Volume Title: The Measurement of Saving, Investment, and Wealth

Volume Author/Editor: Robert E. Lipsey and Helen Stone Tice, editors

Volume Publisher: University of Chicago Press, 1989

Volume ISBN: 0-226-48468-8

Volume URL: http://www.nber.org/books/lips89-1

Conference Date: March 27-28, 1987

Publication Date: 1989

Chapter Title: Using Panel Data to Assess the Bias in Cross-sectional Inferences of Life-Cycle Changes in the Level and Composition of Household Wealth

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Chapter URL: http://www.nber.org/chapters/c8127

Chapter pages in book: (p. 553 - 644)

11 Using Panel Data to Assess the Bias in Cross-sectional Inferences of Life-Cycle Changes in the Level and Composition of Household Wealth

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11.1 Introduction

The purpose of this paper is to confront the issue of the bias engendered by using cross-sectional data sets to estimate time-series relations. We focus on two issues: (1) the extent to which inferences about how the level of wealth changes as households age drawn from a single cross section misrepresent the actual pattern of wealth accumulation over time by individual households and (2) the extent to which the reallocations of wealth among various types of assets and liabilities by households of different ages observed in cross sections differ from the actual reallocations of assets and liabilities over time by individual households. Although it is well known that bias is likely to exist in these situations, and although different researchers have employed alternative adjustments in trying to ameliorate the bias, ours is the first attempt to measure this bias by contrasting results obtained by using cross sections and time series of individual households from the same data set.

Bias from using cross-sectional data to make time-series inferences is a topic of interest because cross-sectional estimates of age-wealth profiles have been used frequently to confirm or contradict the validity of the life-cycle hypothesis of saving (Modigliani 1986). The important paper by Shorrocks (1975) suggests that the age-wealth relation observed in a cross section can have little to do with what the profile

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The order of the authors' names was determined randomly. All the authors contributed equally. Financial support for this paper was provided in part through grants from the Department of Health and Human Services and Michigan State University. Rob Wassmer provided prompt and efficient computer programming assistance.

would look like over time. First, Shorrocks constructed an example showing that, if every cohort member had increased his savings monotonically until death but different cohorts had different age-wealth profiles owing to different lifetime resources, the profile inferred from cross-sectional data would show the characteristic "hump" contrary to the actual monotonic longitudinal pattern of wealth accumulation. This bias, resulting from differences in accumulation across cohorts, can be thought of as the "productivity effect." Second, Shorrocks considered and attempted to adjust for another shortcoming of cross-sectional wealth studies, the problem of differential mortality. If the poor (like the good) die young, then in a cross section the relatively rich are overrepresented among the elderly. This oversampling of the wealthy imparts an upward bias to the observed age-wealth profile, while the previously mentioned productivity effect would cause a downward bias in the age-wealth profile.

Although it has been known that life-cycle inferences based on cross-sectional estimates are possibly biased, cross sections are still utilized throughout the literature owing to a lack, until recently, of alternatives such as panel data sets. Scholars have tried to "correct" the bias in cross sections by adjusting the data for hypothesized cohort differences, often using ad hoc techniques (Mirer 1979) or by adding lifetime earnings as a conditioning or explanatory variable (King and Dicks-Mireaux 1982). Whether such manipulations of cross-sectional data actually yield results that would be obtained from longitudinal data is a question yet to be answered. For example, is there any similarity between the age-wealth profile obtained by Mirer in his regression and that which would be observed as the subjects actually aged? Does the age profile of wealth divided by an estimate of permanent income in a cross section look anything like the profile of that same variable over time as a representative individual ages?

We construct age-wealth profiles from cross sections of our panel and then compare them to age-wealth profiles obtained by following the same households over time. This comparison allows us to identify and demonstrate the biases yielded by use of the cross-sectional approach. We also point out additional biases that may contaminate results obtained using panel data. Although our evidence indicates that using cross-sectional data to estimate age-wealth profiles and changes in the composition of household wealth over time is subject to substantial bias, we make no claim that the degree of bias is generalizable to other issues in which cross-sectional estimation procedures are used to test hypotheses that are longitudinal in nature.

The next section describes the data we use in our empirical analysis. In the following section, we discuss in more detail the problems associated with using cross-sectional data to make life-cycle inferences and the shortcomings of using panel data. In the next two sections,

we present the results of our empirical investigation of the differences between using cross-sectional and panel data in studying age-wealth profiles and portfolio reallocation. The final section contains a summary of our results and our conclusions.

11.2 Data

In our empirical analysis, we utilize data from the National Longitudinal Surveys (NLS) of men aged forty-five to fifty-nine in 1966. These surveys, sponsored by the U.S. Department of Labor, were conducted at intervals from 1966 through 1981 using an initial panel of 5,020 households. Although these households do not represent the entire population, the age-wealth profiles of these households should, according to the life-cycle hypothesis, exhibit the greatest curvature during the ages observed in these surveys. We use the dollar value of household assets and liabilities reported in the 1966, 1971, 1976, and 1981 surveys. All dollar amounts are in 1976 dollars, deflated by the gross national product deflator for personal consumption expenditures.

Our empirical analysis employs three categories of variables constructed from the NLS data: measures of household nonhuman wealth (and its components), earnings variables, and the age of the respondent. WEALTH is defined as the sum of net residential housing assets, net farm assets, net business assets, net investment real estate, deposits in financial institutions, U.S. savings bonds, holdings of stock and bonds, personal loans made to others, and unsecured personal debt. Our analysis excludes annuity wealth, the capitalized value of income streams such as pensions.

In our analysis of household portfolio composition, we grouped net residential housing and farm assets (HOUSE/FARM) together (since the value of the farm frequently includes the value of the house on the farm). We also grouped net business assets and net investment real estate assets together as a variable called BUSINESS/LAND. Deposits in financial institutions, U.S. savings bonds, and personal loans made were grouped together as a variable called FINANCIAL. The amount of wealth held as bonds and stocks constitutes the STOCK/BOND variable. The number of usable observations of household wealth from each survey is reported in table 11.1.

Trend earnings (TREARNAT) is the average of the respondent's wage, salary, self-employment, and farm income (Y_i) discounted to age sixty-two using the following formula:

$$(1)\ \text{TREARNAT} = (1/n)\Sigma[Y_i\,(1 - \text{TRATE}_i)] \\ [(1.02)\exp(62 - \text{AGE}_i)],$$

where n is the number of observations of earnings included in the average, TRATE is an estimate of the respondent's combined federal

Table 11.1 Comparison of Sizes of NLS Samples Using Household Wealth Data

Sample	Table Where Sample Statistics Presented	Observations in Survey Year (N)				
		1966	1969	1971	1976	1981
Complete reporter survivors:						
15-YEAR CRS 1966–81[a]	11.6	1,691	1,691	1,691	1,691	1,691
5-YEAR CRS 1966–71[b]	11.7	3,372		3,372		
5-YEAR CRS 1971–76[c]	11.8			2,683	2,683	
5-YEAR CRS 1976–81[d]	11.9			2,170		2,170
Complete reporter until death[e]	11.10	2,707	2,478	2,354	2,010	1,691
Survivors, including partial reporters with reentry[f]	11.11	2,288	2,223	2,274	2,221	2,474
Usable data, no reentry[g]	11.5	4,546	3,571	3,103	2,294	1,691
Usable data with reentry[h]	11.12	4,546	3,812	3,656	2,953	2,474
Samples of other NLS users:						
Ohio State University Center for Human Resource Research "key" variable		4,028	3,499	3,076	2,639	2,081
Diamond and Hausman (1980, 7)		4,028	2,958	2,628	2,246	
Sobol (1979, table 1)		4,001	3,499	3,076		

[a]This sample consists of all respondents who provided both usable wealth and usable age data in each of the five surveys. Consequently, respondents in this sample must have survived through 1981.

[b]This sample consists of all respondents who provided both usable wealth and usable age data in both the 1966 and the 1971 surveys.

[c]This sample consists of all respondents who provided both usable wealth and usable age data in both the 1971 and the 1976 surveys.

[d]This sample consists of all respondents who provided both usable wealth and usable age data in both the 1976 and the 1981 surveys.

[e]This sample consists of all respondents who provided both usable wealth and usable age data in each survey until they died or survived through 1981. Thus, this sample adds to the 15-YEAR CRS sample those respondents who reported usable data in every survey but died before 1981.

[f]This sample consists of all respondents who provided both usable wealth and usable age data in any particular survey as long as they also provided these data in the 1981 survey.

[g]This sample consists of all respondents who provided both usable wealth and usable age data in any survey as long as they also provided these data in every preceding survey. Sample statistics are not presented for this sample, but it is the basis for the analysis in table 11.5.

[h]This sample consists of all respondents who provided both usable wealth and usable age data in a particular survey whether or not they reported these data in prior or subsequent surveys.

and state average income tax rate, and AGE is the respondent's age in the year of the survey. The NLS provides ten potential reports of the respondent's earnings. The reported earnings were included in the average only if the respondent was younger than sixty-two or met certain criteria relating to full-time hours and weeks of work for the same employer after age sixty-one. The average was computed only if there were at least two valid observations on earnings. This trend earnings variable is obviously related to the household's permanent income. We also computed a measure, AVERAGE EARNINGS, using the same procedure, except that we did not discount earnings to age sixty-two. Earnings measures could be constructed for 4,327 households.

Each respondent's age in the survey year was computed on the basis of his reported year and month of birth. A few respondents (forty-four) indicated ages outside the forty-five- to fifty-nine-year range of the sample. These households were excluded from all analysis because the sample was not selected to be representative of these cohorts.

Since WEALTH was constructed by summing asset and liability categories, households with incomplete or missing asset and liability data were excluded from our analysis of household wealth, but not completely from our analysis of sample attrition. The determination of whether asset and liability data were incomplete considered three situations in the data: (1) whether asset and liability values coded as missing should be considered zero; (2) whether asset and liability values coded as zero should be considered missing; and (3) whether asset and liability values had been coded correctly.

Some asset and liability values were coded as unavailable or unknown on the NLS data tape. In an effort to preserve as much data as possible, we presumed missing asset and liability values were equal to zero except when other information invalidated this presumption. We examined missing asset and liability data in one survey relative to responses in the other surveys. On the basis of comparisons of these values, we considered household wealth data to be incomplete in those surveys where the missing category had been a large proportion of household wealth (greater than 20 percent of net worth) in other surveys when the category was reported. In addition, if most categories of assets and liabilities were not reported in a specific survey, household wealth was considered incomplete in that year.

