CHAPTER 4

PROJECTIONS OF NON-PENSION WEALTH AND INCOME

I. OVERVIEW

It is quite likely, given recent changes in private pension coverage and uncertainty over the course of future Social Security reform efforts, that personal saving will play an increasingly important role in the income security of future retirees. This chapter describes the methodology and results of our projections of non-pension assets at age 62 and 67 for individuals contained on the merged SIPP-SER data file.

We focus separately on housing and non-housing wealth, because it is likely that individuals perceive a clear distinction between both forms of savings. In addition, research (Hurd, 1990; Gustman and Juster, 1996) suggests retirees are less likely to spend down housing wealth, at least in the early stages of retirement. Calculation of the income flows associated with these asset stocks are described in Chapter 7 of this report.

The existing economic literature on why people save is theoretically sophisticated, with most research based on applications of the life-cycle hypothesis (LCH) (Modigliani and Brumberg, 1954). But empirical evidence on the LCH is mixed and no theory does a very good job of explaining data on wealth trajectories. While both demographic characteristics (race, education, marriage, divorce, and number of children) and income levels affect rates of wealth accumulation, the data reveal substantial heterogeneity in wealth at retirement among individuals with similar demographic characteristics and earnings histories. This makes the development of equations that provide reliable projections of future wealth accumulation a daunting task.

To project wealth of individuals for the MINT project, we developed an equation to explain non-pension wealth as a function of age, demographic characteristics of individuals, and economic and demographic variables (marital status, earnings history, and availability of a pension) projected in earlier stages of the project. This equation was then used to project wealth at ages 62 and 67 for individuals in the 1990-93 SIPP files. In keeping with the overall methodology of the MINT project, all of the wealth figures presented are relative to the average national wage in the particular year for which the projections were made and the results are shown on an individual (per person) basis. To derive individual wealth for married couples, each spouse was allocated one half of estimated total family wealth. Finally, the projection equations were calibrated to actual wealth data on the 1990-93 SIPP files, so that the difference between

reported wealth of any individual on the SIPP file and predicted wealth of that individual at the corresponding age was treated as an individual-specific error term. This error term was then used to adjust the predictions of wealth at ages 62 and 67.

The outline of this chapter is as follows. The next section describes our overall approach and data sources used in the estimates and projections and then summarizes the methodology for estimation, calibration, and projection of wealth at ages 62 and 67. The following section presents our econometric estimates for wealth at ages 62 and 67. The final section presents the results of our projections of wealth at ages 62 and 67, based on the econometric estimates and calibration to data on the 1990-93 SIPP files, and discusses qualifications and potential improvements. Two appendicies present the results of alternative econometric specifications.

II. METHODOLOGY

1. Overall Approach and Data Sources

Selection of Overall Approach

We considered two overall approaches to projecting lifetime wealth accumulation patterns of future retirees. The first approach relied on the simulation of annual consumption decisions, deriving wealth at retirement as the cumulative outcome of annual saving (income minus consumption) and rates of return on assets. This approach was rejected on a number of grounds, including a concern that it would not be feasible to simulate such complex processes in the very tight time-frame of the MINT project. Also, it was believed that this approach presumed a knowledge of saving behavior that does not exist.

The second approach, which was the one we selected, used a reduced-form equation to estimate the wealth of individuals as a function of age, earnings histories, and demographic characteristics. The resulting age-wealth profiles reflect the combined effects of decisions on how much to save, portfolio allocations, and realized rates of return on assets. While this approach has less detail than the first approach on the process of wealth accumulation, it does allow straightforward estimation of the pattern of wealth changes over the life cycle.

In deriving age-wealth profiles, we developed separate econometric estimates and projections for housing and non-housing wealth. We define housing wealth as the difference between home value and outstanding mortgage debt (i.e., home equity). Non-housing, non-pension wealth is calculated as the sum of the net value of: vehicles, other real estate, farm and business equity (value - debt), stocks, mutual funds, bonds, checking accounts, savings accounts, money market accounts, and certificate of deposit account balances, less unsecured debt.

Choice of Panel Survey of Income Dynamics (PSID) for Estimates

In performing these estimates, we utilized longitudinal data from the Panel Study on Income Dynamics (PSID). We chose the PSID instead of the Survey of Income and Program Participation (SIPP) to perform this estimation because the PSID enables us to observe the wealth-generating process for an individual over a longer period (approximately ten years) than the SIPP and to isolate individual-specific effects better. Once parameter estimates are obtained from the PSID, they are used to impute wealth at ages 62 and 67 onto the merged SIPP data files covering the years 1990 to 1993.

The PSID is a rich, longitudinal data set that tracks the income, demographic and family characteristics of approximately 5,000 households from 1968 to the present. Detailed information on earnings, sources of income, health, marital status and education are available for most members of the household. Beginning in 1984, a series of questions relating to the types and amounts of financial and non-financial assets were asked. These questions were asked every five years (i.e., in 1984, 1989 and 1994) and they serve as the basis of our estimation. Because the PSID reports wealth on a family basis, we needed to allocate wealth among individual family members. We chose to divide assets equally between both spouses for purpose of estimating the time profile of individual wealth accumulation.

Comparison of SIPP and PSID

One potential concern about using SIPP data in the projections is that SIPP respondents may underreport their wealth. As one check on both underreporting of wealth and potential inconsistencies between the data files used for estimation and projection, we report comparisons of housing and other wealth reported on both files in Tables 4-1 and 4-2 below. All figures shown are weighted and are relative to the average economy-wide wage in the year of the survey.

Table 4-1
Comparison of SIPP and PSID Family Wealth Data: Mean Housing Wealth Divided by Economy-Wide Average Wage, by Age

Age of Family Head	SIPP	PSID
Under 35	0.52	0.40
35 to 44	1.37	1.60
45 to 54	2.13	2.41
55 to 64	2.72	2.96
65 to 74	2.85	2.51
75 and Over	N.A.	1.74
Total	1.58	1.64

Table 4-2
Comparison of SIPP and PSID Family Wealth Data: Mean Other, Non-Pension Wealth Divided by Economy-Wide Average Wage, by Age

Age of Family Head	SIPP	SIPP [a/]	PSID [a/]
Under 35	0.65	0.70	1.15
35 Under 45	1.28	1.45	3.12
45 Under 55	2.26	2.60	6.69
55 Under 65	2.98	3.47	6.41
65 Under 75	2.91	3.47	5.50
75 and Over	N.A.	N.A.	4.27
Total	1.66	1.90	3.83

[a/] Includes IRA and Keogh balances for comparability across files.

For housing wealth, the two files are remarkably similar, with the average value of home equity (as a fraction of the economy-wide wage in the year of the survey) generally rising with the age of the family head. The figures are not strictly comparable because the PSID is a rather unique data set and includes families that were observed over the 1984 to 1994 period, while the SIPP figures are from the merged 1990 to 1993 panel files. In addition, the PSID sample includes all families in the panel while the SIPP estimates reflect only those in the MINT cohorts (1931-60), who ranged from ages 30 to 63 in 1990-93. This is why we do not report figures for older heads of families on the SIPP.

A different picture emerges in the case of non-housing wealth, where the PSID reports roughly twice the average value as the SIPP. This discrepancy is maintained across all age groups. Similar findings have been reported by other researchers. (See, for example, Gustman and Juster, 1996). Table 4-2 compares wealth reported on the SIPP and the PSID.

The PSID reported wealth variable includes wealth in IRAs and Keogh Plans, but does not report these components of wealth separately, while the task order for this project requested that we estimate separately non-pension wealth *excluding IRAs and Keogh plans*. In order to provide a consistent comparison, Table 4-2 reports both the SIPP wealth variable we used for the projections and SIPP wealth including IRA and Keogh Plans. The difference in wealth definitions accounts for only a small fraction of the difference between PSID wealth and the SIPP wealth measure we used.

We use the wealth figures reported on the SIPP instead of PSID wealth in the projections, because they reflect the distribution of wealth of the population under study and provide the appropriate correlations between wealth and other variables. An issue is whether we should

adjust the SIPP wealth data upward to reflect the understatement of wealth on the SIPP, compared with other data files such as the PSID and the Survey of Consumer Finances (SCF). Consistent with views of SSA, we relied on the unadjusted wealth data. One rationale for this choice is that a substantial part of the understatement of wealth on the SIPP is for the highest wealth families and we are relatively less concerned with an accurate measure of retirement income of these families for the purpose of analyzing the future adequacy of Social Security benefits.

An indication that the difference is mostly at the high end is that *median* wealth holdings in the two files are quite similar, even though *mean* values are quite different. Table 4-3 reports the median values (i.e., the 50th percentile) of family wealth on the SIPP and PSID files as well as the values at other percentiles of the wealth distribution on the two files. It shows that there is little difference between reported wealth on the two files through the 90th percentile and that PSID wealth is only about 40 percent higher than the SIPP wealth even for families at the 98th percentile. The large discrepancy in mean wealth in the two files is due almost entirely to differences in reported wealth for individuals in the top *two percent* of the wealth distribution.

