1988) show that the same problem arises in the Japanese case. Data on income and consumption from the Consumer Expenditure Survey and on net worth from the Survey of consumer finances, reported by Ando and Kennickell (1987) can be used to show that qualitative similar results also hold for the U.S. data.

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10. For example, suppose that, on average, families incur significant expenses when the head of the family dies or becomes incapacitated and the family is taken in by a younger household. If this occurs during spring and the survey is conducted later in the year, then since the family no longer exists the expense in question will not be registered as part of consumption, but the reduction in net worth from the previous year will be recorded.

11. In the methodological appendix to this volume, Brandolini and Cannari show that SHIW data underestimate both consumption and income, with underestimation of consumption exceeding that of income by 5 percentage points.

These figures, as Hayashi, Ando and Ferris (1988), argue could be consistent with saving by the elderly together with intergenerational transfers taking place from the old to the younger generation. This interpretation might also explain the rapid accumulation of wealth by younger households that is reflected in the wealth data which, again, does not square with savings as measured by income and consumption data (Ando, Guiso and Terlizzese, 1992).

An alternative explanation of this inconsistent pattern exhibited by saving measured as change in net worth and as income minus consumption is based on the distortion induced in the conventional measure of saving by the presence of inflation and of financial assets whose value is fixed in nominal terms. If a family owns a significant amount of financial assets, inflation would reduce the family's net worth and saving measured as the change in net worth would reflect this fact, but saving measured as income minus consumption will not reflect it. Similarly, if a family is carrying a debt fixed in nominal terms, under inflation it acquires capital gains.[12]

Furthermore, these capital gains and losses might not be evenly distributed among households of various types. If,

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12. This observation, of course, is well known, and it has become a common practice in handling aggregate data, to adjust income to reflect capital gains and losses due to inflation. In the survey data, however, the measurement of households financial assets and liabilities appeared to be particularly poor, so that for most purposes it seemed better not do adjust income. On the other hand, the underestimation of financial assets and liabilities appears to be reasonably uniform over the entire sample and does not seem to change dramatically from one year to the next, so that the change in net worth probably contains significant amount of information about the saving of the family in the period, certainly on its sign if not on the amount.

younger households (between ages 30 and 40) are more likely to hold debt (associated mainly with recent acquisition of houses) and older households (over 60 years old) on the other hand, having paid off mortgages, have accumulated significant amount of financial assets, then under inflation younger households make significant capital gains on there financial liabilities while older households incur capital losses on their financial assets. Thus, if nominal interest payments and receipts are included in income of these households and capital gains and losses on their financial liabilities and assets are not accounted for, a substantial overestimation of saving for older households and a corresponding underestimation for younger households may result from the conventional definition of saving as income minus consumption. These biases will not be present in the measure of saving defined as the change in net worth, provided that real assets are valued at market value.

On the other hand, suppose that the relative price of houses increases significantly from one year to the next. Such real capital gains will accrue uniformly to all homeowners regardless of their other assets-liability status. Such capital gains will also be missed by the measure of saving as conventionally defined as income minus consumption, while the alternative measure of the change in net worth will capture them provided that the market value is accurately caught.

Given these possibilities, the mere fact that older people's net worth position declines more than the rate accounted for by the saving defined as income less consumption, and that younger people's net worth increases more than their saving defined as income less consumption can justify, does not imply conclusively the presence of inter vivos transfers.

In view of this ambiguity in the interpretation on the cause of the discrepancy between the change in net worth and income minus consumption for various age groups, we present below a number of evidences that do not directly depend on this discrepancy and nevertheless tend to indicate the presence of intergenerational transfers.

If some elderly families act on their bequest motive but actual transfers of resources take place both during their life time as well as at the time of their death, then the implication would be that elderly households with a transfer motive decumulate their wealth faster than households without it. This is precisely the result obtained by Hurd with reference to the U.S., using panel data from the Retirement History Survey and by Börsch-Supan (1991) using the Socio-Economic Panel for Germany.[13] Both Hurd and Börsch-Supan interpret their result as evidence against the existence of a bequest motive. As we argued in Section 2, however, this interpretation is correct only if bequests are constrained to take place on the death of the donor. But if credit market imperfections are significant, intergenerational transfers might be targeted towards liquidity constrained young households and be effected well before the death of the donor. Inter vivos transfers would in this case effectively counteract credit market imperfections. On this hypothesis, Hurd's test might have little power to assess the existence of a transfer motive. Yet it would still be the case that during their accumulation phase households with a transfer motive should, on average, accumulate wealth faster than those without such a motive.