Longitudinal checking of the data also helped us identify some households who failed to report the existence of some assets and/or liabilities. For example, in the case in which the survey indicated that the respondent had not moved for three consecutive surveys and that the respondent reported owning a house of approximately equal value in all three surveys (allowing for house price appreciation) but reported the mortgage debt outstanding on the house only in the first and last

survey, we considered household wealth incomplete in the middle survey because of the unreported mortgage debt.

Comparing asset, liability, and income data across surveys also lead us to suspect that some data were entered incorrectly on the data tape. For example, when wage and salary data in successive surveys were $10,100, $12,500, $1,400, $13,500, and $16,000, and when there was no indication that the respondent was unemployed or changed jobs over the interval, we suspected that wage and salary data in the third year could very likely be $14,000 rather than $1,400. We forwarded to the Center for Human Resource Research (CHRR) at The Ohio State University, which has responsibility for public distribution of the NLS data, lists of ninety-nine households for which we suspected income data had been incorrectly coded and 173 households for which we suspected asset or liability data had been incorrectly coded. The CHRR contacted the Census Bureau, which maintains the original survey forms, and received verification that, for seventeen and thirty-three households, respectively, on our lists of suspicious income and wealth reporters, data had been incorrectly transcribed from the survey form to the computer tape. For the remaining cases, the possibility remains that the survey taker incorrectly entered the data on the survey form.

Table 11.1 reports the number of usable observations of household wealth we have for each survey and compares these numbers to the number of observations used in other studies based on these NLS data. Many other researchers have used the wealth variable constructed by the CHRR, which is included on the NLS data tape. The CHRR created this variable by summing the same asset and liability categories as we have, but using different criteria for usable data. The CHRR series is comparable to our sample of "usable data allowing reentry." Our sample includes between 10 and 20 percent more observations than the CHRR series, depending on the survey year. On the basis of the number of observations available in 1966, Diamond and Hausman (1980) appear to have used the CHRR series in 1966 but only those observations in 1969, 1971, and 1976 of households that had reported usable data in 1966. This concept is very similar to our sample of "usable data with no reentry." Again, our sample is as much as 20 percent larger in some survey years. Other studies using the NLS Survey of Mature Men, such as those by Kotlikoff (1979) and Munnell (1976), required usable values for other variables in addition to wealth and, therefore, used much smaller-sized subsamples of the data.

11.3 Pitfalls of Cross-sectional and Panel Data

In the last few years, economists have hotly debated the degree to which the predictions of the life-cycle hypothesis of saving are con-

sistent with actual asset holdings over the life cycle. Using cross-sectional samples of wealth holdings, authors have tried to confirm or contradict the predicted "humped" age-wealth profile implied by the well-known life-cycle model of saving (Modigliani and Brumberg 1954). Some of the research used cross-sectional data from estate duty files (Atkinson and Harrison 1978; Brittain 1978), but most studies have used cross-sectional surveys (e.g., Mirer 1979).

The use of cross-sectional data to test hypotheses about events occuring over time has been criticized generally by economists (Irvine 1981), and the use of cross-sectional estimates of life-cycle age-wealth profiles has been specifically criticized by Shorrocks (1975). As discussed earlier, Shorrocks identifies two sources of bias (working in opposite directions) that confound the estimation of the age-wealth profile using cross-sectional data. First, owing to differential mortality (the poor die younger, the rich die older), the estimated age-wealth path is steeper than would be observed if the same individuals were followed over time. With death being a nonrandom sampler, the older households in an observed cross section are wealthier. Second, younger birth cohorts have higher income on the average since the real income in the economy grows over time. This makes an age-wealth profile constructed using cross-sectional data appear flatter than that which would be observed over time.

Our data on cohorts allow us first to estimate the size of the productivity effect and the amount of differential mortality. After documenting these, we construct cohort age-wealth profiles that are free from biases caused by productivity or mortality.

11.3.1 Productivity Effect

In table 11.2, both the mean and the median values of AVERAGE EARNINGS are reported for each birth cohort in our sample. On the average, median AVERAGE EARNINGS of a cohort is 1.9 percent greater than the next youngest cohort, while mean AVERAGE EARNINGS is 1.3 percent greater than the next youngest cohort. Hence, the NLS data confirm the existence, on the average, of a productivity effect that raises the earnings of cohorts over time. However, note that the rate of growth of income is not smooth. For example, median earnings of the 1909 cohort is 13.2 percent greater than that of the 1908 cohort, while median earnings of the 1918 cohort is 4 percent below the median earnings of the 1917 cohort. Mirer attempted to correct cross-sectional household wealth data for this productivity effect by inflating the wealth of each successive cohort in his sample by 2 percent. The 2 percent adjustment is in line with the difference in median earnings observed in our sample.

Table 11.2 **Average Earnings by Cohort (1976 dollars)**

Cohort Birth Year	Median Average Earnings	Ratio of Cohort Median Earnings over Next Older Cohort	Mean Average Earnings	Ratio of Cohort Mean Earnings over Next Older Cohort
1921	10,885	1.053	11,867	1.017
1920	10,333	.994	11,672	1.038
1919	10,390	1.054	11,249	1.040
1918	9,855	.963	10,817	.993
1917	10,232	1.040	10,889	.997
1916	9,835	1.001	10,917	.988
1915	9,827	1.082	11,052	1.126
1914	9,079	1.015	9,818	1.027
1913	8,948	.993	9,561	.933
1912	9,015	1.081	10,251	1.064
1911	8,343	.963	9,630	1.037
1910	8,665	.952	9,282	.949
1909	9,102	1.132	9,779	1.003
1908	8,039	.948	9,753	.967
1907	8,483		10,091	
Average		1.019		1.013

Source: Computed from National Longitudinal Surveys of Mature Men.

Note: Earnings are the sum of wage, salary, business, and farm income for respondents who were younger than sixty-two at the survey date or who, if over sixty-two, met criteria relating to full-time hours and weeks of work for the same employer after age sixty-one. Average earnings are the arithmetic average of all observations on earnings for the 4,327 households reporting earnings in at least two surveys.

11.3.2 Differential Mortality Effect

The data in table 11.3 verify that there is a strong differential mortality effect. The respondents who reported usable household wealth figures in the 1966 survey were ranked according to their position in the distribution of wealth among other members of their birth cohort in 1966. The proportion of each wealth decile that had died by 1981 is given in table 11.3. For the youngest cohort, those born in 1921 (the first column), we find that 13.4 percent of the poorest respondents in percentile 1–20 died, while only 6.3 percent of the wealthiest respondents in percentile 90–100 died. Hence, for this cohort, the poorer households were more than twice as likely as the richest 10 percent to die. For the oldest cohort, those born in 1907, 49.1 percent of the poorest respondents died, compared to only 18.5 percent of the wealthiest respondents. The ratio of the death rate for the wealthiest 10 percent to that of the poorest 20 percent by cohort is given in the last row of table 11.3. As one can see, this ratio generally increases with the age of the cohort, averaging 2.946 across all the cohorts. Hence,

Table 11.3 Reason for Attrition by Percentile of 1966 Cohort Wealth

	Cohort Birth Year (fraction of initial cohort)				
Reason for Attrition	1921	1920	1919	1918	1917
Percentile 1–20:					
Died	.134	.269	.315	.266	.277
Refused	.090	.119	.110	.109	.169
Bad data	.090	.075	.068	.031	.092
Other	.194	.194	.178	.156	.138
Percentile 21–40:					
Died	.147	.197	.113	.143	.172
Refused	.132	.061	.127	.127	.109
Bad data	.176	.333	.155	.286	.266
Other	.074	.045	.085	.032	.078
Percentile 41–60:					
Died	.149	.091	.137	.095	.188
Refused	.134	.091	.164	.143	.156
Bad data	.209	.242	.233	.206	.172
Other	.075	.076	.055	.032	.078
Percentile 61–70:					
Died	.059	.152	.167	.091	.219
Refused	.059	.152	.250	.061	.156
Bad data	.147	.121	.194	.485	.219
Other	.029	.091	.028	.061	.063
Percentile 71–80:					
Died	.133	.091	.139	.100	.094
Refused	.233	.061	.167	.133	.219
Bad data	.200	.333	.250	.233	.156
Other	.033	.030	.083	.067	.000
Percentile 81–90:					
Died	.086	.061	.028	.094	.219
Refused	.114	.152	.111	.281	.156
Bad data	.200	.303	.250	.281	.219
Other	.000	.091	.000	.000	.031
Percentile 91–100:					
Died	.063	.000	.000	.100	.091
Refused	.188	.219	.121	.033	.091
Bad data	.250	.375	.455	.433	.455
Other	.031	.125	.061	.033	.061
Percentile 1–100:					
Died	.120	.142	.148	.140	.189
Refused	.129	.112	.145	.127	.149
Bad data	.174	.242	.203	.248	.211
Other	.078	.097	.081	.060	.075
Total	.502	.594	.577	.575	.624

(*continued*)

Table 11.3 (continued)

Reason for Attrition	Cohort Birth Year (fraction of initial cohort)				
	1921	1920	1919	1918	1917
Ratio of percentiles 1–20 to percentiles 91–100:					
Died	2.149	. . .	. . .	2.656	3.046
	1916	1915	1914	1913	1912
Percentile 1–20:					
Died	.284	.352	.443	.354	.404
Refused	.045	.070	.033	.046	.035
Bad data	.060	.070	.082	.046	.070
Other	.119	.099	.148	.092	.175
Percentile 21–40:					
Died	.182	.271	.274	.190	.143
Refused	.076	.086	.097	.111	.161
Bad data	.227	.214	.161	.190	.179
Other	.076	.057	.048	.016	.054
Percentile 41–60:					
Died	.258	.286	.203	.175	.339
Refused	.091	.100	.102	.175	.071
Bad data	.197	.271	.288	.206	.196
Other	.045	.014	.034	.016	.000
Percentile 61–70:					
Died	.147	.257	.172	.250	.111
Refused	.206	.114	.172	.063	.185
Bad data	.118	.286	.276	.219	.333
Other	.088	.057	.000	.094	.000
Percentile 71–80:					
Died	.031	.143	.167	.167	.241
Refused	.188	.114	.133	.200	.207
Bad data	.250	.314	.200	.167	.276
Other	.031	.086	.000	.033	.000
Percentile 81–90:					
Died	.242	.143	.167	.161	.250
Refused	.121	.143	.100	.065	.107
Bad data	.152	.200	.233	.452	.286
Other	.061	.086	.067	.000	.000
Percentile 91–100:					
Died	.138	.059	.194	.133	.034
Refused	.069	.088	.194	.100	.069
Bad data	.448	.500	.290	.367	.310
Other	.034	.029	.000	033	.172

Table 11.3 (continued)