Table 4-3
Comparison of Family Wealth on the SIPP with the PSID at Fixed Percentiles of the Wealth Distribution
(in 1996 Dollars)

Percentile Cutoff	SIPP	PSID
10th Percentile	0	0
20th Percentile	2,279	2,880
30th Percentile	9,875	11,271
40th Percentile	26,479	25,672
50th Percentile	52,017	47,838
60th Percentile	84,352	76,390
70th Percentile	130,311	122,725
80th Percentile	197,791	199,116
90th Percentile	329,317	359,160
98th Percentile	728,620	1,030,267

2. Procedure for Deriving Wealth Projections at Ages 62 and 67

The derivation of wealth projections at ages 62 and 67 involved three phases. In the first phase (the *estimation* phase), we estimated a reduced-form equation relating family wealth in year t, to a vector of income and demographic variables, using data from the PSID. In the second phase (the *calibration* phase), we used these estimates to center predicted wealth estimates on the SIPP file. We calculated an individual-specific "residual" which placed each individual on his or her regression line in the year of the SIPP survey. This calibration phase was necessary to control for out-of-sample effects from using parameter estimates from a different data file and also to take into account unobserved heterogeneity. In the third phase (the *projection* phase), these individual residuals were combined with the relevant income and demographic information (both actual and projected in earlier phases of the MINT study) at ages 62 and 67 to obtain projections of housing and other wealth.

Estimation Methodology

The estimates involved a two-step process: (i) estimation and then imputation of a probability of having positive wealth (both housing and other wealth) and (ii) estimation of and projection of the level of wealth, conditional on having positive wealth. Whether or not an imputation of positive wealth was made in step (i) was determined by comparing the imputed probability using the estimated coefficients of the regression equation with a uniformly distributed random number between zero and one.

We chose this strategy after experimenting with a number of alternative reduced-form models of lifetime wealth accumulation. In particular, experiments with a Tobit specification suggested to us that the process which determines whether a family has positive wealth or not is likely to be quite different from the process which determines the level of that wealth. Appendix 4-A contains a brief summary of the alternative specifications with which we experiment.

For the projections of wealth level, conditional on having positive wealth, at ages 62 and 67, we estimate a reduced-form equations of the form for both housing and non-housing wealth:

$$W_{it} = X_{it}\,\beta + \mu_i + \gamma_t + C_a + \epsilon_{it}$$

where W_{it} = wealth for family i in year t, X_{it} = income and demographic variables individual i in year five, γ_t = a dummy variable for year (1984, 1989, or 1994), C_a = a dummy variable for for each 5-year birth cohort beginning with the cohort born in 1931, μ_i = an individual-specific error term to control for heterogeneity, and ϵ_{it} is the usual regression residual. The dependent variable (W_{it}) in each of the estimating equations is the natural logarithm of the dollar value of wealth (housing and other non-pension wealth) divided by the economy-wide average wage in the year the wealth was reported.

In choosing variables to include in the X-array, we used an approach that is common in the literature of predicting age-wealth profiles. The age of the family head and his or her age squared were included to capture life-cycle trajectories of asset accumulation. Dummy variables to indicate whether the head of the family was married, divorced, widowed or headed by a male were included to control for these circumstances, all of which have important effects on lifetime wealth accumulation. A dummy variable to indicate whether the head of the family was white was included because large disparities in wealth accumulation by race, even after adjusting for income, are apparent in reported data. Family size should also be an important predictor of wealth, given the added costs of raising children. Because the presence of young children can also affect the path of wealth accumulation, the age of the youngest child interacted with marital status of the household head was included. Health status of the family head was included because individuals in poor health are likely to have higher than average costs associated with maintaining a household, and therefore accumulate less wealth at any given income level.

Dummy variables to represent the birth cohort of the family head starting in 1930 at five-year intervals were included to capture differences in wealth accumulation among cohorts. (The excluded cohorts are all cohorts born before 1930 or after 1960.)[1] Parameter estimates were scaled to be measured relative to 1994 wealth by including the dummy variables for 1984 and 1989.[2]

Average earnings for both spouses in the prior five years was chosen as a proxy for permanent or lifetime income. We chose this variable because we believed it important to tie the projections closely to the earnings histories. Other specifications were tested, and average earnings over the previous five years appeared to perform well in comparison to other measures. A variable to capture transitory movements in current earnings was included and calculated as the difference between current earnings and average earnings in the previous five years. A dummy variable for married couples to indicate if both spouses worked was included to capture the added costs of maintaining two careers. The fraction of current wealth held in equities was included to capture the fact that these assets generally have higher rates of return than less risky investments. Dummy variables were also included if the household received any pension income and if the household owned (rather than rented) a home.

Calibration and Projection

Once parameter estimates were obtained, they were used to impute an estimate of family wealth onto the merged SIPP file in the base year of the survey for those families reporting positive wealth.[3] At this stage, an individual-specific "residual" (RESIDH and RESIDW) was computed as the difference between the actual wealth reported on the file and predicted wealth from the estimated equation. This residual was used to center the predicted wealth estimates to match reported wealth on the SIPP and was then added to projected wealth at ages 62 and 67 to obtain final wealth estimates. In cases where an individual has a change in marital status, the average of the residuals of both spouses (if present at age of projection) was used in the projections.

Use of a residual wealth component in this manner helps to ensure that the projections are tied to reported wealth in the base SIPP files. It has the added benefit of attempting to capture the "propensity" of certain individuals to be above- or below-average savers. One drawback of this approach is that it implicitly assumes this propensity is carried throughout an individual's lifetime. This seems a particularly strong assumption for the younger cohorts, but is quite reasonable for those in the SIPP data set (60 year-olds, say) who are nearing retirement or at mid-career.

In general, predictions were made using the coefficients of the estimated equation, adjusted for the calibrated individual-specific effect. Some of the variables which were included to obtain better estimates of the age coefficient in the estimated equation required modification in the projections equation.

One variable that needed to be modified for the projections was the variable for family size. Because younger families are more likely to still have children living with them and this is likely to have a negative effect on their level of wealth, it is necessary to control for this in the wealth equations. But family compositional changes not being forecast in MINT are not necessarily related to family size at the time of the MINT sample, so family size cannot be used as a variable to forecast future wealth of individuals in the 1990-93 SIPP panels. For purposes of the projections, we therefore set the value of the family size variable to two for married couples and to one for single individuals. At ages 62 and 67, few families have children living in the home, so setting the family size to or two only slightly overstates the projection of aggregate wealth.

Another variable that could not be used as is in the projections was the difference between current earnings and a measure of permanent income (WDELTA). The purpose of including WDELTA was to control for unexpected, transitory movements in income which could (temporarily) affect wealth accumulation if consumption does not respond much to transitory movements in income. A decline in earnings at older ages for anticipated life cycle reasons does not have the same interpretation as a transitory decline during working years, however, and should not be expected to produce a similar decline in wealth. Therefore, for purposes of the projections, we set WDELTA equal to zero.

III. ESTIMATES OF WEALTH AT AGES 62 AND 67

1. Housing Wealth

As described above, a two-stage procedure was used to project housing wealth at ages 62 and 67. In the first stage, a probability of having positive home equity was determined. In the second stage, an amount conditional on having a positive value was imputed.

Probability of Positive Housing Wealth

Table 4-4 contains the parameter estimates used in this equation. We chose a relatively parsimonious model for the probability of having positive housing wealth. The results indicate that the age of the family head increases the probability of having positive home equity; being white and married also have strong, positive effects. Family size and average earnings in the prior five years have strong positive effects on the accumulation of housing wealth. Having both couples in the labor force reduces this probability. All coefficients are statistically significant at the 95 percent level.

Estimation of Housing Wealth At Ages 62 and 67

Table 4-5 contains the parameter estimates of a random effects model of housing wealth, conditional on having positive wealth. The dependent variable is the natural logarithm of housing wealth (housing value less home mortgage debt) divided by the economy-wide average wage. The results indicate that housing wealth increases with age, but with a decreasing rate as indicated by the negative coefficient on the age-squared term. Divorce has a negative effect on housing wealth as does being widowed. Married couples with two earners have less housing wealth than an otherwise identical couple where only one is in the labor force. Average earnings in the prior five years has a strong, positive effect on the value of housing wealth. Positive effects on housing wealth are also indicated by the fraction of assets held in equities, whether the household head is male (but this effect is not statistically different from zero), and if the head is in good health. Family size is positively related to housing wealth. Cohort effects are generally positive, except for the youngest cohort where housing wealth is lower, after controlling for other characteristics. (Recall that the missing cohorts have heads of household born before 1930 and after 1960.)

2. Non-Housing Wealth

Probability of Positive Non-Housing Wealth.

To determine whether an individual would have positive non-housing wealth at age 62 or 67, a probability was calculated using a random effects probit model estimated from the PSID. We used a model similar to that used for the housing wealth imputation and the parameter estimates are shown in Table 4-6. The estimates indicate that the probability of having positive wealth increases with the age of the family head and with the size of average earnings. A negative effect on the probability of having positive non-housing wealth is observed for two-earner couples. (This means that two-earner couples have a slightly lower probability of having positive housing wealth <u>after</u> controlling for earnings, family size, age and race.) Finally, the results suggest this probability is also lower for larger families. All coefficients are statistically significant at the 95 percent level.