13. Börsch-Supan shows that Hurd's result holds also using data from the PSID.

4. Transfer motives and the pattern of wealth accumulation

This Section presents a formal test of the foregoing propositions. The idea is to contrast accumulation of wealth by households with children (and thus with a potential transfer motive) with that by childless households.

Thus, if a transfer motive is present, one would expect to find that other things being equal, households with young dependent children accumulate more rapidly than those with no children. On the other hand, households with independent working children might, at some stage, decumulate faster than households without children in order to help ease a binding liquidity constraint.

To perform our test we assume, as in King and Dicks-Mireaux (1982), that the (log of the) ratio of wealth to permanent income can be expressed as a function of (a piecewise linear function of) age and of the indicator for the presence of a transfer motive, aside from a set of variables measuring: i) households' characteristics (sex, education and geographic location), to allow for household heterogeneity and variation in tastes; ii) perceived income risk, to account for precautionary accumulation of assets; iii) partecipation in the labour market by elderly households to allow for non-declining earnings profiles. In summary, we estimate an equation of the form

$$[1]\quad \log(w/y)^i = \sum_{j=1}^{8} \alpha_j da_j + \beta X^i + \gamma_1 h_d^i A^i + \gamma_2 h_c^i D^i + \delta f^i D^i + \varepsilon_i$$

where i index the households, w denotes accumulated wealth, y is a measure of permanent income, the da_j variables are segments of the age spline and X is a vector of characteristics. The other variables in the equation will be defined shortly. The first four terms of the spline (da_1, da_2, da_3, da_4) refer to the following age intervals: under 30, 30-39, 40-49, 50-59. In light at the typical pattern of wealth accumulation in a life cycle model, we identify the accumulation phase with the age interval 30-59. The remaining four terms (da_5, da_6, da_7, da_8 standing for the intervals 60-69, 70-74, 75-80 and over 80) cover the decumulation phase.[14] The indicator for the presence of a potential transfer motive is given by the variables h (mnemonic for heirs); h_d is a dummy variable equal to 1 if the household is in the accumulation phase and has dependent children and zero otherwise; h_c is equal to 1 if the household is in the decumulation phase and has independent children; it is zero otherwise. α, β, γ and δ are parameters while ε is an error term.

To perform our test we interact the h dummy with the age spline. The variable A_i is a segment of the spline in the age interval 30-59, while D_i is a segment corresponding to age above 69, i.e. past the peak in the ratio of wealth to permanent income as shown in Table 6.5. Under the assumption that a transfer motive is present, the first interaction term, which refers to households with dependent children in their accumulation phase, should be positive. The second

14. The average age of marriage for men in Italy is 27, with the first child born at age 29 (see ISTAT, Sommario di Statistiche Storiche 1926-1985). Assuming that fertility is on average completed at age 37, children become independent when the parent is in the age bracket 56-64.

interaction term, for households with independent children whose head is over 69, should be negative. Finally, to account for differential perceived mortality of singles and couples, we introduce a further interaction term between the age spline after retirement with an indicator for household type, f, taking value 1 if the "household" is a single.[15]

4.1 Empirical results

For the reasons given in Section 4 we restrict the sample to pure nuclear households, with only the husband and wife being allowed to be income recipients. All households with additional income recipients have been rejected. Thus, extended households are not included in the final sample. Moreover, the choice of the logarithm specification for equation 1 results in the exclusion of those households with zero or negative net worth (257 households after selecting pure nuclear households).