Reason for Attrition	Cohort Birth Year (fraction of initial cohort)				
	1916	1915	1914	1913	1912
Percentile 1–100:					
Died	.202	.243	.255	.217	.241
Refused	.101	.097	.106	.108	.110
Bad data	.190	.240	.205	.207	.209
Other	.070	.060	.053	.041	.064
Total	.563	.640	.619	.573	.624
Ratio of percentiles 1–20 to percentiles 91–100:					
Died	2.056	5.986	2.287	2.654	11.702

	1911	1910	1909	1908	1907	All
Percentile 1–20:						
Died	.484	.389	.426	.462	.491	.350
Refused	.032	.037	.093	.038	.055	.075
Bad data	.081	.019	.000	.058	.036	.059
Other	.161	.148	.130	.135	.109	.141
Percentile 21–40:						
Died	.344	.407	.321	.412	.327	.240
Refused	.049	.056	.094	.020	.102	.093
Bad data	.197	.204	.208	.157	.184	.213
Other	.115	.037	.019	.059	.102	.058
Percentile 41–60:						
Died	.164	.358	.245	.327	.314	.207
Refused	.082	.132	.113	.135	.118	.129
Bad data	.295	.226	.264	.154	.196	.227
Other	.033	.019	.094	.077	.039	.047
Percentile 61–70:						
Died	.400	.296	.259	.208	.400	.218
Refused	.033	.111	.074	.167	.240	.129
Bad data	.200	.259	.333	.167	.120	.227
Other	.033	.037	.037	.042	.040	.055
Percentile 71–80:						
Died	.133	.296	.269	.160	.269	.153
Refused	.100	.111	.269	.120	.077	.155
Bad data	.400	.370	.154	.440	.308	.262
Other	.033	.000	.077	.040	.077	.042

(*continued*)

Table 11.3 (continued)

Reason for Attrition	Cohort Birth Year (fraction of initial cohort)					
	1911	1910	1909	1908	1907	All
Percentile 81–90:						
Died	.267	.074	.074	.259	.240	.150
Refused	.133	.148	.111	.037	.120	.126
Bad data	.367	.370	.185	.259	.240	.278
Other	.033	.000	.000	.074	.080	.035
Percentile 91–100:						
Died	.233	.160	.160	.200	.185	.119
Refused	.000	.080	.000	.040	.037	.094
Bad data	.367	.400	.440	.440	.370	.397
Other	.067	.000	.040	.080	.111	.049
Percentile 1–100:						
Died	.303	.315	.275	.324	.337	.224
Refused	.059	.090	.106	.074	.101	.110
Bad data	.247	.228	.204	.203	.186	.215
Other	.079	.045	.064	.078	.081	.068
Total	.688	.678	.649	.680	.705	.616
Ratio of percentiles 1–20 to percentiles 91–100:						
Died	2.074	2.431	2.662	2.308	2.651	2.946

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: Sample consists of 4,546 households that reported valid age and wealth data in the 1966 survey.

on the average, the poorer respondents died nearly three times more frequently than the richest respondents, controlling for age. Evidence from our sample certainly confirms Shorrocks's assertion that the poor die young.

We have also examined the death rates between samples by cohort. Higher death rates are, of course, observed between later surveys since the respondents are aging. Aggregating across cohorts, table 11.4 gives the death rates between samples by initial wealth level. Again, we see the poorer respondents dying more frequently between surveys.

11.3.3 Sample Attrition

Panel data offer the advantage of being able to track the behavior of individual cohorts over time. However, over time there is sample attrition. As panel members drop out, the representativeness of the sam-

Table 11.4 **Mortality Rates by Percentile of 1966 Wealth**

1966 Wealth Percentile	Deaths between (fraction of remaining cohort):				1966–81 (fraction of initial cohort)
	1966–69	1969–71	1971–76	1976–81	
1–20	.07	.06	.18	.19	.35
21–40	.05	.04	.11	.13	.24
41–60	.04	.03	.11	.15	.21
61–70	.06	.04	.09	.10	.22
71–80	.04	.03	.08	.10	.15
81–90	.04	.02	.06	.11	.15
91–100	.03	.02	.04	.09	.12
1–100	.05	.03	.11	.14	.22

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: Sample consists of 4,546 households that reported valid age and wealth data in the 1966 survey.

ple with respect to the underlying population may be affected. In table 11.5, data are presented that summarize attrition in the NLS sample between surveys. About two-thirds of the attrition is due to failure to interview the respondent, and about one-third is due to the respondent reporting unusable data ("bad data").

As the next to bottom row indicates, from 38 to 69 percent of the noninterviews were caused by death of the respondent since the last survey date. Even though death is not random (as documented above), the remaining observed sample would be representative of the living members of the cohort if death were the only cause of attrition.

Other forms of attrition, to the extent that they are not randomly distributed across the cohort, however, may cause the observed panel sample to be unrepresentative of the living cohort. Looking again at table 11.3, which classifies households by cohort and wealth percentile, we see in the right-hand column that more of the poorest respondents were lost owing to other reasons (moved, temporary absence, etc.). On the other hand, the percentage of respondents lost because they refused to be interviewed increased with wealth level up to decile 71–80. Even more striking is the fact that the percentage lost because they reported bad data increases dramatically with wealth. This percentage ranges from 5.9 for the bottom 20 percent to about 22 for respondents with moderate wealth to a high of 39.7 for the wealthiest 10 percent of the households. Hence, attrition due to either refusing to answer or giving bad data when interviewed rises dramatically with initial wealth level. Assuming the initial sample was selected so as to be representative of the living cohort in 1966, this attrition due to refusal/bad data makes the observed cohort in later samples unrepresentative of the

Table 11.5 Reasons for Sample Attrition

	Survey Year				
	1966	1969	1971	1976	1981
Number of observations with usable wealth and age data	4,546	3,571	3,103	2,294	1,691
Number of attritors[a]		975 (21%)	468 (13%)	809 (26%)	603 (26%)
Reason for attrition:[b]					
Bad data		372 (38%)	249 (53%)	270 (33%)	142 (24%)
Noninterview		603 (62%)	219 (47%)	539 (67%)	461 (76%)
Reason for noninterview:[c]					
No reason		16 (3%)	6 (3%)	10 (2%)	3 (1%)
Moved		45 (7%)	17 (8%)	10 (2%)	5 (1%)
Nonmover		37 (6%)	14 (6%)	6 (1%)	5 (1%)
Temporary absence		16 (2%)	10 (5%)	9 (2%)	4 (1%)
Institutionalized		11 (2%)	11 (5%)	14 (2%)	18 (4%)
Refused		227 (38%)	37 (17%)	135 (25%)	96 (21%)
Dead		229 (38%)	124 (56%)	344 (64%)	319 (69%)
Dropped from sample		22 (4%)	0 (0%)	11 (2%)	11 (2%)

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: Sample consists of all respondents who provided both usable wealth and usable age data in any survey as long as they also provided these data in every preceding survey.

[a]Numbers in parentheses give percentage of participants in previous survey.

[b]Numbers in parentheses give percentage of attritors.

[c]Numbers in parentheses give the percentage of participants not interviewed.

living cohort members. The observed sample of any cohort in later years contains too few wealthy respondents. For example, using the members of the 1914 cohort who reported usable data in 1976 to calculate the wealth of the 1914 cohort will probably understate the wealth of the living members of the 1914 cohort since attrition due to bad data/refusal was higher among the wealthier deciles. This result is consistent with other research that finds that wealthy people are less likely to

respond or respond fully to surveys of financial information (Lillard, Smith, and Welch 1986; Projector and Weiss 1966; Ferber 1965; Ferber et al. 1969).

11.3.4 Construction of Cohort Age-Wealth Profiles

We want to construct age-wealth profiles that are representative of individual behavior over time. In particular, we want to avoid biases that are introduced by the productivity effect, by the differential mortality effect, and by differential attrition. These profiles are of interest not only because they provide some additional evidence on the life-cycle hypothesis but, more important, because they will be used to assess the bias in age-wealth profiles based on cross-sectional data (the focus of this paper).

Productivity-effect biases are avoided by observing the same-aged respondents over time. The NLS data allow us to track the wealth of individuals in fifteen different cohorts as they age from 1966 through 1981. However, one should not simply use the available data from each cohort in each year, calculate the median wealth (or mean wealth), and plot median wealth against age. Such cohort-specific age-wealth profiles would still be subject to biases caused by differential mortality and differential attrition.

By plotting the median wealth of a cohort over time, the implicit assumption is that the median person is the "representative individual" from the cohort. However, as the cohort ages, a larger percentage of the poorer households die. This differential mortality removes more individuals from the lower part of the wealth distribution and, hence, causes the median of the remaining respondents to be a wealthier person. Ceteris paribus, this differential mortality would bias cohort age-wealth profiles to show more wealth accumulation over time. For example, in the extreme case in which every individual simply maintained his initial wealth level over time, the differential mortality of the poor would lead one to observe median wealth increasing with the age of the cohort. Fortunately, one can correct for this differential mortality bias in constructing cohort age-wealth profiles by limiting one's sample to those respondents who survived to the end of the panel. In this way, mortality effects are removed from the sample.