Table 4-4
Random Effects Model for Home Ownership

```
GENERAL ESTIMATING EQUATION FOR PANEL DATA        NUMBER OF OBS    =     22653
GROUP VARIABLE:                     ENTRYID       NUMBER OF GROUPS =     11620
LINK:                                PROBIT       OBS/GROUP, MIN   =         1
FAMILY:                            BINOMIAL                   AVG   =      1.95
CORRELATION:                   EXCHANGEABLE                   MAX   =         3
                                                  CHI2(6)          =   4865.71
SCALE PARAMETER:                          1       PROB > CHI2      =    0.0000
PEARSON CHI2(22646):               22450.38       DEVIANCE         =  23732.05
DISPERSION (PEARSON):              .9913617       DISPERSION       =  1.047958
```

Variable	Coeficient	Std.Err.	Description
AGEH	.0318355**	.0006646	AGE OF FAMILY HEAD
MARRIED	.6684303**	.0293448	MARITAL STATUS (1=MARRIED,0=OTHERWISE)
WHITE	.2710493**	.0193593	RACE OF FAMILY HEAD (1=WHITE,0=OTHERWISE)
TWOEARN	.0740953**	.0301678	TWO EARNER COUPLE (1=YES, 0=NO)
FAMSIZE	.0818698**	.007483	FAMILY SIZE
AVEW5	.4199301**	.0133128	AVERAGE EARNINGS IN THE LAST 5 YEARS
_CONS	2.347942	.0419664	CONSTANT TERM

**SIGNIFICANT AT 95% CONFIDENCE LEVEL

Table 4-5
Random Effects Model for Home Equity

```
RANDOM-EFFECTS GLS REGRESSION
SD(U_ENTRYID)                =  .8447528              NUMBER OF OBS =   11730
SD(E_ENTRYID_T)              =   .614591                          N =    6324
SD(E_ENTRYID_T + U_ENTRYID)  =  1.044667                      T-BAR = 1.47918
CORR(U_ENTRYID, X)           =  0 (ASSUMED)           R-SQ WITHIN   =  0.1773
                                                           BETWEEN   =  0.2114
                                                           OVERALL   =  0.2327
------------------- THETA --------------------
  MIN      5%       MEDIAN        95%      MAX         CHI2( 23)     = 2884.60
0.4117   0.4117     0.5425     0.6127   0.6127          PROB > CHI2 =  0.0000
```

Variable	Coefficent	Std.Err.	Description
AGEH	.0711246**	.0049428	AGE OF FAMILY HEAD
AGESQU	-.0004375**	.000048	AGE OF FAMILY HEAD SQUARED
AGEYMS	-.0010634	.0019232	AGE OF YOUNGEST CHILD * MARRIED
MARRIED	-.0653245	.0524478	MARITAL STATUS (1=MARRIED,0=OTHERWISE)
DIVORCE	-.243517**	.0528379	DIVORCE STATUS (1=DIVORCED,0=OTHERWISE)
WHITE	.2582437**	.026842	RACE OF FAMILY HEAD (1=WHITE,0=OTHERWISE)
MALE	.0771856*	.0416846	SEX OF FAMILY HEAD (1=MALE,0=OTHERWISE)
FAMSIZE	.030562**	.0081368	FAMILY SIZE
HEALTH	.1056517**	.0217015	HEALTH STATUS OF HEAD(1=GOOD,0=OTHERWISE)
WDELTA	.0953282**	.0138442	CURRENT EARNINGS LESS AVERAGE EARNINGS
STOCKPCT	.0707172**	.0164373	FRACTION OF WEALTH HELD IN EQUITIES
C01	.1794287**	.0544402	DUMMY VARIABLE FOR 1930-1934 BIRTH COHORT
C02	.1284095**	.0577457	DUMMY VARIABLE FOR 1935-1939 BIRTH COHORT
C03	.1268119**	.0528962	DUMMY VARIABLE FOR 1940-1944 BIRTH COHORT
C04	.1760489**	.0445504	DUMMY VARIABLE FOR 1945-1949 BIRTH COHORT
C05	.0831315**	.0423746	DUMMY VARIABLE FOR 1950-1954 BIRTH COHORT
C06	-.1154209**	.043027	DUMMY VARIABLE FOR 1955-1959 BIRTH COHORT
Y1984	-.4925764**	.028821	DUMMY VARIABLE FOR 1984
Y1989	-.3571948**	.026782	DUMMY VARIABLE FOR 1989
AVEW5	.2126162**	.0125009	AVERAGE EARNINGS IN PREVIOUS 5 YEARS
TWOEARN	-.0895436**	.026112	TWO EARNER COUPLE(1=YES,0=NO)
PENSION	.2161221**	.0250284	PENSION INCOME INDICATOR (1=YES,0=NO)
WIDOWED	-.127434**	.0592256	WIDOWED STATUS (1=YES,0=OTHERWISE)
_CONS	-2.311579	.1206449	CONSTANT TERM

** SIGNIFICANT AT 95% CONFIDENCE LEVEL
* SIGNIFICANT AT 90% CONFIDENCE LEVEL

Table 4-6
Random Effects Probit Model for Presence of Positive Other Wealth

```
GENERAL ESTIMATING EQUATION FOR PANEL DATA          NUMBER OF OBS    =     22653
GROUP VARIABLE:                    ENTRYID          NUMBER OF GROUPS =     11620
LINK:                               PROBIT          OBS/GROUP, MIN   =         1
FAMILY:                            BINOMIAL                     AVG   =      1.95
CORRELATION:                   EXCHANGEABLE                     MAX   =         3
                                                    CHI2(6)          =   2582.23
SCALE PARAMETER:                          1         PROB > CHI2      =    0.0000
PEARSON CHI2(22646):               23490.44         DEVIANCE         =  20896.35
DISPERSION (PEARSON):              1.037289         DISPERSION       =   .922739
```

Variable	Coefficient	Std.Err.	Description
AGEH	.0112677**	.0006371	AGE OF FAMILY HEAD
MARRIED	.5361912**	.0309842	MARITAL STATUS (1=MARRIED,0=OTHERWISE)
WHITE	.4978503**	.0225575	RACE OF FAMILY HEAD
TWOEARN	-.0699946**	.0336925	TWO EARNER COUPLE (1=YES, 0=NO)
FAMSIZE	-.0451171**	.0075319	FAMILY SIZE
AVEW5	.4157107**	.0160942	AVERAGE EARNINGS IN THE LAST 5 YEARS
_CONS	-.3150706	.0379231	CONSTANT TERM

**SIGNIFICANT AT 95% CONFIDENCE LEVEL

Estimation of Other (Non-Housing) Wealth At Ages 62 and 67.

Table 4-7 shows the results of a random effects model for other wealth, conditional on it being positive, estimated from the PSID.

The dependent variable in Table 4-7 is the natural logarithm of other wealth divided by the economy-wide average wage. The parameter estimates corroborate much of what has been found by other researchers and are suggestive of the following:

- Coefficients on age and age-squared show the familiar curvature of empirical age-wealth profiles -- the age term is positive and the age-squared term is negative;
- Married couples have higher wealth than families headed by persons who have never been married;
- Divorce has a negative effect on asset accumulation;

Table 4-7
Random Effects Model For Other Wealth

```
RANDOM-EFFECTS GLS REGRESSION
SD(U_ENTRYID)                =  1.211939              NUMBER OF OBS =   17335
SD(E_ENTRYID_T)              =  1.090656                          N =    9486
SD(E_ENTRYID_T + U_ENTRYID)  =  1.630438                       T-BAR =  1.4622
CORR(U_ENTRYID, X)           =  0 (ASSUMED)           R-SQ WITHIN   =  0.1428
BETWEEN  =  0.3369                                         OVERALL  =  0.3271
------------------- THETA --------------------
  MIN      5%       MEDIAN        95%      MAX         CHI2( 24)     = 5902.01
0.3311   0.3311     0.4631     0.5389   0.5389           PROB > CHI2 =  0.0000
```

Variable	Coefficient	Std. Error	Description
AGEH	.0516739**	.0064644	AGE OF FAMILY HEAD
AGESQU	-.0002816**	.000064	AGE OF FAMILY HEAD SQUARED
AGEYMS	-.0095816**	.0030315	AGE OF YOUNGEST CHILD * MARRIED
MARRIED	.2154922**	.0547575	MARITAL STATUS (1=MARRIED,0=OTHERWISE)
DIVORCE	-.3043057**	.0519517	DIVORCE STATUS (1=DIVORCED,0=OTHERWISE)
WHITE	.5549008**	.0346952	RACE OF FAMILY HEAD (1=WHITE,0=OTHERWISE)
MALE	.3088287**	.0462454	SEX OF FAMILY HEAD (1=MALE,0=OTHERWISE)
FAMSIZE	-.0592723**	.0108611	FAMILY SIZE
HEALTH	.1842078**	.0302921	HEALTH STATUS OF HEAD (1=GOOD,0=OTHERWISE
WDELTA	.3420059**	.0203431	CURRENT EARNINGS LESS AVERAGE EARNINGS
STOCKPCT	.0780171**	.0289176	FRACTION OF WEALTH HELD IN EQUITIES
C01	-.1114624	.0775325	DUMMY VARIABLE FOR 1930-1934 BIRTH COHORT
C02	.048001	.0815694	DUMMY VARIABLE FOR 1935-1939 BIRTH COHORT
C03	.080252	.0725842	DUMMY VARIABLE FOR 1940-1944 BIRTH COHORT
C04	.0738006	.0606003	DUMMY VARIABLE FOR 1945-1949 BIRTH COHORT
C05	-.0681498	.0532004	DUMMY VARIABLE FOR 1950-1954 BIRTH COHORT
C06	-.1244007**	.0487746	DUMMY VARIABLE FOR 1955-1959 BIRTH COHORT
Y1984	-.9284874**	.0384727	DUMMY VARIABLE FOR 1984
Y1989	-.7322598**	.0362317	DUMMY VARIABLE FOR 1989
AVEW5	.5721058**	.0183561	AVERAGE EARNINGS IN PREVIOUS 5 YEARS
TWOEARN	-.115793**	.036885	TWO EARNER COUPLE(1=YES,0=NO)
TENURE	.5157948**	.0295728	HOME OWNERSHIP INDICATOR (1=YES,0=NO)
PENSION	.4029462**	.0383109	PENSION INCOME INDICATOR (1=YES,0=NO)
WIDOWED	-.1956565**	.0715522	WIDOWED STATUS INCICATOR (1=YES,0=NO)
_CONS	-3.042983	.1378594	CONSTANT TERM

** SIGNIFICANT AT 95% CONFIDENCE LEVEL

- Being white and residing in a male-headed household has a strong positive effect on wealth;
- Increases in family size reduce wealth;
- Good health can have an important effect on lifetime wealth accumulation;
- The fraction of wealth held in equities has a positive impact on wealth, but this could just reflect the time period over which the estimates were obtained (1984-1994);
- Average earnings in the previous five years has an unambiguous, positive effect on wealth accumulation;
- Married couples with two-earners have less wealth than one-earner couples with the same income, possibly reflecting the added costs of managing two careers; and
- Owning a home is positively correlated with wealth accumulation.