The results of the estimation of equation 1 are given in Table 6.6. The first column reports a simple regression of the log of the ratio of wealth to permanent income against the age spline alone, which just reproduces the pattern described in Table 6.5. Wealth is accumulated at decreasing rates up to the age bracket 60-69, while there appears to be decumulation thereafter, at rates increasing with age. The annual rate of decumulation is estimated at 3.7 percent for age-group 70-74 and 6.1 percent in the higher age-group. The second column introduces a set of variables to control for variation in tastes and households' characteristics. Households with higher education hold more assets and the same is true for households headed by men but the basic

15. In principle one should interact the f dummy with the entire age spline. In practice the effect of perceived mortality at younger ages must be negligible given the low value of the probability of death.

picture remains un-altered: though the size and significance of the coefficients of the age dummies after retirement is somewhat reduced, they are still negative and increasing in absolute value with age.

In the third column we further allow for differential mortality and other effects. The coefficient of the f variable, interacted with the age spline during the decumulation phase, has the expected negative sign; its size implies that a large part of the decumulation observed in the total sample after retirement is accounted for by singles, who as "households", have a higher perception of mortality than couples. The specification in column 3 also includes a dummy variable to account for income uncertainty (1 for those households that report that they expect their income in the next five years to be unstable). Its coefficient is positive and significantly different from zero, implying that wealth accumulation is affected by precautionary saving. This finding confirms a similar result obtained by Guiso, Jappelli and Terlizzese (1993) using a direct measure of earnings uncertainty.

Finally, column 4 reports the results of our test. The h_d dummy has been interacted with the A variable, corresponding to the age-groups 30-39, 40-49 and 50-59. The results are interesting in several respects. First of all the coefficient of the interaction term between the h_d variable and these three terms of the age spline has the positive sign implied by the existence of a transfer motive; households with dependent children that are in their accumulation phase accumulate at a rate about 1 percent higher than households of the same age without children. Since, moreover, households with children also have more current needs, their average wealth might be expected to be, ceteris paribus, lower than that of households without children. This suggests inserting in the regression also the dummy variable h_d alone. Its

coefficient is significant and, as expected, negative: on average the ratio of wealth to permament income of households with children is 20 percent lower than that of households without dependent children.[16]

Secondly, the interaction between the dummy for households with independent children, h_c, and the age spline after retirement, D, is negative though it is significant only at the 12 percent level of confidence. Other things being equal, in the lifetime after retirement, households with independent children decumulate 2.2 percentage points faster than those without children.

These results are consistent with the existence of a transfer motive and with inter-vivos transfers to the younger generation to relieve liquidity constraints or other adverse contingencies. Clearly, to be helpful these transfers must be well timed. Thus, one would expect that the rate of asset decumulation is highest when liquidity constraints are more likely to bind or family needs to arise. In the 1989 survey we have no direct information on liquidity-constrained households; however one can use the 1987 SHIW to compute the average age of the households that are liquidity-constrainded. Using the definition adopted by Guiso and Jappelli (1990) the average age of liquidity-constrained households (excluding the retired) is 43 if discouraged borrowers are included and 40 if only households that have been denied credit are considered. Given that the generation gap is about 29 years and that the average fertility ranges from age 29 to 37 (see footnote 14), the decumulation induced by intergenerational transfers should be highest in the age interval 69-77. Using the estimates reported in column 4, it

16. Notice, however, that the overall effect of the presence of dependent children is to increase the level of net worth at all ages in the accumulation phase.

turns out that the average rate of decumulation for households with independent children is 1.4 and 1.3 percent per year in the age classes 70-74 and 75-79 respectively and only 0.4 percent afterwards.[17]

Households without a transfer motive accumulate less rapidly before retirement but continue to accumulate even thereafter. A possible interpretation is that the elderly and their children may conclude mutually beneficial informal pacts to insure one another against, respectively, major disasters in old age or and the fear of catastrophic illness, the possibility of being denied credit in the loan market or other similar contingencies. The observed decumulation, then would correspond to the insurance payout from the older to the younger generation. Households without children have no such pact at their disposal and have to resort to precautionary saving.

5. Additional evidence on the bequest motive

The evidence provided in the previous section is consistent with consumers having a bequest motive and anticipating the transfer to the time when it is most valuable. However, it is also consistent with the absence of a bequest motive and with transfers motivated only by reciprocity between parents and their children, whereby parents agree to transfer money to children when an adverse

17. Another implication of liquidity constraints is that the rate of wealth accumulation should be lower when liquidity constraints are most likely to be binding; in our case this should occur around age 40. The estimates in Table 6.7 show that the annual rate of wealth accumulation drops from 8.5 percent in the 30-39 age-group to 3.0 percent at 40-49 and rises to 5.5 percent at age 50-59. This is consistent with the presence of binding liquidity constrains around age 40.

event occurs or a particular need arises in exchange for help or assistence in case of need.