As we saw earlier, however, sample attrition was not caused just by death, but also resulted from respondents' refusal to participate, reporting bad data, or other reasons (moving, etc.). Hence, limiting the sample to those respondents who survive to the end of the panel (1981 in our case) does not produce a sample of the same individuals over time. At any given sample date, some households refuse, report bad data, or are otherwise unavailable. In fact, reentry is possible in that a person may report good data in 1966, unusable data in 1969, and

good data again in 1971, 1976, and 1981. If all this attrition (and reentry) were uncorrelated with wealth, little bias would be caused. But as we documented earlier, the frequency of bad data/refusal increased substantially with initial wealth. This leads to more of the richer households being missing from the cohort sample over time. This differential attrition tends to lower the median wealth of the observed distribution, ceteris paribus. One can correct for this differential attrition bias by limiting one's sample to respondents who reported usable data over every interval for which analysis is conducted. However, as explained below, this procedure may affect the representativeness of the remaining sample.[1]

For our analysis of cohort age-wealth profiles over the entire fifteen-year survey interval, we limit our sample to those cohort members who both survived to 1981 and reported usable data in all five surveys. In this way, we eliminate biases caused by differential mortality and differential attrition. By tracking the wealth accumulation of these "fifteen-year complete reporting survivors" (15-YEAR CRS), we are indeed tracking the behavior of the same individuals over time. There are 1,691 households included in this sample. Dividing them into fifteen age cohorts, we are able to construct age-wealth profiles that are representative of the behavior of individuals in these cohorts (but not necessarily the aggregate cohort). We concentrate on age-wealth profiles based on median wealth since the majority of studies have focused on the median individual. However, in table 11.6, we report the mean, median, twenty-fifth, seventy-fifth, and ninetieth percentile wealth of each cohort at each survey date in terms of 1976 dollars for those interested in behavior at other points on the wealth distribution.[2]

Before examining these age-wealth profiles, we should point out possible limitations of using this 15-YEAR CRS sample. To be included in the 15-YEAR CRS sample, the household must have survived until 1981 and reported complete data in every survey. These are very stringent requirements. Studying table 11.1 indicates that the requirement that the respondent live to 1981 reduced the potential sample size by as many as 1,016 households in 1966, but by only 319 households in 1976. Our earlier analysis of differential mortality suggests these were mainly poorer households. The further requirement that the respondent provide usable data in all surveys eliminated 500–600 more households that were partial reporters. These tended to be mainly richer households. Since these effects are somewhat offsetting, it is not clear whether the median wealth of a cohort in our 15-YEAR CRS sample is representative of the living members of the cohort. In either case, it is likely that the very poor and the very rich are underrepresented in the 15-YEAR CRS sample. Hence, 15-YEAR CRS cohort age-wealth profiles are not necessarily representative of the entire NLS mature men sample

Table 11.6 WEALTH by Cohort for 15-YEAR CRS Sample (1976 dollars)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year					Age in
	1966	1969	1971	1976	1981	1981
45 (158):						60
Mean	27,856	35,436	35,060	52,894	68,598	
Median	16,004	20,492	22,204	31,938	39,201	
Twenty-fifth percentile	3,151	7,899	8,186	10,300	16,046	
Seventy-fifth percentile	31,509	43,070	42,974	53,700	88,016	
Ninetieth percentile	66,219	78,987	76,398	117,000	143,873	
46 (131):						61
Mean	30,390	34,244	34,315	43,392	60,274	
Median	13,847	17,884	21,010	28,500	32,837	
Twenty-fifth percentile	1,658	1,490	3,411	3,000	4,739	
Seventy-fifth percentile	27,570	31,244	37,517	50,000	63,643	
Ninetieth percentile	61,360	70,045	79,127	103,000	119,838	
47 (150):						62
Mean	33,295	35,920	38,986	50,158	59,868	
Median	13,553	15,100	18,349	25,353	31,303	
Twenty-fifth percentile	2,488	522	2,046	5,700	10,291	
Seventy-fifth percentile	34,624	39,270	45,157	61,050	74,475	
Ninetieth percentile	66,750	78,689	72,052	110,050	139,066	
48 (131):						63
Mean	25,755	29,179	33,475	40,379	46,120	
Median	14,378	12,665	16,508	21,500	27,420	
Twenty-fifth percentile	2,156	2,666	4,229	6,026	7,583	
Seventy-fifth percentile	33,333	40,238	43,656	48,200	59,580	
Ninetieth percentile	50,415	67,697	75,716	89,500	81,900	
49 (115):						64
Mean	32,206	33,151	34,521	45,752	46,044	
Median	14,096	17,884	19,782	26,453	29,262	
Twenty-fifth percentile	4,146	3,204	6,821	5,500	5,484	
Seventy-fifth percentile	39,138	39,195	41,610	55,000	62,288	
Ninetieth percentile	77,944	78,912	72,033	104,000	119,634	
50 (135):						65
Mean	29,732	31,353	36,297	43,227	49,315	
Median	14,594	14,203	18,690	23,000	30,806	
Twenty-fifth percentile	166	0	2,046	1,600	4,401	
Seventy-fifth percentile	32,803	36,662	41,337	57,000	58,226	
Ninetieth percentile	79,270	82,951	73,670	103,750	124,577	
51 (121):						66
Mean	37,171	36,186	37,303	42,758	48,447	
Median	12,438	17,511	17,735	17,000	21,286	
Twenty-fifth percentile	249	355	614	3,000	4,062	
Seventy-fifth percentile	35,489	44,411	45,634	52,000	55,518	
Ninetieth percentile	66,667	71,535	85,471	86,000	96,276	

(*continued*)

Table 11.6 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year					Age in
	1966	1969	1971	1976	1981	1981
52 (108):						67
Mean	33,040	35,789	36,783	45,083	54,203	
Median	15,744	18,350	19,987	24,930	25,051	
Twenty-fifth percentile	5,058	3,690	4,195	6,850	8,633	
Seventy-fifth percentile	36,029	44,330	47,272	49,600	58,565	
Ninetieth percentile	81,260	90,909	88,677	117,000	118,483	
53 (131):						68
Mean	31,282	35,329	38,240	43,177	44,770	
Median	14,096	17,437	20,464	22,000	27,759	
Twenty-fifth percentile	539	37	873	2,000	7,448	
Seventy-fifth percentile	36,070	43,219	47,749	60,000	60,934	
Ninetieth percentile	66,335	76,602	89,495	101,500	98,172	
54 (103):						69
Mean	26,978	31,258	34,526	43,307	41,285	
Median	14,262	18,629	19,100	20,700	17,603	
Twenty-fifth percentile	3,463	4,396	4,775	3,500	1,625	
Seventy-fifth percentile	33,831	45,455	43,656	51,000	50,102	
Ninetieth percentile	76,285	80,626	83,083	120,000	91,401	
55 (87):						70
Mean	48,957	64,248	51,895	51,676	60,032	
Median	17,579	21,495	20,464	23,000	29,824	
Twenty-fifth percentile	2,861	5,961	6,194	4,100	1,726	
Seventy-fifth percentile	36,318	50,820	52,183	58,350	64,320	
Ninetieth percentile	119,403	133,383	121,419	135,000	174,001	
56 (80):						71
Mean	37,063	43,189	49,817	52,558	47,745	
Median	10,116	14,233	15,229	21,800	23,697	
Twenty-fifth percentile	382	1,341	231	300	1,050	
Seventy-fifth percentile	34,163	33,368	45,574	52,050	45,566	
Ninetieth percentile	82,090	96,982	107,231	102,200	87,339	
57 (91):						72
Mean	40,830	43,613	45,121	53,019	67,914	
Median	17,413	21,013	22,374	31,000	30,467	
Twenty-fifth percentile	4,146	4,620	7,640	8,200	6,838	
Seventy-fifth percentile	64,365	55,216	51,842	59,950	64,997	
Ninetieth percentile	109,453	96,982	106,557	137,000	159,106	
58 (80):						73
Mean	35,078	40,965	41,223	42,234	46,356	
Median	16,750	18,257	21,146	22,113	21,165	
Twenty-fifth percentile	1,658	558	3,070	4,242	5,077	
Seventy-fifth percentile	38,943	52,161	46,385	49,000	56,161	
Ninetieth percentile	98,673	110,656	91,406	97,200	102,924	

Table 11.6 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1966	1969	1971	1976	1981	Age in 1981
59 (70):						74
Mean	36,828	27,901	27,330	31,407	30,001	
Median	13,433	12,444	13,438	22,880	20,650	
Twenty-fifth percentile	166	0	2,729	8,000	3,047	
Seventy-fifth percentile	43,947	31,133	29,795	44,000	40,623	
Ninetieth percentile	87,107	70,790	61,051	79,000	70,346	

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of 1,691 respondents who provided both usable wealth and usable age data in each of the five surveys.

or even of all living members of the cohort at any given date. The respondents who die before 1981 may very well have differently shaped age-wealth profiles (especially if they expect to die); we document below that their median wealth levels are lower. Also, the partial reporters may have differently shaped age-wealth profiles; we document below that their median wealth is higher. It is also possible that the twentieth or the ninetieth percentile age-wealth profiles differ from the median age-wealth profile. The usefulness of the median 15-YEAR CRS cohort age-wealth profiles is that they allow us to assess the amount of productivity and differential mortality bias present in age-wealth profiles based on cross-sectional data over a fifteen-year span.

To make our analysis more complete, over shorter five-year intervals we have constructed 5-YEAR CRS samples. Inclusion in the 5-YEAR CRS 1966–71 sample required only that a household survive until 1971 and report complete data in both the 1966 and the 1971 surveys. These requirements yielded a sample of 3,372 households, compared to the 1,691 members of the 15-YEAR CRS sample. Likewise, the 5-YEAR CRS 1971–76 and 5-YEAR CRS 1976–81 samples required that households survive to at least 1976 and 1981, respectively, and report complete data in the two adjacent surveys. These samples include 2,683 and 2,170 households in the 5-YEAR CRS 1971–76 and 1976–81 samples, respectively. When these larger samples are compared to the 15-YEAR CRS sample, median cohort wealth was lower in 1966, about the same in 1971, and higher in 1976. However, the larger samples definitely include more wealthy individuals, making the mean wealth across all households larger in the larger samples. The mean and median wealth of cohorts in these larger 5-YEAR CRS samples as well as measures of wealth at other points in the distribution are reported in tables 11.7–11.9.[3]

Table 11.7 **WEALTH by Cohort for 5-YEAR CRS 1966–71 SAMPLE (1976 dollars)**

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1966	WEALTH in Survey Year 1971	Age Range between Surveys	Number Dissaving
45 (269):			45–50	79
Mean	29,073	42,395		
Median	14,925	22,920		
Twenty-fifth percentile	2,920	6,821		
Seventy-fifth percentile	32,753	42,701		
Ninetieth percentile	68,823	77,763		
46 (247):			46–51	81
Mean	38,651	45,318		
Median	14,212	17,735		
Twenty-fifth percentile	1,607	3,553		
Seventy-fifth percentile	31,426	38,199		
Ninetieth percentile	72,139	89,359		
47 (267):			47–52	88
Mean	32,393	37,555		
Median	12,023	15,621		
Twenty-fifth percentile	1,161	1,988		
Seventy-fifth percentile	31,509	41,814		
Ninetieth percentile	71,476	84,686		
48 (236):			48–53	77
Mean	29,931	38,226		
Median	15,527	20,396		
Twenty-fifth percentile	2,805	6,139		
Seventy-fifth percentile	36,310	47,886		
Ninetieth percentile	62,521	85,266		
49 (234):			49–54	78
Mean	37,748	39,206		
Median	12,089	17,889		
Twenty-fifth percentile	3,317	5,457		
Seventy-fifth percentile	32,007	38,199		
Ninetieth percentile	70,481	78,445		
50 (240):			50–55	77
Mean	35,780	42,733		
Median	14,449	18,349		
Twenty-fifth percentile	1,721	3,823		
Seventy-fifth percentile	32,529	41,491		
Ninetieth percentile	80,805	76,057		