IV. PROJECTIONS OF WEALTH AT AGES 62 AND 67

Wealth projections were obtained by replacing values of the independent variables in the equations for estimating the determination of wealth with the appropriate values in place at ages 62 and 67 for members of the MINT population. Wage histories were updated to reflect projected earnings after 1996; marital status and family compositional changes were incorporated; homeownership status was updated; and the residual term was added to predicted wealth. In order to facilitate a discussion of the projections, Table 4-8 shows the mean values by five-year birth cohort of selected independent variables that were used in the projections for wealth at age 62.

By reading across each row of the table, one can examine how certain economic and demographic variables are likely to be affecting the projections. For example, more recent cohorts are less likely to be married; are more likely to reach age 62 divorced; and family heads are slightly less likely to be white males. Average wages in the five years leading up to retirement show an interesting pattern, with the middle cohorts experiencing slightly higher wages (as a fraction of the economy-wide average) than both the earlier and later cohorts.

1. Projections of Housing Wealth

We assumed that those households who were homeowners on the base SIPP file remained homeowners throughout the projection period. For those who were not homeowners in the base period, a random effects probit model was used to determine a probability of having positive housing wealth.

Table 4-8
Mean Values of Selected Independent Variables at Age 62, By Birth Cohort

Variable	1931 to 1935	1936 to 1940	1941 to 1945	1946 to 1950	1951 to 1955	1956 to 1960
MARRIED	0.7356	0.7016	0.6902	0.6850	0.6733	0.6648
DIVORCE	0.1020	0.1413	0.1547	0.1666	0.1654	0.1705
WHITE	0.8750	0.8722	0.8634	0.8523	0.8438	0.8305
MALE	0.8145	0.7931	0.7950	0.7930	0.7901	0.7834
HEALTH	0.4317	0.5146	0.5724	0.6326	0.6591	0.6912
STOCKPCT	0.0731	0.0686	0.0650	0.0622	0.0593	0.0506
AVEW5	1.2507	1.2714	1.3180	1.3420	1.2577	1.1689
TWOEARN	0.4150	0.4367	0.4396	0.4585	0.4567	0.4575
WIDOWED	0.1188	0.1137	0.1048	0.0897	0.0928	0.0922
RESIDH	0.1431	0.1838	0.2295	0.2583	0.2074	0.1862
RESIDW	0.7601	1.0301	1.1699	1.1380	1.0400	1.0300

Variable definitions: MARRIED = dummy variable for whether the head of household is married; DIVORCE = dummy variable for whether head of household is divorced; WHITE = dummy variable for whether head of household is white; MALE = dummy variable for whether household is headed by a male; HEALTH = dummy variable for health status of family head (1 if good; 0 otherwise); STOCKPCT = fraction of wealth held in equities ; AVEW5 = average earnings for both spouses in the previous five years; TWO EARN = dummy variable to indicate if both spouses worked; WIDOWED = dummy for whether head of household is widowed; RESIDH = difference between housing wealth on SIPP file and predicted housing wealth; and RESIDW = difference between non-housing wealth on SIPP file and predicted non-housing wealth.

For those individuals who were not homeowners on the base-year SIPP file, the probit value from the equation in Table 4-4 was compared with a uniformly distributed random number to determine if the family would receive an imputed value for housing wealth at age 62. We then assumed that homeownership status remained unchanged between the ages of 62 and 67. [4]

Applying the coefficients from Table 4-4 to predict future homeownership of individuals on the SIPP with no home equity results in an over-estimate of the number of individuals in the earliest cohorts (the oldest people in the 1990-93 SIPP files) who have positive home equity because it is unlikely that these individuals would purchase a home late in life if they have not already done so. This over-estimate becomes less serious as the procedure is applied to each subsequent cohort because younger individuals who do not own homes in the 1990-93 SIPP are more likely to become homeowners than older non-homeowners. The correct probability to use in the projections is the conditional probability of purchasing a home at age 62 (or 67) given that one was not a homeowner at the time of the SIPP interview. Because we do not know when a 62 or 67 year old homeowner on the PSID purchased his or her home, we are unable to estimate this conditional probability on the PSID. To compensate for the over-estimate we approximated the conditional probability by adding an age-specific constant adjustment to the projection equation that makes the overall projected probabilities of home ownership by age in the projection equal to the probability of home ownership by age in the base year SIPP data. Therefore, the equation is selecting which people in the SIPP will become homeowners, based on their characteristics, but does not provide an independent projection of the future rate of homeownership.

After we had projected whether housing wealth was positive, we then projected the level of housing wealth at ages 62 and 67 for those with positive wealth. The equation for housing wealth, conditional on homeownership, from Table 4-5 was used in the projections at both age 62 and at age 67, with all values of the independent variables updated to reflect earnings and demographic changes consistent with the projections of the other tasks. Tables 4-9 to 4-11 contain the results of the projections, showing the mean housing wealth at ages 62 and 67 for all individuals on the file and the fraction with positive home equity by birth cohort, first for all individuals and then separately for married couples and unmarried individuals.

The projections indicate that approximately 85 percent of families will have some housing wealth at ages 62 and 67. This seems a bit high compared with the baseline SIPP data where the figure is about 77 percent for those in the earliest cohort. We suspect this result is a consequence of our assumption that individuals who are homeowners in the base-year SIPP file remain homeowners throughout the projection period. Additionally, this assumption means that for a married couple who owns a home in the base year and subsequently gets divorced, each spouse will continue to be a homeowner in the projection period. It is difficult to say if this is a realistic assumption given projections that individuals in more recent cohorts are more likely to reach retirement age in a divorced state. We return to this issue later when we discuss the projections of non-housing wealth.

Table 4-9
Mean Housing Wealth as a Fraction of the Economy-Wide Average Wage at Ages 62 and 67, by Birth Cohort — All Individuals

Birth Cohort	Proportion With Positive Housing Wealth		Average for All Individuals	
	Age 62	Age 67	Age 62	Age 67
1931 to 1935	0.84	0.85	1.89	1.93
1936 to 1940	0.84	0.85	1.78	1.79
1941 to 1945	0.85	0.85	1.79	1.78
1946 to 1950	0.84	0.84	1.78	1.77
1951 to 1955	0.82	0.82	1.66	1.65
1956 to 1960	0.80	0.80	1.40	1.39

Table 4-10
Mean Housing Wealth as a Fraction of the Economy-Wide Average Wage at Ages 62 and 67, by Birth Cohort — Married Individuals

Birth Cohort	Proportion With Positive Housing Wealth		Average for All Individuals	
	Age 62	Age 67	Age 62	Age 67
1931 to 1935	0.92	0.92	1.84	1.75
1936 to 1940	0.91	0.90	1.72	1.64
1941 to 1945	0.91	0.91	1.67	1.58
1946 to 1950	0.92	0.92	1.68	1.61
1951 to 1955	0.89	0.88	1.61	1.53
1956 to 1960	0.88	0.87	1.34	1.27

Table 4-11
Mean Housing Wealth as a Fraction of the Economy-Wide Average Wage at Age 62, by Birth Cohort — Single Individuals

Birth Cohort	Proportion With Positive Housing Wealth		Average for All Individuals	
	Age 62	Age 67	Age 62	Age 67
1931 to 1935	0.64	0.71	2.01	2.30
1936 to 1940	0.65	0.71	1.90	2.06
1941 to 1945	0.71	0.74	2.08	2.16
1946 to 1950	0.68	0.71	2.00	2.09
1951 to 1955	0.68	0.71	1.77	1.87
1956 to 1960	0.65	0.68	1.51	1.60

The projections show lower mean housing wealth relative to the average wage for the two more recent cohorts than for earlier cohorts. The decline in the ratio of housing wealth to the average wage is quite substantial. For all individuals, at age 62, mean housing wealth relative to the average wage is over 20 percent lower for the 1956-60 birth cohort than for the 1946-50 birth cohort.

Examination of the mean values of the independent variables in Table 4-5 suggests two possible sources of the decline in housing wealth -- 1) slightly lower wages in the previous five years (about 7 percent below the preceding cohorts) and 2) a slightly larger proportion of divorced individuals than in the earlier cohorts.

The projections also indicate that the mean, per person housing wealth of single individuals is slightly above that of married couples. That is, while married couples are projected to have higher mean housing wealth than do single individuals, they do not have twice as much more, on average. In contrast, the base year SIPP data for the oldest cohorts show that per person hsouing wealth is about the same for married couples and single individuals. There are two explanations for this result. First, the coefficient on the MARRIED term enters the equation with a negative sign (-0.065), indicating that, on the PSID, married couples have slightly less housing wealth per capita than single individuals, after controlling for other variables. Second, the treatment of divorced couples in the projections may overstate housing wealth of some single individuals at ages 62 and 67. This is because we assume that individuals who were homeowners in the base year SIPP, but subsequently divorce before reaching age 62 or 67, continue to be homeowners after they divorce. This assumption could raise the number of single homeowners in the projections, relative to the base year SIPP, thereby causing overall average housing wealth for unmarried individuals to be slightly higher relative to the average for married couples than in the base year SIPP.