Discriminating between these two possibilities is beyond the scope of this paper.[18] However, we can shed some further light on the presence of a bequest motive by looking at the age profile of insurance purchases by households with and without a potential bequest motive.

5.1 Evidence based on life insurance

Additional evidence of the bequest motive can be obtained by looking at the age-pattern of life insurance. If a bequest motive is present, parents facing life uncertainty have an incentive to purchase life insurance in order to assure sufficient income to their descendants. Fischer (1973), extending the previous work of Yarii (1965), shows that even if insurance is not actuarially fair, life insurance will be taken out if the weight attached to the utility from leaving a bequest is sufficiently high. Thus, concern for their descendants makes consumers more likely to purchase life insurance. Further, since as emphasized by Yaari (1965), the concern for bequests is likely to be hump-shaped because the importance of leaving inheritances is greatest when the consumer dies in middle ages, the probability of buying life insurance will also be hump-shaped.

Table 6.7 offers some support for the bequest motive. It reports the proportion of households holding life insurance at various ages. The first column refers to the total sample. The proportion with life insurance rises

18. Cox (1987) and Cox and Rank (1992) perform tests to discriminate between transfers motivated by exchange and by altruism.

initially with age, up to age 40-49 and declines rapidly thereafter; after age 65-69 very few households hold life insurance.

This pattern reproduces very closely the theoretical simulations of Fischer (1973), where life insurance purchases increase to around age 40 and decline thereafter, possibly becoming negative at old ages, when (fair) annuities become a dominant form of holding assets. The second and third columns of Table 6.7 report the age pattern of insurance for households with and without children. Although the shape of the life insurance profile is quite similar, households with dependent children are more likely to purchase life insurance. While life insurance holdings are only slightly larger for very young households with dependent children, they significantly exceed the purchase of life insurance by households without children at older ages. This can be interpreted as prima facie evidence of the existence of a bequest motive. However, the result might depend on differences in tastes and characteristics of the two types of households. A proper test of the effect of the bequest motive (as measured by the presence of children) on the purchase of life insurance must take account of these differences.

Let y_i^* be the latent variable for the insurance purchase decision of the i-th household. When $y_i^* > 0$ the bequest motive is strong enough to make it worthwhile purchasing life insurance. We assume that it depends linearly upon a vector of variables z which includes a polynomial in age, a set of demographic variables to account for differences in tastes and the dummy for the presence of dependent children as an indicator of the bequest motive:

$$y_i^* = \beta z_i + u_i$$

where β is a vector of coefficients and u_i an error term.

Let y_i be a dummy variable taking value 1 if household i purchases life insurance and zero otherwise. Then

$$\text{prob } (y_i = 1) = \text{prob } (y_i^* > 0) = \text{prob } (u_i > -\beta z_i)$$

Assuming u_i is normally distributed, the vector of parameters β can be estimated (up to a constant of proportionality) by maximum likelihood. The results of the probit estimates are displayed in Table 6.8. Column 1 reports the results of a simple model where the vector z includes only a third order polynomial in age and the proxy for the bequest motive (dependent children).

The coefficient of the h_d variable is positive and significant, while the probability of purchasing insurance rises until around age 40 and declines thereafter. This regression just summarizes the data shown in Table 6.7. Adding a set of demographic variables as in column 2 leaves the coefficient of the h_d variable and its significance unchanged; purchasing insurance is more likely for households not living in the North and in the South, for households headed by a man, for married couples and households with higher education.