Table 11.7 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1966	1971	Age Range between Surveys	Number Dissaving
51 (260):			51–56	83
Mean	35,390	44,276		
Median	12,438	17,572		
Twenty-fifth percentile	637	2,077		
Seventy-fifth percentile	32,007	43,349		
Ninetieth percentile	73,218	90,041		
52 (225):			52–57	76
Mean	42,922	38,788		
Median	15,423	18,267		
Twenty-fifth percentile	2,471	4,502		
Seventy-fifth percentile	37,479	47,749		
Ninetieth percentile	83,250	89,291		
53 (246):			53–58	89
Mean	32,178	43,999		
Median	15,838	20,471		
Twenty-fifth percentile	1,119	873		
Seventy-fifth percentile	38,640	47,749		
Ninetieth percentile	81,260	109,141		
54 (212):			54–59	71
Mean	41,563	37,478		
Median	14,887	19,100		
Twenty-fifth percentile	2,926	4,775		
Seventy-fifth percentile	33,167	40,928		
Ninetieth percentile	56,385	82,435		
55 (202):			55–60	65
Mean	44,681	49,653		
Median	15,672	20,293		
Twenty-fifth percentile	663	2,729		
Seventy-fifth percentile	44,113	53,956		
Ninetieth percentile	107,794	121,419		
56 (182):			56–61	61
Mean	33,045	38,929		
Median	11,941	13,957		
Twenty-fifth percentile	829	153		
Seventy-fifth percentile	28,192	40,928		
Ninetieth percentile	66,874	83,083		

(*continued*)

Table 11.7 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1966	1971	Age Range between Surveys	Number Dissaving
57 (203):			57–62	66
Mean	35,295	41,956		
Median	17,413	20,464		
Twenty-fifth percentile	3,317	4,775		
Seventy-fifth percentile	38,972	43,656		
Ninetieth percentile	109,453	117,190		
58 (187):			58–63	67
Mean	48,911	48,332		
Median	16,252	19,236		
Twenty-fifth percentile	1,658	2,080		
Seventy-fifth percentile	43,947	45,703		
Ninetieth percentile	120,232	98,226		
59 (162):			59–64	65
Mean	60,984	53,131		
Median	14,902	16,508		
Twenty-fifth percentile	539	1,364		
Seventy-fifth percentile	43,947	36,767		
Ninetieth percentile	96,186	98,909		

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of 3,372 respondents who provided both usable wealth and usable age data in the 1966 and 1971 surveys.

Table 11.8 **WEALTH by Cohort for 5-YEAR CRS 1971–76 Sample (1976 dollars)**

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1971	1976	Age Range between Surveys	Number Dissaving
45 (223):			50–55	61
Mean	46,856	60,225		
Median	24,523	32,000		
Twenty-fifth percentile	9,550	10,200		
Seventy-fifth percentile	50,750	61,000		
Ninetieth percentile	88,677	147,000		
46 (198):			51–56	62
Mean	40,634	48,033		
Median	18,691	25,000		
Twenty-fifth percentile	5,593	4,150		
Seventy-fifth percentile	38,452	50,500		
Ninetieth percentile	95,498	124,675		

Table 11.8 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1971	1976	Age Range between Surveys	Number Dissaving
47 (224):			52–57	59
Mean	39,347	50,083		
Median	17,156	22,813		
Twenty-fifth percentile	2,456	5,708		
Seventy-fifth percentile	43,452	61,065		
Ninetieth percentile	89,632	130,500		
48 (200):			53–58	71
Mean	37,718	44,384		
Median	19,202	22,300		
Twenty-fifth percentile	6,821	7,650		
Seventy-fifth percentile	45,634	51,350		
Ninetieth percentile	80,491	92,120		
49 (186):			54–59	66
Mean	40,995	46,192		
Median	19,100	26,477		
Twenty-fifth percentile	6,821	8,000		
Seventy-fifth percentile	41,883	56,420		
Ninetieth percentile	88,677	93,800		
50 (207):			55–60	63
Mean	41,027	45,848		
Median	20,600	24,500		
Twenty-fifth percentile	3,547	6,100		
Seventy-fifth percentile	43,656	59,050		
Ninetieth percentile	81,855	103,750		
51 (199):			56–61	74
Mean	37,112	43,677		
Median	18,505	23,000		
Twenty-fifth percentile	4,775	5,025		
Seventy-fifth percentile	45,634	51,000		
Ninetieth percentile	88,267	97,000		
52 (191):			57–62	72
Mean	38,527	44,175		
Median	17,599	22,700		
Twenty-fifth percentile	3,411	5,000		
Seventy-fifth percentile	47,783	50,000		
Ninetieth percentile	96,180	109,000		
53 (193):			58–63	67
Mean	41,300	44,607		
Median	21,555	24,000		
Twenty-fifth percentile	1,637	5,000		
Seventy-fifth percentile	46,385	57,676		
Ninetieth percentile	103,001	101,500		

(*continued*)

Table 11.8 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1971	WEALTH in Survey Year 1976	Age Range between Surveys	Number Dissaving
54 (167):			59–64	65
Mean	31,600	38,272		
Median	18,690	20,700		
Twenty-fifth percentile	4,025	4,685		
Seventy-fifth percentile	40,246	47,400		
Ninetieth percentile	81,310	95,700		
55 (160):			60–65	60
Mean	52,022	50,008		
Median	21,112	21,950		
Twenty-fifth percentile	3,822	3,900		
Seventy-fifth percentile	54,263	55,678		
Ninetieth percentile	125,512	118,800		
56 (127):			61–66	40
Mean	39,885	44,612		
Median	15,280	21,100		
Twenty-fifth percentile	409	1,500		
Seventy-fifth percentile	40,928	50,700		
Ninetieth percentile	76,398	76,000		
57 (149):			62–67	57
Mean	45,548	51,947		
Median	23,874	29,940		
Twenty-fifth percentile	7,149	6,770		
Seventy-fifth percentile	51,842	59,950		
Ninetieth percentile	131,651	138,000		
58 (139):			63–68	67
Mean	51,445	47,529		
Median	22,419	21,600		
Twenty-fifth percentile	3,070	3,000		
Seventy-fifth percentile	51,160	50,000		
Ninetieth percentile	144,611	117,500		
59 (120):			64–69	46
Mean	44,444	45,981		
Median	16,781	22,480		
Twenty-fifth percentile	3,895	7,900		
Seventy-fifth percentile	38,848	44,000		
Ninetieth percentile	89,905	85,875		

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of 2,683 respondents who provided both usable wealth and usable age data in the 1971 and 1976 surveys.

Table 11.9 WEALTH by Cohort for 5-YEAR CRS 1976–81 Sample (1976 dollars)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1976	WEALTH in Survey Year 1981	Age Range between Surveys	Number Dissaving
45 (195):			55–60	60
Mean	64,277	80,190		
Median	34,340	40,691		
Twenty-fifth percentile	15,000	17,332		
Seventy-fifth percentile	61,000	91,401		
Ninetieth percentile	147,000	160,799		
46 (165):			56–61	47
Mean	54,876	71,561		
Median	28,600	32,498		
Twenty-fifth percentile	4,750	7,448		
Seventy-fifth percentile	53,500	64,658		
Ninetieth percentile	165,000	163,372		
47 (187):			57–62	60
Mean	53,484	66,275		
Median	26,125	32,498		
Twenty-fifth percentile	8,700	11,510		
Seventy-fifth percentile	61,800	79,215		
Ninetieth percentile	140,000	152,877		
48 (168):			58–63	57
Mean	45,369	50,034		
Median	25,350	29,079		
Twenty-fifth percentile	7,350	9,510		
Seventy-fifth percentile	51,850	64,355		
Ninetieth percentile	95,000	100,413		
49 (152):			59–64	69
Mean	51,878	54,896		
Median	30,000	35,206		
Twenty-fifth percentile	11,250	8,673		
Seventy-fifth percentile	58,100	70,379		
Ninetieth percentile	107,000	129,113		
50 (176):			60–65	63
Mean	45,104	53,596		
Median	24,450	31,144		
Twenty-fifth percentile	6,736	9,411		
Seventy-fifth percentile	60,750	66,960		
Ninetieth percentile	108,000	132,701		

(*continued*)

Table 11.9 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1976	1981	Age Range between Surveys	Number Dissaving
51 (160):			61–66	64
Mean	43,496	47,916		
Median	25,700	23,731		
Twenty-fifth percentile	5,112	6,280		
Seventy-fifth percentile	51,900	58,870		
Ninetieth percentile	88,525	97,224		
52 (139):			62–67	66
Mean	47,587	55,932		
Median	25,000	26,405		
Twenty-fifth percentile	7,702	8,125		
Seventy-fifth percentile	50,000	60,528		
Ninetieth percentile	117,000	135,410		
53 (157):			63–68	65
Mean	52,839	57,011		
Median	29,935	33,852		
Twenty-fifth percentile	8,000	9,248		
Seventy-fifth percentile	66,000	64,031		
Ninetieth percentile	156,000	140,149		
54 (124):			64–69	55
Mean	45,742	43,513		
Median	22,250	20,311		
Twenty-fifth percentile	4,843	3,216		
Seventy-fifth percentile	54,634	54,232		
Ninetieth percentile	122,600	94,617		
55 (120):			65–70	61
Mean	56,206	60,089		
Median	26,500	29,469		
Twenty-fifth percentile	5,525	4,063		
Seventy-fifth percentile	68,750	66,690		
Ninetieth percentile	127,500	177,725		
56 (109):			66–71	51
Mean	60,681	52,871		
Median	26,800	30,467		
Twenty-fifth percentile	6,000	5,416		
Seventy-fifth percentile	60,000	55,518		
Ninetieth percentile	135,000	117,129		
57 (114):			67–72	49
Mean	55,319	65,701		
Median	34,500	32,498		
Twenty-fifth percentile	10,900	11,713		
Seventy-fifth percentile	63,400	67,244		
Ninetieth percentile	150,000	159,106		

Table 11.9 (continued)

Age in 1966 (N): Sample Statistic	WEALTH in Survey Year 1976	1981	Age Range between Surveys	Number Dissaving
58 (108):			68–73	51
Mean	49,970	53,248		
Median	28,400	28,282		
Twenty-fifth percentile	6,664	6,669		
Seventy-fifth percentile	52,500	60,968		
Ninetieth percentile	120,000	113,067		
59 (96):			69–74	43
Mean	42,540	53,036		
Median	24,200	24,746		
Twenty-fifth percentile	8,930	6,770		
Seventy-fifth percentile	48,788	51,795		
Ninetieth percentile	107,900	107,921		

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of 2,170 respondents who provided both usable wealth and usable age data in the 1976 and 1981 surveys.