Tables 4-12 and 4-13 show average housing wealth as a fraction of the economy-wide average wage at age 62 and 67, respectively, arrayed by birth cohort and income quintile. For purposes of these tables, the income measure used was income at first receipt of Social Security benefits. Income is defined as the sum of earnings, Social Security benefits, benefits from defined benefit pension plans, the annuitized return on defined contribution plans and non-pension financial wealth, and imputed rental income from owner-occupied housing. (Some of these sources of income are projected in subsequent chapters of this report. A more complete description of the income measure is provided in Chapter 7.)

The projections of housing wealth at age 62 and 67 by income quintile show average home equity in the top quintile is about three times the home equity for the lowest quintile in all cohorts, but the percentage differential between the top and bottom quintiles declines slightly for the most recent cohorts. Home equity relative to the average wage at ages 62 and 67 remains approximately constant between the 1931-35 and 1946-50 birth cohorts for the bottom two quintiles and declines for the top three quintiles. Home equity relative to the average wage at ages 62 and 67 declines between the 1946-50 and 1956-60 cohorts in all five income quintiles.

Table 4-12
Mean Housing Wealth as a Fraction of the Economy-Wide Average Wage at age 62, by Birth Cohort and Income Quintile - All Individuals

Income Quintile	1931 to 1935	1936 to 1940	1941 to 1945	1946 to 1950	1951 to 1955	1956 to 1960
First Quintile	0.93	0.85	0.98	0.91	0.82	0.76
Second Quintile	1.32	1.32	1.32	1.28	1.16	1.02
Third Quintile	1.79	1.67	1.64	1.66	1.52	1.28
Fourth Quintile	2.27	2.03	2.01	2.02	1.90	1.56
Fifth Quintile	3.09	2.82	2.68	2.74	2.68	2.21

Table 4-13
Mean Housing Wealth as a Fraction of the Economy-Wide Average Wage at age 67, by Birth Cohort and Income Quintile - All Individuals

Income Quintile	1931 to 1935	1936 to 1940	1941 to 1945	1946 to 1950	1951 to 1955	1956 to 1960
First Quintile	0.99	0.89	1.03	0.96	0.86	0.80
Second Quintile	1.36	1.36	1.35	1.28	1.17	1.04
Third Quintile	1.80	1.68	1.63	1.63	1.50	1.25
Fourth Quintile	2.24	2.02	1.96	1.96	1.84	1.52
Fifth Quintile	2.97	2.76	2.58	2.61	2.55	2.09

2. Projections of Other (Non-Housing Wealth)

A similar procedure was employed to project other wealth at ages 62 and 67 as was used to project housing wealth. First, a probability of having non-zero other wealth was determined and compared with a uniformly distributed (pseudo-) random number to decide if a positive value was to be imputed. The calculated probability was compared with a uniform random number to determine if the family should be given a wealth imputation at age 62. In the second stage, a value of other wealth was imputed for those with positive wealth at both ages 62 and 67.

The results of the housing wealth projections were utilized in this stage of the process through a dummy variable indicating home ownership appears on the right hand side of the equation for non-housing wealth.

After the independent variables were updated this equation was used to determine the level of non-housing wealth. Tables 4-14 to 4-16 contain the results of the projections, showing mean other wealth at ages 62 and 67 for all individuals on the file and the fraction with positive amounts by birth cohort, first for all individuals and then separately for married and unmarried persons. Tables 4-17 and 4-18 show mean non-housing wealth by birth cohort and income quintile at age 62 and 67 respectively. As before, the income measure used here is the income at first receipt of Social Security benefits. This is to ensure that a complete picture of the income of future retirees is used.

Approximately 90 percent of individuals are projected to have positive non-housing, non-pension wealth at ages 62 and 67. The projections also indicate that single individuals will reach retirement age with significantly less wealth (on a per person basis) than married individuals. This result is consistent across cohorts.

The percentage of individuals with positive wealth remains about the same for more recent birth cohorts as for the earlier cohorts. But projected non-housing, non-pension wealth is much lower in relation to the average wage for recent birth cohorts than for the earlier cohorts. For example, at age 62, the average wealth (relative to the average wage) for all individuals in the 1956-60 birth cohorts is about 40 percent lower than the average non-housing non-pension wealth for all individuals in the 1931-35 birth cohorts. While the decline in *this component* of wealth is striking, we emphasize that it results mostly from a shift in the *composition* of financial wealth between pension and non-pension wealth instead of from a decline in total wealth. In particular, more recent birth cohorts are projected to accumulate more wealth in defined contribution pension plans, including 401(k) plans, and individual retirement accounts. The results reported in Chapter 7 suggest that total income from financial wealth as a proportion of the average wage will in general remain stable across cohorts, although it will decline for the most recent (1956-60) birth cohort. But even for this cohort the decline in total financial wealth is much more modest than the projected decline in non-pension wealth.

The lower projected wealth for most recent birth cohorts largely reflects the effect of the individual-specific residual calculated as part of the calibration phase. More recent birth cohorts (the youngest individuals in the SIPP files) are further below their predicted age-wealth profile than earlier cohorts at the time of the SIPP interview, based on the regression estimates shown in Table 4-6. Because we allow this residual to be carried forward to age 62, they will, on average, be projected to have less wealth than a member of the oldest cohort with similar characteristics. The lower average earnings later in life of the two most recent cohorts also contribute to their lower projected wealth at ages 62 and 67.

Table 4-14
Mean Other Wealth as a Fraction of the Economy-Wide Average Wage at Ages 62 and 67, by Birth Cohort — All Individuals

Birth Cohort	Proportion With Positive Other Wealth		Average for All Individuals	
	Age 62	Age 67	Age 62	Age 67
1931 to 1935	0.91	0.90	2.15	1.68
1936 to 1940	0.90	0.89	1.84	1.49
1941 to 1945	0.91	0.90	1.83	1.42
1946 to 1950	0.91	0.90	1.66	1.31
1951 to 1955	0.90	0.89	1.47	1.14
1956 to 1960	0.90	0.89	1.26	0.99

Table 4-15
Mean Other Wealth as a Fraction of the Economy-Wide Average Wage at Ages 62 and 67, by Birth Cohort — Married Individuals

Birth Cohort	Proportion With Positive Other Wealth		Average for All Individuals	
	Age 62	Age 67	Age 62	Age 67
1931 to 1935	0.95	0.94	2.28	1.80
1936 to 1940	0.95	0.94	2.05	1.62
1941 to 1945	0.95	0.95	1.96	1.47
1946 to 1950	0.95	0.94	1.84	1.38
1951 to 1955	0.95	0.94	1.64	1.22
1956 to 1960	0.94	0.93	1.36	1.01

Table 4-16
Mean Other Wealth as a Fraction of the Economy-Wide Average Wage at Ages 62 and 67, by Birth Cohort — Single Individuals

Birth Cohort	Proportion With Positive Other Wealth		Average for All Individuals	
	Age 62	Age 67	Age 62	Age 67
1931 to 1935	0.80	0.81	1.81	1.43
1936 to 1940	0.80	0.81	1.36	1.26
1941 to 1945	0.81	0.80	1.53	1.34
1946 to 1950	0.83	0.81	1.29	1.16
1951 to 1955	0.80	0.82	1.13	1.01
1956 to 1960	0.82	0.82	1.05	0.96

Table 4-17
Mean Other Wealth as a Fraction of the Economy-Wide Average Wage at Age 62, by Birth Cohort and Income Quintile - All Individuals

Income Quintile	1931 to 1935	1936 to 1940	1941 to 1945	1946 to 1950	1951 to 1955	1956 to 1960
First Quintile	0.47	0.57	0.52	0.51	0.47	0.48
Second Quintile	0.83	0.83	0.73	0.72	0.67	0.62
Third Quintile	1.30	1.06	1.17	1.17	1.00	0.88
Fourth Quintile	2.05	1.79	1.89	1.77	1.52	1.32
Fifth Quintile	6.08	4.93	4.74	4.05	3.69	2.95

Table 4-18
Mean Other Wealth as a Fraction of the Economy-Wide Average Wage at age 67, by Birth Cohort and Income Quintile - All Individuals

Income Quintile	1931 to 1935	1936 to 1940	1941 to 1945	1946 to 1950	1951 to 1955	1956 to 1960
First Quintile	0.44	0.53	0.49	0.48	0.46	0.45
Second Quintile	0.66	0.71	0.62	0.61	0.59	0.55
Third Quintile	1.07	0.87	0.96	0.93	0.80	0.72
Fourth Quintile	1.61	1.46	1.42	1.36	1.13	1.03
Fifth Quintile	4.33	3.84	3.49	3.04	2.68	2.17

Future wealth of more recent cohorts may be higher than we projected if they receive larger inheritances, relative to the economy-wide average wage, than earlier cohorts. But our model does not capture the effects of differential inheritances among cohorts. Projecting inheritances by cohort would require us to model the evolution of bequests as a function of wealth accumulation and the disposition of bequests among successive cohorts. Such a model is beyond the scope of this project.

Projections of wealth by income quintile are presented in Tables 4-17 and 4-18. The projections, as expected, show the ratio of mean wealth to wages is higher for higher income groups at both ages 62 and 67 in all birth cohorts. Mean other wealth in the highest income group at age 62 is about 13 times as high as in the lowest group for the 1931-35 cohorts, reflecting a wider dispersion of non-housing, non-pension wealth than of housing wealth. The

dispersion of other wealth remains larger than the dispersion of housing wealth in subsequent cohorts, but narrows over time. In the 1956-60 cohorts, mean other wealth in the top quintile at age 62 is about 6 times as high as mean other wealth in the bottom quintile.