As Fischer (1973), points out, one of the major reasons for the purchase of life insurance is the fact that the death of the head of the family involves the loss of a primary source of income. Further, the loss is greater the higher is the expected future income associated with the household head. This implies that households which have higher permanent income are also more likely to buy insurance. To take this into account we add to the specification our measure of permanent income. The results in

column 3 of Table 6.8 support this conjecture. Permanent income has a positive and highly significant effect on the probability of life insurance purchase.[19]

The specification in column 3 includes as an additional regressor the dummy for the existence of independent children. If a bequest motive is present, one might expect this variable too to affect the probability of purchasing life insurance. Its coefficient is positive but lower than that of the indicator for dependent children, perhaps because, as is suggested by Yaari (1965), the bequest motive is stronger when children can only rely on parents' resources. Since we have information on the economic condition of independent children relative to that of their parents, we can test whether a life insurance purchase is more likely when children are relatively poorer than parents. The regression in the last column of Table 6.8 replaces the dummy variable for the existence of independent children with five dummies for the average economic condition of the independent children when they are present. While the existence of independent children who are in a better or much better condition than their parents lowers the probability of life insurance purchases, the probability of purchasing life insurance is higher for independent children who are in the same or in worse economic conditions. Further, the effect on the probability is highest for independent children who are much worse off, and decreases monotonically to turn negative when the parents' economic condition is worse than that of their children.

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19. The same results obtain if instead of the measure of permanent income one includes a set of occupational dummies as proxies of future income. The coefficient of the occupational dummies is higher for occupations that are likely to deliver higher permanent income, such as managers and entrepreneurs.

These results support the view that households have a bequest motive and that bequests or transfers are more likely to be effected the poorer the children are relative to the parents as predicted by models with altruistically linked consumers.[20] It is true, however, that a large number of households with dependent children or with independent but poor children, do not purchase life insurance. While the share of households with children in worse economic conditions than their parents is only 8.4 percent, that of households with dependent children is certainly much higher (62 percent); yet only 13 percent of the households in the sample have life insurance policies.

In part, this could be due to life insurance costs exceeding fair premiums and in part to households having accumulated enough assets in the form of bequeathable wealth; but it is also likely that some households simply do not conform to the prediction of a model with a bequest motive. This would indeed be consistent with the relatively small share of households reporting the desire to leave a bequest

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20. If the decision to leave a bequest or make a transfer is a decision to increase the utility of the beneficiary at the expence of the utility of the donor, then given equal concern of parents for their children's welfare, a transfer will be more likely to take place the lower the resources of the beneficiary with respect to those of the donor. In general, in a growing economy new generations are better off, on average, than previous generations. Thus, one would expect the scope for transfers to decrease as the rate of growth of the economy rises. Among the households with independent children, in 57 percent of the cases, children are reported to have a much better (19 per cent) or better (38 per cent) economic condition. For 35 per cent the economic condition of the independent children is about the same, and in only 8 per cent of the cases are children worse or much worse off than their parents. This distribution seems to indicate that there is scope for a transfer to become operative surely in 8 percent of the cases but probably in no more than 43 per cent of the households with living independent children, which corresponds to 18 percent of the households in the total sample.

as a primary reason for saving.[21]

9. Conclusions

We have documented the pattern of wealth accumulation and decumulation of Italian households over the life cycle. Although the evidence contradicts the strict life cycle model of saving, it is not necessarily inconsistent with versions of that model extended to accommodate a transfer motive, life length uncertainty and the risk of catastrophes in old age. Households accumulate fast, at rates above 7 per cent per year, when young. They appear to decumulate after retirement but at rates consistent with substantial amounts of wealth left as bequests even after some of it has been transfered inter vivos. Our test for the transfer motive shows that before retirement households with children tend to accumulate somewhat faster than childless households. After retirement, most of the observed decumulation is accounted for by households with independent children; households without children, perhaps because of fear of catastrophes, continue to accumulate assets. Finally, other indirect evidence suggests that the resource gap betweeen parents and independent children leaves enough room for transfers to be operative, while evidence based on life insurance is consistent with the bequest motive model, in that households with still dependent children or independent children who are economically worse-off than their parents, are more likely to hold life insurance policies.

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21. In Italy, as in other countries, only a small share of households report that bequests are an important reason for saving. See Barca, Cannari and Guiso in this volume.