Age-wealth profiles for each of the 1907–21 cohorts based on the 15-YEAR CRS sample are represented in figures 11.1–11.15 by squares. The other points marked with crosses form the age-wealth profiles that are obtained by adding to the 15-YEAR CRS sample those households who reported usable data in each survey up until their death. These data are reported in table 11.10. This adds 1,016 households in 1966, 787 households in 1969, 663 households in 1971, and 319 households in 1976. The 1981 point is based on the same households and hence is the same. Comparison of the two age-wealth profiles in figures 11.1–11.15 illustrates the effect of differential mortality. The profile that includes respondents who die before 1981 lies below the 15-YEAR CRS age-wealth profile. This downward bias is generally larger for the oldest cohorts since their death rate is larger. In the portions of age-wealth profile that slope up (e.g., in the figures for the 1908, 1914, and 1919 cohorts), this bias can work to steepen the implied age-wealth profile.

In figures 11.16–11.30, the age-wealth profiles of each cohort based on the 15-YEAR CRS sample are again represented by squares. The other points marked by crosses constitute the age-wealth profile one obtains from a sample consisting of the 15-YEAR CRS sample plus those households who survived until 1981 but did not report usable

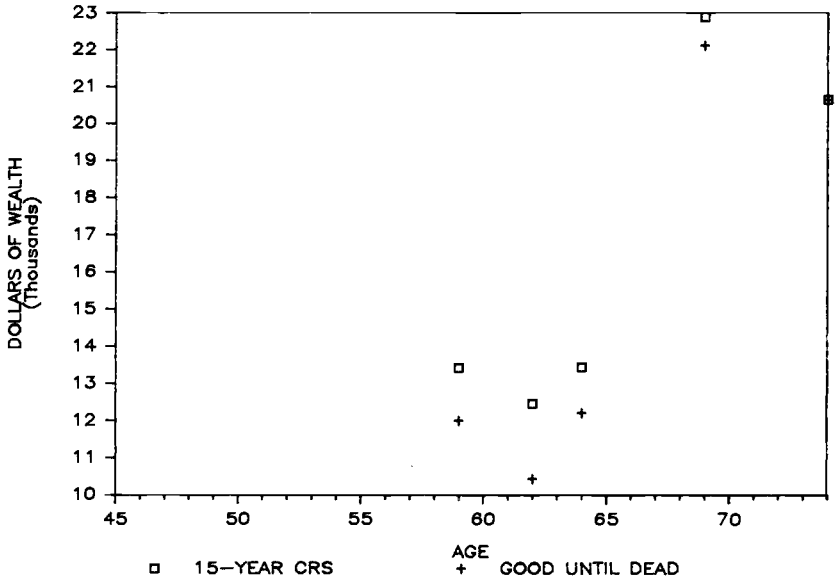

Fig. 11.1 1907 cohort median WEALTH

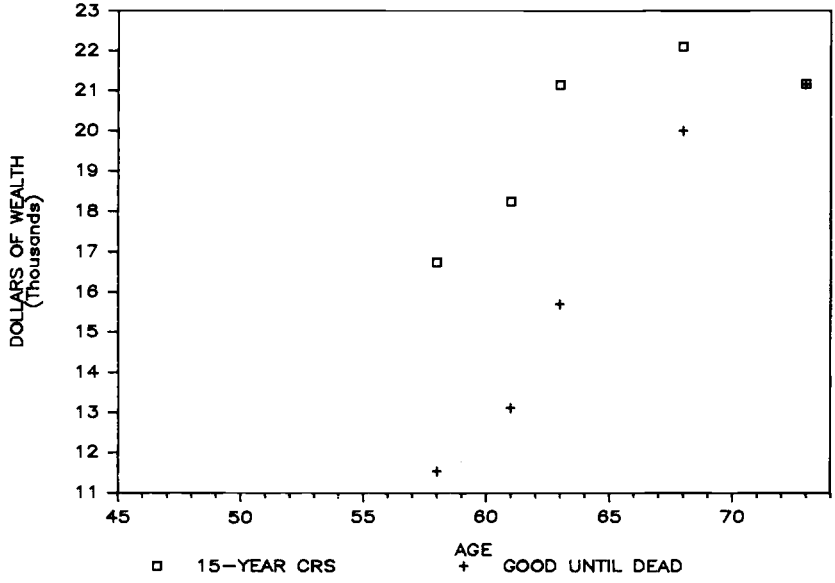

Fig. 11.2 1908 cohort median WEALTH

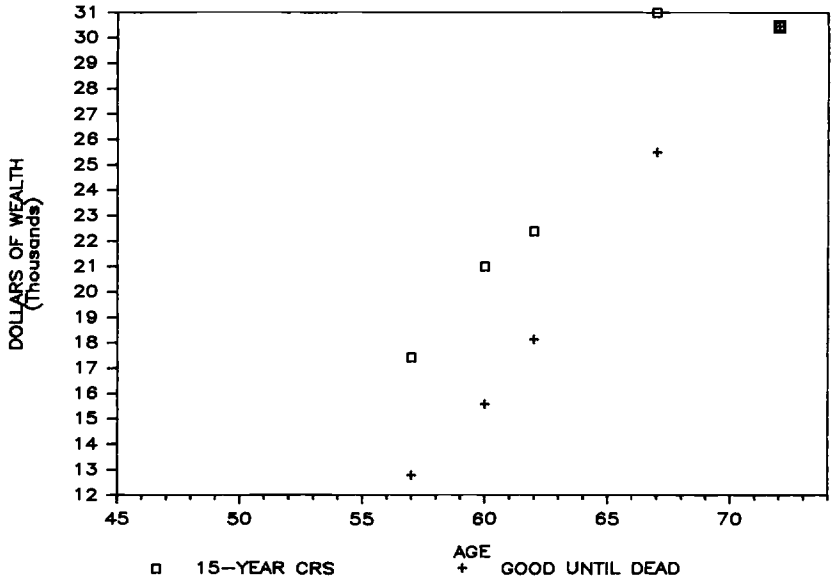

Fig. 11.3 1909 cohort median WEALTH

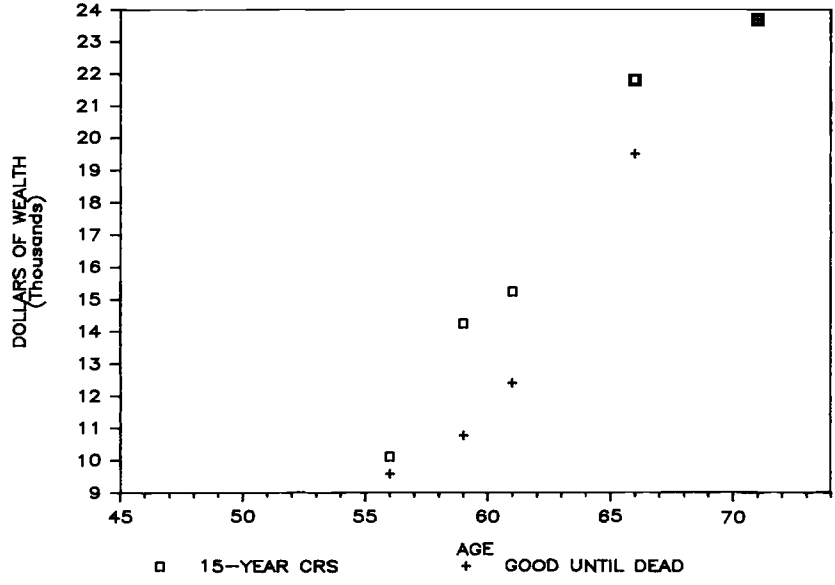

Fig. 11.4 1910 cohort median WEALTH

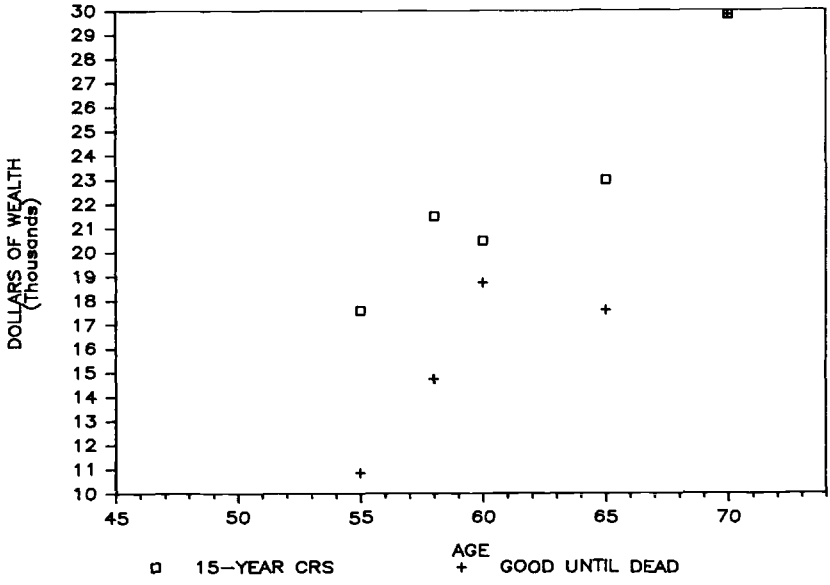

Fig. 11.5 1911 cohort median WEALTH

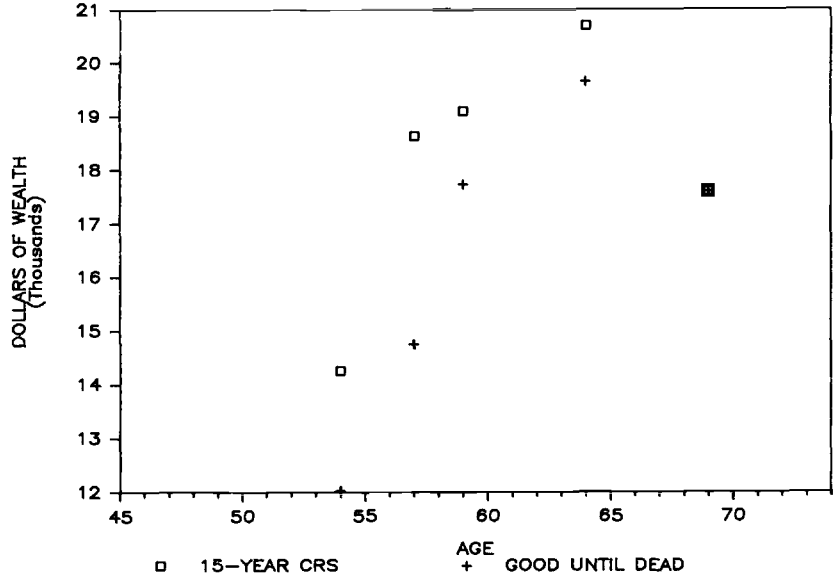

Fig. 11.6 1912 cohort median WEALTH

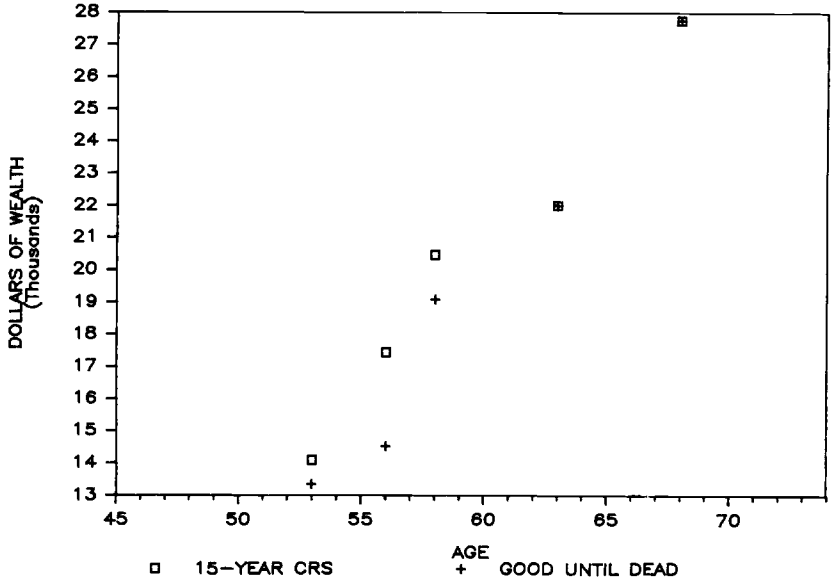

Fig. 11.7 1913 cohort median WEALTH

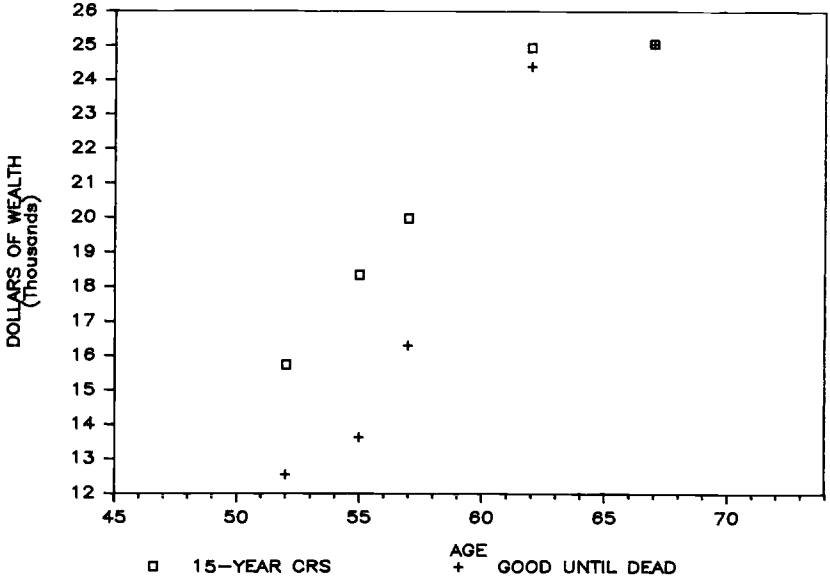

Fig. 11.8 1914 cohort median WEALTH

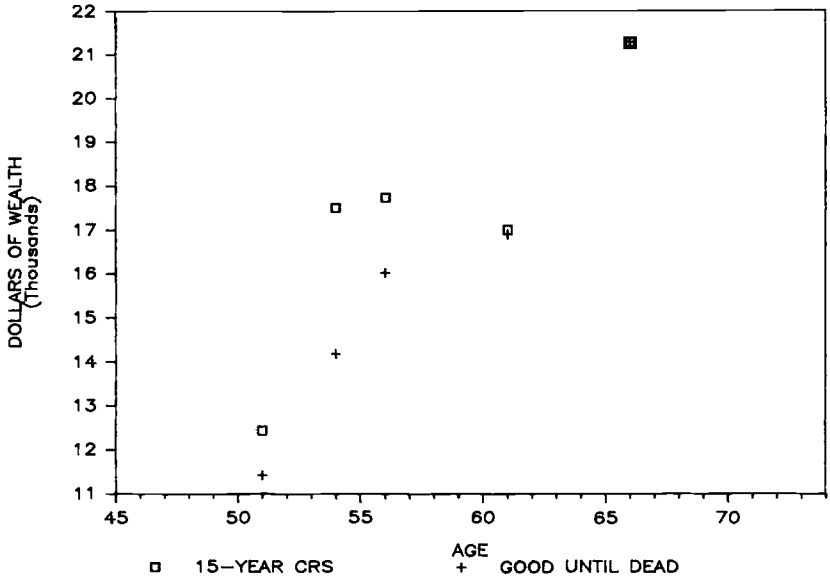

Fig. 11.9 1915 cohort median WEALTH

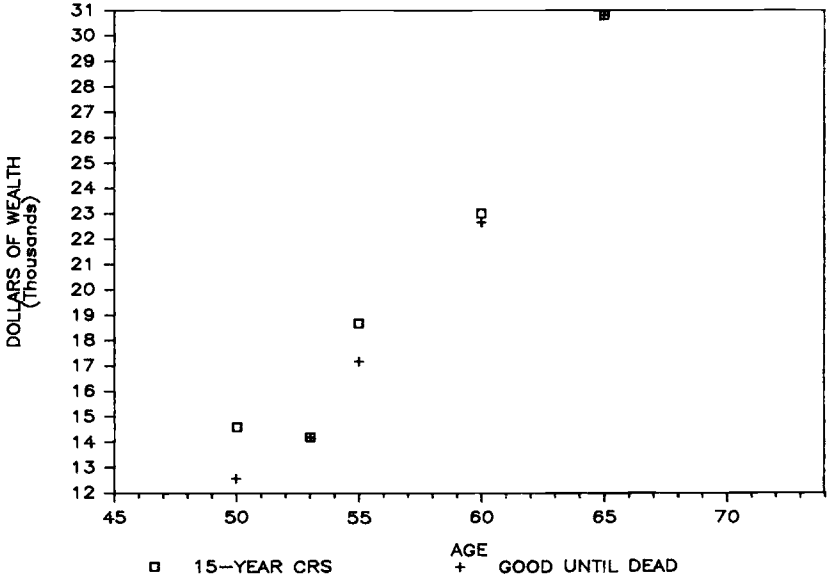

Fig. 11.10 1916 cohort median WEALTH

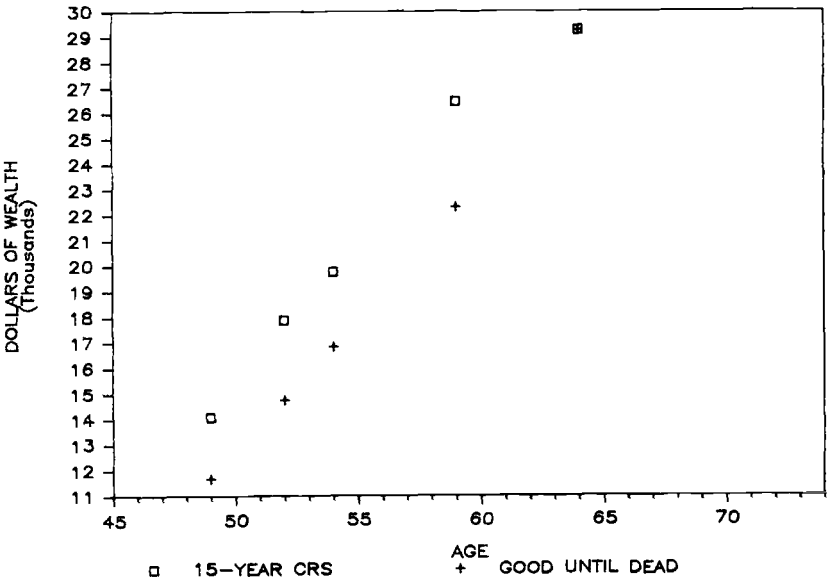

Fig. 11.11 1917 cohort median WEALTH

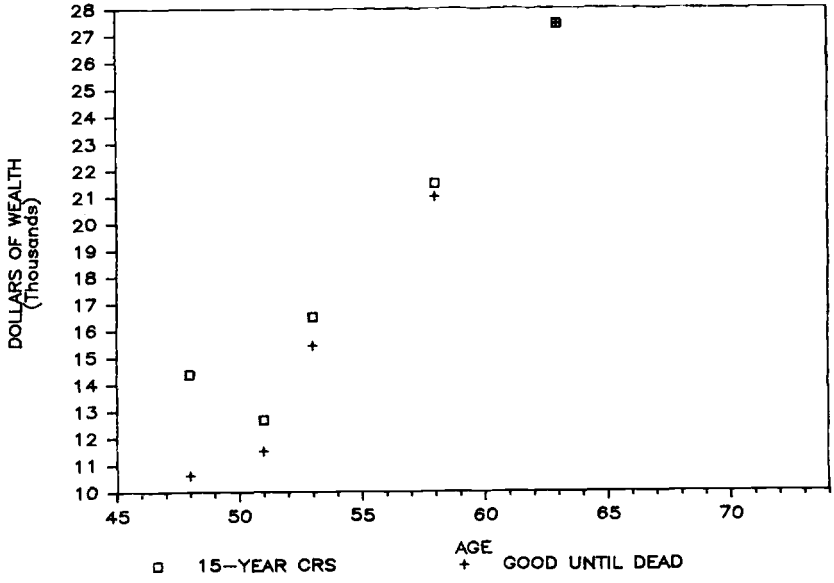

Fig. 11.12 1918 cohort median WEALTH

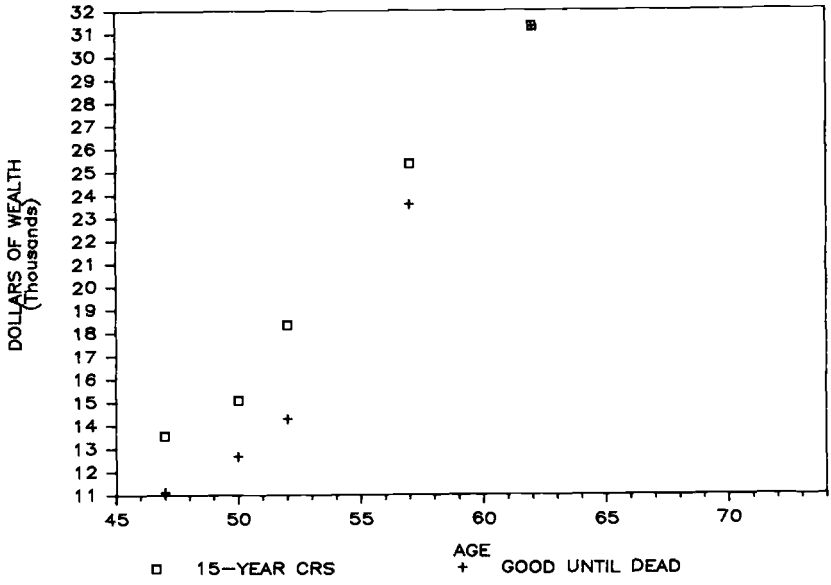

Fig. 11.13 1919 cohort median WEALTH

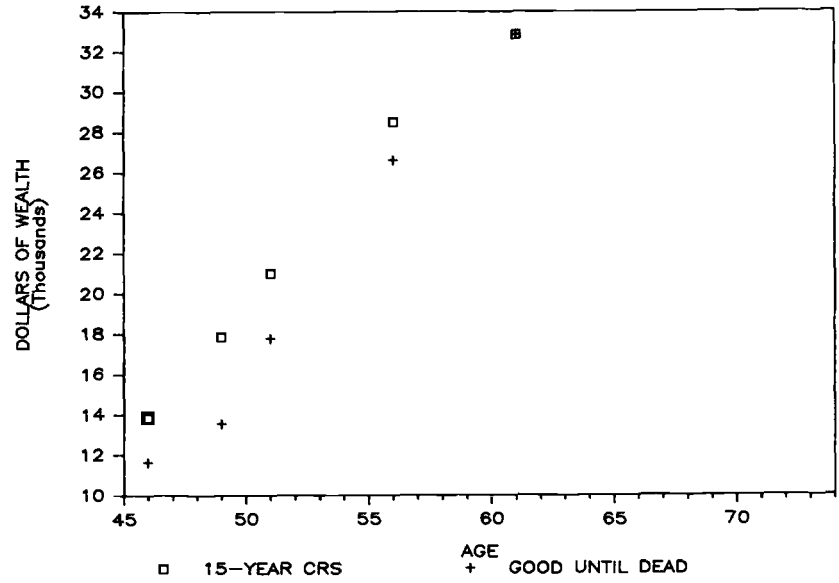

Fig. 11.14 1920 cohort median WEALTH