Mean other wealth declines monotonically from earlier to more recent cohorts for the top quintile of families, who are by far the largest holders of wealth. In the other four quintiles, mean other wealth either increases or declines moderately between the 1931-35 and 1946-50 birth cohorts, but then it declines for all quintiles between 1946-50 and 1956-60.

3. Qualifications and Suggested Improvements

One major issue with the method is whether we are adequately capturing the variance in wealth at ages 62 and 67 among individuals. This is important because one concern of the entire MINT project is to project the number of individuals who will have inadequate income in retirement. For this purpose, a projection method that understates the variance in non-pension wealth at retirement will underestimate the number of individuals who have little or no retirement income from these assets, although some of these individuals may have other sources of income (from pensions, Social Security benefits, or earnings) that make up for the lack of income from non-pension saving.

Variance of the Estimates

There was some concern that the projection methods employed in this task would understate the true variance of the observed wealth distribution of future retirees. While the calibration method captures the dispersion in wealth accumulation among individuals within each age group of the 1990-93 SIPP samples, it does not capture any dispersion in future rates of wealth accumulation beyond that explained by differences in right-hand side variables (such as average wages) that change over time in the projections. Thus, it is possible that the projections *understate* the dispersion of wealth at ages 62 and 67.

One potential test of whether the projections are showing too much or too little variance is to compare coefficients of variation (the ratio of the standard deviation to the mean) of wealth at ages 62 and 67 for different birth cohorts. The variance for the 1931-35 cohorts at age 62 should differ little from the actual variance on the SIPP files because for these observations wealth at 62 or 67 is determined mostly by the initial (actual) level of wealth and only marginally by the several years of wealth accumulation or decumulation after the date of the SIPP panel surveys. In contrast, the age-wealth profile as determined by the projection equation has much more influence relative to the initial starting point in projecting wealth to age 62 for the more recent birth cohorts who were younger at the time of the SIPP surveys. If the projections were systematically understating the dispersion of wealth, we should expect the coefficient of variation in the projections to be declining from earlier to later cohorts.

Table 4-19 compares the coefficients of variation of the wealth projections by birth cohort for housing and other wealth. It reveals no clear downward trend in the coefficient of variation for later birth cohorts. For housing wealth, the coefficient of variation is slightly higher for later cohorts than for earlier cohorts at ages 62 and 67. For other (non-housing, non-pension) wealth, the coefficient of variation rises through the 1941-45 cohorts and then declines in the most recent birth cohorts.

Table 4-19
Coefficient of Variation of Wealth Estimates, By Birth Cohort

Birth Cohort	Housing Wealth at Age 62	Housing Wealth at Age 67	Other Wealth at Age 62	Other Wealth at Age 67
1931 to 1935	101.01	103.47	208.22	206.55
1936 to 1940	102.83	104.30	200.49	203.64
1941 to 1945	104.81	107.12	279.21	267.76
1946 to 1950	108.32	108.93	255.92	240.24
1951 to 1955	114.85	116.25	216.98	222.78
1956 to 1960	123.69	124.26	222.39	247.14

While the coefficient of variation is not decreasing over time, it still may be too low if more recent cohorts in fact will be experiencing more dispersion than earlier cohorts. Therefore, future refinements of the model might consider explicit ways of modeling the dispersion of wealth.

Other Issues

In addition to the concern about variance, there are a number of other areas where further refinement of the model might be desirable.

Definition of the Earnings Variable. In the general reduced form framework, differences in the path of earnings must be an important determinant of differences among individuals in wealth accumulation. Our choice in using the last five years of earnings in our estimation equation was not entirely arbitrary, because observations on the PSID were spaced at five year intervals, but other measures could result in improved estimates, particularly for later cohorts. The choice of the previous five years of earnings was certainly appropriate for the earlier cohorts, where the projection horizon was quite short and observations on wealth were available.

Age-Wealth Profile. Our estimates assume a quadratic relationship between age and wealth. The coefficient of age and age-squared imply that wealth increases monotonically with age until well past age 67 and is inconsistent with the life cycle model and with data showing that wealth begins to decline at much younger ages than implied by our coefficients. In part, this reflects the fact that the coefficient on earnings is picking up the effects of age for individuals over age 55 whose projected earnings are falling with age. Consequently, the coefficients on age and age-squared do not reveal the aggregate relationship between wealth and age in our projections, but only show the partial effect of age with all other variables constant.

Nonetheless, a more detailed specification with dummy variables may better capture the shape of the age-wealth relationship. Appendix 4-C discusses the effects of using alternative functional forms for the age variable in the estimating equation.

Housing Wealth. Our procedure for projecting housing wealth should most likely be reconsidered, especially for those individuals who change marital status during the projection period. There is a difficult trade-off here, because we would like the projection method to be consistent with the underlying SIPP data file with respect to home-ownership and housing wealth. Our assumptions about homeownership are probably more defensible for earlier cohorts.

Two adjustments to our methodology are worth considering. First, we need to model the effects of divorce on homeownership. The current model assumes that both individuals remain homeowners after a divorce, but that is likely not the case for many divorcing home-owning couples. Second, we need to capture better the changes in aggregate homeownership by relaxing the assumption that homeownership incidence among later cohorts at age 62 and 67 will be the same as the incidence of homeownership among 62 and 67 year olds in the 1990-93 SIPP files. This would require developing a two-stage process to project total homeownership and then to assign probabilities of changing homeownership status among younger non-owners in the SIPP files.

APPENDIX A
ALTERNATIVE ECONOMETRIC SPECIFICATIONS

In the early phase of the project, we experimented with four different specifications of the projection equations. This appendix presents results from the four specifications we estimated. The dependent variable in each equation is the natural logarithm of other (non-pension) wealth.

Preliminary testing of equations similar to the one reported in the text revealed several characteristics of the underlying data that could necessitate the use of specifications other than ordinary least squares. First, a significant number of families (about 12 percent) reported zero or negative wealth on the PSID. This clustering is likely to bias regression coefficients estimated using OLS. Second, OLS ignores individual-specific effects, and persistence in individual wealth holdings over time could create a bias in the estimates of β. Third, the data included small number of households with very large wealth. These households could excessively influence the results, making the equations worse predictors of the age-wealth profiles of most households.

To address these issues, we tested four different general specifications:

1) *Ordinary least squares*. OLS was used on the pooled observations for each year in which non-zero wealth was observed.

2) *Quantile (median) regression*. A median regression was estimated on the pooled data with non-zero wealth. This is equivalent to minimizing the sum of the absolute deviations of the residuals and reduces the effect of outliers.

3) *Random effects model*. A random effects model was estimated to isolate the individual-specific effect contained in the μ_i. Because the PSID represents a random sample from a larger population, we chose this specification over the fixed effects model.

4) *Tobit model*. A Tobit model was estimated on the pooled data using zero as the truncation point. (A few households with negative reported wealth were assumed to have zero wealth.)

Parameter estimates from the first three models are quite similar. Estimates from the Tobit specification, however, are often very different. For example, coefficients on the age and age-squared terms reverse sign. This suggests that the process generating whether or not a family has positive wealth may be quite different than the process generating the amount of this wealth, conditional on it being positive. As a result of this preliminary analysis, we chose a two-stage approach for predicting wealth where the probability of having non-zero wealth was estimated in the first stage via a probit specification and a random effects model was used in the second stage.

Table 4-A-1
OLS Estimates of Non-Pension Wealth

Source	SS	df	MS
Model	22199.2425	24	924.968436
Residual	45321.3674	17312	2.61791632
Total	67520.6099	17336	3.8948206

Number of obs =	17337
F(24, 17312) =	353.32
Prob > F =	0.0000
R-squared =	0.3288
Adj R-squared =	0.3278
Root MSE =	1.618

lnwlth1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ageh	.0293287	.0063319	4.632	0.000	.0169176	.0417397
agesqu	-.0001017	.0000625	-1.628	0.104	-.0002242	.0000208
ageyms	-.0124633	.0034931	-3.568	0.000	-.0193101	-.0056165
married	.3054901	.0533615	5.725	0.000	.2008962	.410084
divorce	-.2874366	.0483523	-5.945	0.000	-.382212	-.1926612
white	.8109704	.035016	23.160	0.000	.7423356	.8796053
male	.2800115	.0415374	6.741	0.000	.1985941	.361429
famsize	-.099161	.0108279	-9.158	0.000	-.1203847	-.0779372
health	.4029935	.0334959	12.031	0.000	.3373381	.4686489
wdelta	.0001253	.0000996	1.258	0.208	-.0000699	.0003204
stockpct	.1616533	.032601	4.959	0.000	.0977521	.2255546
c01	-.1050892	.0619348	-1.697	0.090	-.2264876	.0163092
c02	.0664632	.0654669	1.015	0.310	-.0618586	.194785
c03	.1286764	.0596457	2.157	0.031	.0117647	.2455881
c04	.1323134	.0506834	2.611	0.009	.0329689	.231658
c05	-.032133	.0446253	-0.720	0.471	-.1196031	.0553371
c06	-.06463	.0410617	-1.574	0.116	-.1451151	.0158552
y1984	-1.233218	.0422172	-29.211	0.000	-1.315968	-1.150468
y1989	-.9799199	.0411001	-23.842	0.000	-1.06048	-.8993595
avew5	.0228808	.0006181	37.017	0.000	.0216692	.0240923
twoearn	-.1421335	.0372968	-3.811	0.000	-.215239	-.0690279
tenure	.722499	.0296725	24.349	0.000	.6643379	.78066
pension	.3633051	.0402741	9.021	0.000	.2843638	.4422463
widowed	-.2395633	.064252	-3.728	0.000	-.3655037	-.1136229