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Appendix

The construction of permanent income

To compute the permanent income of the household we have used the overall sample of income recipients in the 1989 SHIW (14,552 obervations). This sample was then split into two parts. The first includes only working persons over age 16, while the second includes only retired people. The permanent income of retired persons is proxied with their pension income. To compute the permanent income of working consumers we proceed as follows. Let $Y(\tau,j)$ denote the earnings of individual j of age τ. We assume that individual earnings can be expressed as a function of a vector z of individual characteristics (education, occupation, sector, regional location and family size), a quadratic function of age $\Phi(\tau)$ and a zero mean disturbance u

$$Y(\tau,j) = Z\,\beta + \Phi(\tau) + u$$

Normal earnings, not adjusted for cohort effects, are then defined as

$$Y_p(\tau,j) = Z\,\hat{\beta} + \hat{\Phi}(\tau) + 0.5\,\hat{u}$$

where the hats denote the estimated coefficients from a Generalized Least Squares regression, using as weights the residuals from a first-stage OLS regression.

Human wealth of individual j of age τ_0 is then computed as

$$H(\tau_0, j) = \sum_{k=1}^{R_j - \tau_0} [Y_p(\tau_0 + k, j)] \left(\frac{1+n}{1+r} \right)^k$$

where $Y_p(\tau_0+k, j)$ is the projected value of normal earnings from the previous equation, R_j is the retirement age of member j and n and r represent, respectively, the rate of growth of productivity and the rate of interest. Retirement age is assumed to be 65 for husbands and 55 for wives; the annual rate of interest is assumed to be equal to 5 percent and the rate of productivity growth to 2.5 percent.

The permanent income of individual j is defined as the annualized value of his human wealth. From this, the permanent income of the household is obtained as the sum of the permanent income of its income recipients.

Table 1

AGE WEALTH - PROFILE

Age	Number of households	Net worth(a) (1)	Net worth / Permanent income (2)	Net worth index(b) (3)	w/y_p index(c) (4)
under 30	567	76.0	1.56	1.00	1.00
30-39	1489	113.8	2.46	1.49	1.58
40-49	1804	161.7	3.61	2.12	2.31
50-59	1769	187.6	4.80	2.47	3.08
60-64	816	174.7	6.91	2.30	4.43
65-69	710	146.7	7.40	1.93	4.74
70-74	387	103.9	6.25	1.37	4.01
75-79	380	101.7	6.41	1.34	4.10
over 79	239	94.9	7.96	1.25	5.10

(a) Millions of 1989 lire; (b) net worth at age under 30=100; (c) ratio of net worth to permanent income at age under 30=100.

Table 2

Wealth and mortality correlation. Age of the deceased and average wealth and income of his family (a)

Family type	Age 30-44		Age 45-54		Age 55-64		Age 65-69		Age 70-74	
	Prob. of death	Wealth (income)	Prob. of death	Wealth (income)	Prob. of death	Wealth (income)	Prob. of death	Wealth (income)	Prob. of death	Wealth (income)
1	1.297	85.8 (25.5)	2.766	124.0 (29.1)	4.275	147.2 (26.8)	7.353	123.2 (23.1)	11.837	130.3 (21.8)
2	.850	88.8 (24.9)	2.285	143.1 (31.4)	5.055	149.4 (35.1)	9.735	215.6 (35.3)	14.776	137.7 (36.4)
3	.469	144.4 (34.7)	1.700	193.8 (46.3)	4.342	182.8 (46.4)	9.307	217.4 (47.0)	14.393	141.5 (34.0)
4	.381	142.3 (40.1)	1.580	198.9 (49.9)	4.0122	223.2 (50.7)	8.370	266.1 (55.9)	13.273	192.7 (44.7)
5	.310	183.7 (49.8)	1.339	339.0 (66.1)	3.758	399.4 (66.2)	8.093	286.3 (61.0)	12.083	290.9 (58.0)
Total	.477	139.6	1.797	190.6	4.458	195.3	8.923	197.2	13.669	157.7
Mortality ratio: - reachest	0.650		0.745		0.8043		0.907		0.884	
- poorest	2.362		1.539		0.959		0.887		0.865	
Adjusted wealth	137.6			189.1		193.4		195.8		156.0

Source: Figures on the probability of death by family type are taken from Istat, "La mortalità differenziale secondo alcuni fattori socio-economici. Anni 1981-82".