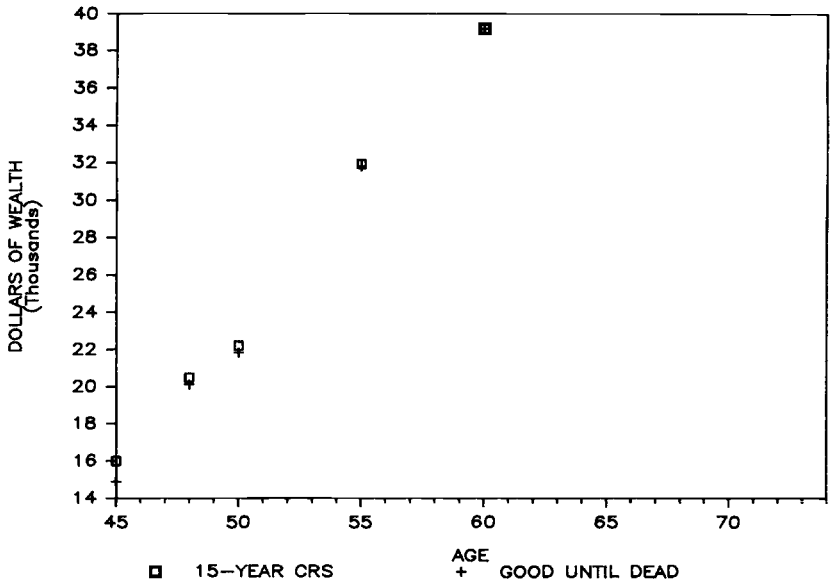

Fig. 11.15 1921 cohort median WEALTH

Table 11.10 **WEALTH by Cohort for Complete Reporter until Dead Sample (1976 dollars)**

Age in 1966: Sample Statistic	WEALTH in Survey Year 1966	1969	1971	1976	1981	Age in 1981
45:						60
Mean	25,866	32,889	33,586	52,125	68,598	
Median	14,870	20,119	21,828	31,800	39,201	
Twenty-fifth percentile	2,892	6,707	6,958	10,200	16,046	
Seventy-fifth percentile	31,260	40,127	42,633	53,700	88,016	
Ninetieth percentile	56,385	69,300	69,782	114,000	143,873	
N	198	196	192	173	158	
46:						61
Mean	24,798	29,796	30,544	40,969	60,275	
Median	11,609	13,565	17,799	26,625	32,837	
Twenty-fifth percentile	116	112	1,842	2,000	4,739	
Seventy-fifth percentile	23,134	28,838	34,925	49,500	63,643	
Ninetieth percentile	50,083	67,101	65,765	102,500	119,838	
N	177	163	161	142	131	
47:						62
Mean	26,995	30,650	33,836	47,198	59,868	
Median	11,103	12,668	14,257	23,600	31,303	
Twenty-fifth percentile	493	298	682	3,600	10,291	
Seventy-fifth percentile	28,690	32,720	37,790	57,250	74,475	
Ninetieth percentile	58,043	63,897	69,577	110,000	139,066	
N	203	191	182	165	150	

(*continued*)

Table 11.10 (continued)

Age in 1966: Sample Statistic	WEALTH in Survey Year 1966	1969	1971	1976	1981	Age in 1981
48:						63
Mean	23,595	28,820	34,361	42,773	46,120	
Median	10,614	11,524	15,449	21,000	27,420	
Twenty-fifth percentile	580	1,639	1,985	5,786	7,583	
Seventy-fifth percentile	31,385	39,046	44,686	49,000	59,580	
Ninetieth percentile	51,244	69,747	80,491	92,740	81,900	
N	175	166	160	148	131	
49:						64
Mean	27,981	28,138	30,497	42,087	46,044	
Median	11,692	14,773	16,849	22,300	29,262	
Twenty-fifth percentile	1,741	1,490	2,644	4,000	5,484	
Seventy-fifth percentile	32,007	34,277	37,074	49,500	62,288	
Ninetieth percentile	67,993	61,848	66,849	91,000	119,634	
N	175	162	156	135	115	
50:						65
Mean	35,887	30,024	33,505	41,920	49,316	
Median	12,570	14,203	17,190	22,650	30,806	
Twenty-fifth percentile	111	0	1,091	1,600	4,401	
Seventy-fifth percentile	30,000	36,066	39,563	54,450	58,226	
Ninetieth percentile	74,461	76,453	71,351	103,750	124,577	
N	200	187	177	158	135	
51:						66
Mean	29,499	28,262	30,502	39,834	48,477	
Median	11,418	14,189	16,031	16,900	21,286	
Twenty-fifth percentile	0	185	614	4,610	4,062	
Seventy-fifth percentile	28,358	31,297	38,779	51,000	55,518	
Ninetieth percentile	61,028	63,338	75,034	86,000	96,276	
N	204	189	185	143	121	
52:						67
Mean	29,097	32,049	34,536	42,486	54,203	
Median	12,542	13,636	16,303	24,390	25,051	