Table 4-A-2
Median Regression Estimates of Non-Pension Wealth

```
Median Regression                                       Number of obs =     17337
  Raw sum of deviations 27014.95 (about 9.595603)
  Min sum of deviations 21281.79                        Pseudo R2     =    0.2122

------------------------------------------------------------------------------
 lnwlth1 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    ageh |   .0304047   .0059682      5.094   0.000       .0187064     .042103
  agesqu |  -.0000824   .0000589     -1.399   0.162      -.0001978    .0000331
  ageyms |  -.0132126   .0032915     -4.014   0.000      -.0196642    -.006761
 married |   .2645963   .0502888      5.262   0.000       .1660251    .3631675
 divorce |  -.3671339   .0455654     -8.057   0.000      -.4564467   -.2778211
   white |   .6731704   .0330151     20.390   0.000       .6084576    .7378833
    male |   .2934008   .0391512      7.494   0.000       .2166606     .370141
 famsize |  -.1300097   .0101866    -12.763   0.000      -.1499765    -.110043
  health |   .3329332   .0315724     10.545   0.000       .2710482    .3948182
  wdelta |   5.43e-06   .0000834      0.065   0.948       -.000158    .0001688
stockpct |   .8716776   .0307422     28.354   0.000       .8114198    .9319353
     c01 |  -.0048528   .0583433     -0.083   0.934      -.1192116     .109506
     c02 |   .1329323   .0617135      2.154   0.031       .0119677     .253897
     c03 |   .0876548   .0561895      1.560   0.119      -.0224823    .1977919
     c04 |   .1070763   .0477803      2.241   0.025        .013422    .2007305
     c05 |  -.0128076   .0420651     -0.304   0.761      -.0952595    .0696442
     c06 |  -.0290027   .0387059     -0.749   0.454      -.1048702    .0468648
   y1984 |  -1.064694   .0397995    -26.751   0.000      -1.142705    -.986683
   y1989 |   -.832094   .0387503    -21.473   0.000      -.9080486   -.7561394
   avew5 |   .0225327   .0005827     38.670   0.000       .0213906    .0236748
 twoearn |   -.176531   .0351404     -5.024   0.000      -.2454097   -.1076523
  tenure |   .6027899   .0279755     21.547   0.000        .547955    .6576247
 pension |   .4015276   .0379641     10.577   0.000       .3271142     .475941
 widowed |  -.2809615   .0605508     -4.640   0.000      -.3996471   -.1622759
   _cons |   7.804974    .127691     61.124   0.000       7.554687    8.055261
```

Table 4-A-3
Random Effects Estimates of Non-Pension Wealth

```
sd(u_entryid)                =  1.225467                Number of obs =   17335
sd(e_entryid_t)              =  1.092338                            n =    9486
sd(e_entryid_t + u_entryid)  =  1.641637                        T-bar =  1.4622
corr(u_entryid, X)           =  0 (assumed)             R-sq within   =  0.1410
                                                             between  =  0.3248
                                                             overall  =  0.3226
------------------- theta --------------------
  min      5%       median        95%      max           chi2( 24)     = 5635.36
0.3346   0.3346     0.4668     0.5424   0.5424            Prob > chi2 =  0.0000

------------------------------------------------------------------------------
 lnwlth1 |      Coef.   Std. Err.       z     P>|z|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    ageh |   .0495983    .006522      7.605   0.000       .0368155    .0623812
  agesqu |  -.0003203   .0000643     -4.984   0.000      -.0004463   -.0001944
  ageyms |  -.0072291   .0030406     -2.378   0.017      -.0131886   -.0012696
 married |   .3060794   .0548955      5.576   0.000       .1984861    .4136727
 divorce |   -.273879   .0523051     -5.236   0.000      -.3763951    -.171363
   white |   .5943649   .0348283     17.066   0.000       .5261028     .662627
    male |   .3511839   .0464772      7.556   0.000       .2600904    .4422775
 famsize |  -.0716045   .0108979     -6.570   0.000      -.0929639    -.050245
  health |   .2239798    .030401      7.368   0.000       .1643949    .2835648
  wdelta |   .0001821   .0000832      2.189   0.029        .000019    .0003451
stockpct |   .0855346   .0290275      2.947   0.003       .0286418    .1424275
     c01 |  -.1201581   .0781493     -1.538   0.124      -.2733279    .0330117
     c02 |   .0376976   .0822243      0.458   0.647      -.1234592    .1988543
     c03 |   .1064208   .0731327      1.455   0.146      -.0369166    .2497583
     c04 |   .1182982   .0610065      1.939   0.052      -.0012724    .2378688
     c05 |  -.0598341   .0536091     -1.116   0.264      -.1649061    .0452378
     c06 |  -.1115107   .0491453     -2.269   0.023      -.2078336   -.0151877
   y1984 |  -.9818571   .0383334    -25.614   0.000      -1.056989   -.9067251
   y1989 |  -.7354849   .0362926    -20.265   0.000      -.8066171   -.6643527
   avew5 |   .0177455   .0006353     27.930   0.000       .0165003    .0189908
 twoearn |  -.0647489   .0358629     -1.805   0.071       -.135039    .0055411
  tenure |   .5612197   .0295709     18.979   0.000       .5032617    .6191776
 pension |   .2909765   .0381639      7.624   0.000       .2161765    .3657764
 widowed |   -.110072   .0720228     -1.528   0.126       -.251234    .0310901
   _cons |   7.319754   .1396728     52.406   0.000          7.046    7.593507
```

Table 4-A-4
TOBIT Estimates of Non-Pension Wealth

```
Tobit Estimates                                   Number of obs =  22657
                                                  chi2(24)      =8064.97
                                                  Prob > chi2   = 0.0000
Log Likelihood = -56559.635                       Pseudo R2     = 0.0666

------------------------------------------------------------------------------
 lnwlth1 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    ageh |  -.0503349   .0159612     -3.154   0.002        -.08162   -.0190497
  agesqu |   .0007053   .0001584      4.453   0.000       .0003948    .0010157
  ageyms |   .0152987   .0093019      1.645   0.100      -.0029337     .033531
 married |   1.515099    .131916     11.485   0.000       1.256535    1.773664
 divorce |    .700743   .1126127      6.223   0.000       .4800144    .9214717
   white |   2.243521   .0871913     25.731   0.000        2.07262    2.414422
    male |   1.291132   .0995466     12.970   0.000       1.096014     1.48625
 famsize |  -.2712382   .0263218    -10.305   0.000      -.3228307   -.2196457
  health |   .8901867   .0853516     10.430   0.000       .7228917    1.057482
  wdelta |   .0005052   .0002812      1.797   0.072      -.0000459    .0010564
stockpct |   .9972555   .0919571     10.845   0.000       .8170133    1.177498
     c01 |  -.0017042   .1602294     -0.011   0.992      -.3157648    .3123565
     c02 |   .0982653   .1685484      0.583   0.560      -.2321011    .4286318
     c03 |   .4778047   .1553428      3.076   0.002       .1733222    .7822871
     c04 |   .3200034   .1316745      2.430   0.015       .0619124    .5780943
     c05 |   .0210909   .1128943      0.187   0.852      -.2001896    .2423714
     c06 |   .0371084   .1023157      0.363   0.717      -.1634374    .2376542
   y1984 |  -1.706617   .1023238    -16.679   0.000      -1.907178   -1.506055
   y1989 |  -1.771994   .0997258    -17.769   0.000      -1.967464   -1.576525
   avew5 |   .0438894   .0016842     26.059   0.000       .0405882    .0471906
 twoearn |   .0210249   .0981525      0.214   0.830      -.1713607    .2134105
  tenure |   2.527377   .0752069     33.606   0.000       2.379967    2.674788
 pension |   .8647954   .1055722      8.192   0.000       .6578667    1.071724
 widowed |   .9110909   .1559956      5.840   0.000       .6053288    1.216853
   _cons |   3.746167   .3381798     11.077   0.000       3.083311    4.409023
---------+--------------------------------------------------------------------
     _se |    4.57969   .0264857              (Ancillary parameter)
```

APPENDIX B
ALTERNATIVE SPECIFICATION OF AGE EFFECTS

In order to capture life-cycle effects of saving and wealth accumulation, we included variables in our regression equation to represent the age of the family head and age-squared. The squared term was added to capture the fact that wealth should, at some point in the life-cycle, turn downward as households begin to dissave in retirement. Our parameter estimates had the appropriate signs -- a positive coefficient on age and a negative coefficient on age-squared. Both were statistically significant at a 95 percent confidence level.

Our estimates of the (mean) age-wealth profile implicit in the parameter estimates suggest, however, that the ages at which housing and other wealth begins to decline is quite high -- about 81 years for housing wealth and 92 for other wealth. This means that, *all other things equal*, no one decumulates wealth until very late in life, a situation not observed in the cross-sectional data on the distribution of wealth by age. Our projections do show wealth declining earlier than the age coefficients themselves imply because the equations include an earnings term that causes wealth to be lower as earnings decline in the latter part of the average earner's working life.