(a) The probabilities are computed devided the number of deaths over the period November 1th, 1981 - April 30, 1982 to the resident population at the end of October 1981 in each age-class-family-type combination. The figures in the table are multiplied by 1,000.

(b) Households are classified in the five groups according to the following procedure. First of all four indicators of the economic status of the household are selected; they are: i) average education of the members of the household of the deceased with completed education; ii) occupation of each household member in working age (i.e. with age less than 75 and not yet pensioned, and older than 14, excluding students); iii) number of earners among those in working age; iv) presence of unemployed persons in the household. For each criteria a score in the interval 0-1 is assigned, and the scores in the four criteria added together. This assignes a total score to each household. A score equal to 1 is given to the household characheristic which ranks highest. Taking education as an example, if a member of the household is graduated he is given score 1; if he has a secondary school diploma he is given a score equal to 13/17, where 13 is the number of years of schooling for a secondary school diploma, and 17 for a University degree. A similar procedure is followed for the other criteria. On the basis of the total score, households are divided into quintiles, with type one belonging to the first quintile, type 2 to the second and so on.

Table 3

INCOME, CONSUMPTION AND WEALTH BY FAMILY TIPE

Family type	N. of households	Age of household head	Disposable income (a)	Consumption (a)	Net worth (a)	Propensity to save
Nuclear households	6780	52	34.1	26.1	140.8	0.21
Extended households	358	49	46.9	33.0	190.6	0.30
Other types	1136	47	28.8	22.0	110.9	0.24

(a) Millions of 1989 lire.

Table 4

IN AND OUT OF OLDER RELATIVES INTO YOUNGER HOUSEHOLDS

		N. of households	Age of household head	Age of entrant	Net worth (a)		Disposable income (a)	
					1987	1989	1987	1989
Entrants	1987	16	50.63	77.63	213.7	321.1	32.7	50.5
	1989	7	51.43	76.71	99.5	155.6	21.7	37.8
Leavers	1987	13	42.00	72.62	290.5	65.3	50.5	27.6
	1989	7	39.57	66.71	278.2	100.5	35.9	18.2

Source: panel component of the 1987 and 1989 SHIW.
(a) Millions of 1989 lire.

Table 5

AGE-WEALTH PROFILE: PURE NUCLEAR HOUSEHOLDS

Age	N. of households	Net worth(a) (1)	Net worth / Permanent income (2)	Index of net worth(b) (3)	w/y_p index(b) (4)	Saving (c) rate (5)
Under 30	377	76.6	1.51	1.00	1.00	0.17
30-39	1170	115.0	2.44	1.50	1.62	0.19
40-49	1267	164.3	3.86	2.14	2.56	0.21
50-59	909	179.2	5.92	2.34	3.92	0.21
60-64	484	158.3	8.31	2.07	5.50	0.23
65-69	465	128.9	8.64	1.68	5.72	0.26
70-74	288	91.3	6.95	1.08	4.60	0.25
75-79	286	87.4	7.07	1.19	4.68	0.22
over 79	159	71.6	6.25	0.93	4.14	0.21

(a) In million of lire; b) wealth at age "below 30"=100; (c) as a ratio to disposable income.