In order to test the sensitivity of the estimates to the specification of age, we re-estimated the equations for housing and other wealth and substituted dummy variables for age in place of age and age-squared. The results of these new equations are shown in Tables B-1 and B-2 below. We included 11 dummy variables to capture these age effects. AGE01 was set equal to one if the family head was under 31 years of age (this variable was dropped from the estimation) and zero otherwise. AGE02 through AGE10 were set equal to one if the family head was, respectively, between 31 and 35, 36 and 40, 41 and 45, and so forth up to ages 71 and 75. AGE11 was set to one if the family head was older than 75. We also included interaction terms to capture the effects of age and earnings. These variables are labeled AE01-AE11.

The use of dummy variables in place of the quadratic functional form does not appear to have a significant effect on the partial relationship between age and wealth, with all other variables constant. We compared the two functional forms by calculating for each equation the percentage change in non-housing wealth between ages 45 and 65, with all other explanatory variables fixed. With the quadratic form, wealth at age 65 is 51.28 percent higher than wealth at age 45. Using a series of age dummies, as in the equations in this appendix, the change in wealth between ages 45 and 65 is 51.34%, or virtually the same as with the quadratic functional form.

Table 4-B-1
Projection Equation for Housing Wealth With Dummy Variables for Age

```
                                                   Random-effects GLS regression
sd(u_entryid)                =   .846745                Number of obs =   11730
sd(e_entryid_t)              =  .6142938                            n =    6324
sd(e_entryid_t + u_entryid)  =  1.046104                        T-bar = 1.47918

corr(u_entryid, X)           =  0 (assumed)             R-sq within   =  0.1786
                                                                between  =  0.2058
                                                                overall  =  0.2247
------------------- theta --------------------
  min      5%       median        95%      max           chi2( 35)     = 2805.39
0.4128   0.4128     0.5436     0.6137   0.6137             Prob > chi2 =  0.0000

------------------------------------------------------------------------------
 lnhomeq |      Coef.   Std. Err.       z     P>|z|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  ageyms |  -.0004017   .0019918     -0.202   0.840      -.0043057    .0035022
 married |  -.0470029   .0527931     -0.890   0.373      -.1504755    .0564697
 divorce |   -.211301   .0529906     -3.988   0.000      -.3151607   -.1074413
   white |   .2524143   .0269492      9.366   0.000       .1995948    .3052337
    male |   .0805786     .04184      1.926   0.054      -.0014262    .1625835
 famsize |    .030349   .0083549      3.632   0.000       .0139737    .0467244
   age02 |   .3656104     .05828      6.273   0.000       .2513837    .4798371
   age03 |   .6702154   .0585753     11.442   0.000         .55541    .7850208
   age04 |   .7799013   .0613748     12.707   0.000        .659609    .9001937
   age05 |   .9206856   .0649748     14.170   0.000       .7933374    1.048034
   age06 |   1.133275   .0658443     17.211   0.000       1.004223    1.262328
   age07 |   1.204261   .0653608     18.425   0.000       1.076156    1.332366
   age08 |   1.264167   .0636573     19.859   0.000       1.139401    1.388933
   age09 |   1.427201   .0629528     22.671   0.000       1.303816    1.550586
   age10 |   1.341704   .0657857     20.395   0.000       1.212766    1.470641
   age11 |   1.394973   .0679068     20.542   0.000       1.261879    1.528068
    ae02 |  -.0037812   .0366009     -0.103   0.918      -.0755177    .0679553
    ae03 |  -.0757764   .0359853     -2.106   0.035      -.1463062   -.0052465
    ae04 |  -.0323214     .03655     -0.884   0.377       -.103958    .0393153
    ae05 |  -.0361541   .0381466     -0.948   0.343      -.1109201     .038612
    ae06 |  -.0793206   .0401837     -1.974   0.048      -.1580791   -.0005621
    ae07 |  -.0294227   .0416848     -0.706   0.480      -.1111234     .052278
    ae08 |  -.0074866   .0424819     -0.176   0.860      -.0907495    .0757763
    ae09 |  -.1540036    .053162     -2.897   0.004      -.2581991   -.0498081
    ae10 |  -.0499875   .1014364     -0.493   0.622      -.2487993    .1488242
    ae11 |  -.0942115   .1664143     -0.566   0.571      -.4203776    .2319545
  health |   .1104692    .021613      5.111   0.000       .0681086    .1528298
  wdelta |   .0954425   .0140088      6.813   0.000       .0679858    .1228993
stockpct |   .0708702   .0164786      4.301   0.000       .0385728    .1031676
   y1984 |  -.4759873   .0288525    -16.497   0.000      -.5325371   -.4194375
   y1989 |  -.3509022   .0268493    -13.069   0.000      -.4035258   -.2982785
   avew5 |   .2578843   .0321052      8.032   0.000       .1949593    .3208093
 twoearn |  -.0900857   .0262903     -3.427   0.001      -.1416138   -.0385577
 pension |   .2130511   .0256052      8.321   0.000       .1628659    .2632363
 widowed |  -.1118281   .0597046     -1.873   0.061       -.228847    .0051907
   _cons |  -.8272929   .0640202    -12.922   0.000      -.9527702   -.7018156
------------------------------------------------------------------------------
```

Table 4-B-2
Projection Equation for Other Wealth with Dummy Variables for Age

```
                                                   Random-effects GLS regression
sd(u_entryid)                =  1.205792                Number of obs =   17335
sd(e_entryid_t)              =  1.093757                            n =    9486
sd(e_entryid_t + u_entryid)  =  1.627956                       T-bar =  1.4622

corr(u_entryid, X)           =  0 (assumed)             R-sq within   =  0.1418
                                                             between  =  0.3388
                                                             overall  =  0.3277
------------------- theta --------------------
  min      5%       median        95%      max          chi2( 36)     = 5902.54
0.3281   0.3281     0.4601     0.5361   0.5361            Prob > chi2 =  0.0000

------------------------------------------------------------------------------
lnvwlth1 |      Coef.   Std. Err.       z     P>|z|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  ageyms |   -.009167   .0031227     -2.936   0.003      -.0152874   -.0030465
 married |   .2289664   .0549988      4.163   0.000       .1211708    .3367621
 divorce |  -.2686803   .0518607     -5.181   0.000      -.3703254   -.1670353
   white |   .5603245   .0347573     16.121   0.000       .4922014    .6284476
    male |    .305683   .0462173      6.614   0.000       .2150988    .3962671
 famsize |  -.0553805   .0110676     -5.004   0.000      -.0770725   -.0336885
   age02 |   .2189216    .061184      3.578   0.000       .0990032    .3388399
   age03 |   .4133094   .0669148      6.177   0.000       .2821587    .5444601
   age04 |   .5876249   .0738286      7.959   0.000       .4429234    .7323264
   age05 |   .7478025    .082601      9.053   0.000       .5859075    .9096975
   age06 |   .6679172   .0865916      7.713   0.000       .4982008    .8376336
   age07 |   .9032182   .0863747     10.457   0.000       .7339269    1.072509
   age08 |   1.002014   .0829289     12.083   0.000       .8394768    1.164552
   age09 |   1.127883   .0803806     14.032   0.000       .9703399    1.285426
   age10 |   1.140505   .0837755     13.614   0.000       .9763084    1.304702
   age11 |   1.222803   .0850703     14.374   0.000       1.056068    1.389538
    ae02 |  -.0080804   .0430363     -0.188   0.851        -.09243    .0762691
    ae03 |  -.0260821   .0435074     -0.599   0.549       -.111355    .0591908
    ae04 |  -.0373977    .045359     -0.824   0.410      -.1262998    .0515044
    ae05 |   -.008029   .0489515     -0.164   0.870      -.1039722    .0879142
    ae06 |   .0357198   .0535514      0.667   0.505       -.069239    .1406785
    ae07 |   .0076826   .0570606      0.135   0.893       -.104154    .1195193
    ae08 |  -.0557424   .0592061     -0.941   0.346      -.1717843    .0602994
    ae09 |   .1495142   .0798942      1.871   0.061      -.0070755    .3061039
    ae10 |   .0050059   .1588551      0.032   0.975      -.3063444    .3163563
    ae11 |   .1215177   .2578508      0.471   0.637      -.3838605     .626896
  health |   .1789965   .0301379      5.939   0.000       .1199274    .2380656
  wdelta |    .348186   .0205226     16.966   0.000       .3079625    .3884095
stockpct |   .0783248   .0289695      2.704   0.007       .0215456    .1351041
   y1984 |   -.917398   .0387157    -23.696   0.000      -.9932795   -.8415165
   y1989 |  -.7235808   .0364028    -19.877   0.000      -.7949289   -.6522326
   avew5 |   .5957117   .0365947     16.279   0.000       .5239873     .667436
 twoearn |  -.1125771    .037173     -3.028   0.002      -.1854349   -.0397193
  tenure |   .5313395   .0295915     17.956   0.000       .4733413    .5893376
 pension |   .3932966   .0391116     10.056   0.000       .3166393    .4699539
 widowed |   -.163029   .0719575     -2.266   0.023      -.3040631   -.0219949
   _cons |  -1.975892   .0584115    -33.827   0.000      -2.090377   -1.861408
------------------------------------------------------------------------------
```

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CHAPTER 4: ENDNOTES

1. This differs slightly from the way cohorts are defined in other tables presented in this report, where the first cohort begins in 1931.

2. Including age, time and cohort effects results in an equation that is over-determined since, by definition, t = a + c where t equals time, a equals age and c is cohort (year of birth). Perfect collinearity was not present in the estimated model because the cohort dummies were defined in broad, 5-year age groups. Nevertheless, the estimates of the cohort effects need to be interpreted with caution.

3. For a small number of families with negative wealth, we set these values to zero.

4. This seems like a reasonable assumption to make for housing wealth. That is, it is unlikely that someone who did not own a home at age 62 would purchase one by age 67. This assumption had very little effect on the results.