Table 6

OLS ESTIMATES. DEPENDENT VARIABLE: LOGARITHIM OF THE RATIO OF NET WORTH TO PERMANENT INCOME

Variable	(1)	(2)	(3)	(4)
da_1	0.072 (2.030)	0.057 (1.597)	0.056 (1.590)	0.068 (1.895)
da_2	0.090 (8.549)	0.090 (8.634)	0.090 (8.669)	0.086 (7.931)
da_3	0.038 (4.047)	0.042 (4.467)	0.041 (4.416)	0.030 (2.827)
da_4	0.039 (4.195)	0.054 (5.668)	0.056 (5.836)	0.055 (5.302)
da_5	0.018 (1.541)	0.021 (1.856)	0.019 (1.670)	0.021 (1.702)
da_6	-0.026 (-0.891)	-0.011 (-0.362)	-0.007 (-0.226)	0.008 (0.267)
da_7	-0.066 (-1.936)	-0.044 (-1.287)	-0.026 (-0.726)	0.009 (0.222)
da_8	-0.079 (-2.255)	-0.058 (-1.643)	-0.025 (-0.600)	0.018 (0.378)
Household head characteristics				
- resident in the North		-0.060 (-1.074)	-0.064 (-1.147)	-0.063 (-1.114)
- resident in the South		-0.047 (-0.842)	-0.056 (-1.015)	-0.056 (-1.018)
- male		0.294 (4.417)	0.242 (3.252)	0.243 (3.254)
- primary school		0.119 (2.061)	0.114 (1.963)	0.107 (1.845)
- high school		0.275 (4.585)	0.266 (4.431)	0.248 (4.102)
- university degree		0.555 (6.800)	0.545 (6.676)	0.520 (6.333)
- older worker		1.421 (1.639)	1.414 (1.630)	1.43 (1.652)
Income variability			0.106 (2.126)	0.103 (2.046)
f * D			-0.020 (-1.836)	-0.011 (-1.768)
h_d * A				0.010 (2.052)
h_c * D				-0.022 (-1.516)
h_d				-0.200 (-1.870)
Constant	-2.39 (-2.393)	-2.42 (-2.430)	-2.41 (2.425)	-2.6373 (-2.641)
Adjusted R^2	0.128	0.142	0.143	0.144
Standard Error	1.498	1.487	1.486	1.486
N. of Observations	5,138	5,138	5,138	5,138
F (n, m)	94.05	56.51	50.29	43.15
log-likelihood	-9,362.49	-9,320.75	-9,317.47	-9,313.80

Table 7

AGE PROFILE OF LIFE INSURANCE HOLDINGS (a)

Age	Total sample	Households without dependent children	Households with dependent children
< 30	13.6	13.0	14.3
30-39	19.8	15.2	21.4
40-49	20.1	15.4	20.6
50-59	15.2	11.5	16.1
60-65	9.6	7.0	12.0
65-69	5.8	3.8	9.2
70-74	2.1	1.0	5.2
75-79	1.8	0.6	7.0
> 80	1.7	1.1	3.6

(a) Life insurance holding is a dummy variable equal to 1 if the household holds life insurance and zero otherwise; the data in the table is thus the proportion of households with life insurance in the specified age class.

Probit estimates. Dependent variable: purchase of life insurance (a)
(asymptotic t - values in parenthesis)

Variables	1	2	3	4
Age	.163 (3.674)	.130 (2.829)	.167 (3.596)	.166 (3.594)
Age^2	- .282E-2 (-3.136)	- .213E-2 (-2.279)	- .292E-2 (-3.099)	- .293E-2 (3.125)
Age^3	.127E-4 (2.189)	.889E-5 (1.466)	.142E-4 (2.324)	.145E-4 (2.391)
h_d	.230 (5.135)	.246 (4.924)	.171 (3.299)	.155 (2.979)
h_c			.103 (1.863)	
Household characteristics:				
Males		.192E-2 (0.025)	- .029 (-.367)	.050 (- .638)
Living in the North		- .059 (-1.269)	- .092 (-1.960)	- .083 (-1.768)
Living in the South		- .282 (-5.771)	- .229 (-4.614)	- .230 (-4.624)
Married		.186 (2.555)	.147 (2.004)	.157 (2.141)
Year of Education		.046 (10.816)	.037 (8.475)	.036 (8.148)
Permanent income			.614E-2 (7.977)	.586E-5 (7.582)
Condition of independent children				
- Much better				- .303 (-1.895)
- Better				- .106 (-1.217)
- The same				.191 (2.824)
- Worse				.317 (2.633)
- Much worse				.346 (1.486)
Constant	-3,825 (-5.508)	-3,892 (-5.417)	-4.542 (-6.238)	-4.471 (-6.162)
Sample size	8,161	8,161	8,161	8,161
Life insurance holders	1139	1139	1139	1139
Likelihood at binomial	-3,298.5	-3,298.5	-3,298.5	-3,298.5
Final likelihood	-3,103.9	-3,015.9	-2,982.9	-2,972.0

(a) Dummy for the purchase of insurance equal to 1 if the household hold life insurance, zero otherwise; (b) the average economic condition of independent children is computed taking the mean condition and rounding it to the closest integer. This integer than identifies one of the five groups, ranging from the "much better", to the "much worse".