Twenty-fifth percentile	498	745	1,637	4,000	8,633	
Seventy-fifth percentile	33,002	38,003	43,656	50,000	58,565	
Ninetieth percentile	75,622	90,909	88,677	117,000	118,483	
N	184	167	158	137	108	
53:						68
Mean	29,125	32,699	36,768	40,763	44,771	
Median	13,350	14,531	19,100	22,000	27,759	
Twenty-fifth percentile	249	0	273	2,000	7,448	
Seventy-fifth percentile	33,167	40,238	44,884	57,000	60,934	
Ninetieth percentile	63,433	74,888	89,495	99,000	98,172	
N	198	186	182	155	131	
54:						69
Mean	22,996	27,893	30,181	37,981	41,285	
Median	12,023	14,754	17,735	19,650	17,603	

Table 11.10 (continued)

Age in 1966: Sample Statistic	WEALTH in Survey Year 1966	1969	1971	1976	1981	Age in 1981
Twenty-fifth percentile	912	1,565	2,183	700	1,625	
Seventy-fifth percentile	31,551	36,513	36,835	47,850	50,102	
Ninetieth percentile	53,068	75,261	79,400	97,650	91,401	
N	171	159	149	128	103	
55:						70
Mean	39,691	50,734	49,538	47,683	60,032	
Median	10,863	14,754	18,732	17,600	29,824	
Twenty-fifth percentile	124	0	1,637	1,000	1,726	
Seventy-fifth percentile	33,167	44,709	52,183	55,000	64,320	
Ninetieth percentile	89,055	114,605	129,604	120,000	174,001	
N	178	151	138	117	87	
56:						71
Mean	28,967	31,156	36,302	46,252	47,745	
Median	9,577	10,768	12,415	19,500	23,697	
Twenty-fifth percentile	265	596	0	0	1,050	
Seventy-fifth percentile	27,197	26,826	36,289	47,850	45,566	
Ninetieth percentile	57,877	80,701	67,531	85,500	87,339	
N	163	140	130	100	80	
57:						72
Mean	31,864	35,482	39,746	48,372	67,915	
Median	12,791	15,574	18,152	25,500	30,467	
Twenty-fifth percentile	1,388	2,310	2,985	4,256	6,838	
Seventy-fifth percentile	37,355	46,528	43,656	55,100	64,997	
Ninetieth percentile	93,118	105,067	111,119	130,000	159,106	
N	164	148	140	116	91	
58:						73
Mean	32,602	41,731	38,599	43,312	46,357	
Median	11,531	13,115	15,689	20,000	21,165	
Twenty-fifth percentile	332	0	802	1,750	5,078	
Seventy-fifth percentile	34,992	35,768	39,973	45,000	56,161	
Ninetieth percentile	87,065	84,948	79,809	84,400	102,924	
N	162	144	132	103	80	
59:						74
Mean	31,580	26,525	25,007	33,569	30,001	
Median	11,990	10,432	12,212	22,100	20,650	
Twenty-fifth percentile	0	0	289	8,000	3,047	
Seventy-fifth percentile	33,997	30,432	29,393	42,000	40,623	
Ninetieth percentile	72,637	76,006	67,531	79,500	70,346	
N	155	129	112	90	70	

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of those respondents who provided both usable wealth and usable age data in every survey until they died or survived through 1981.

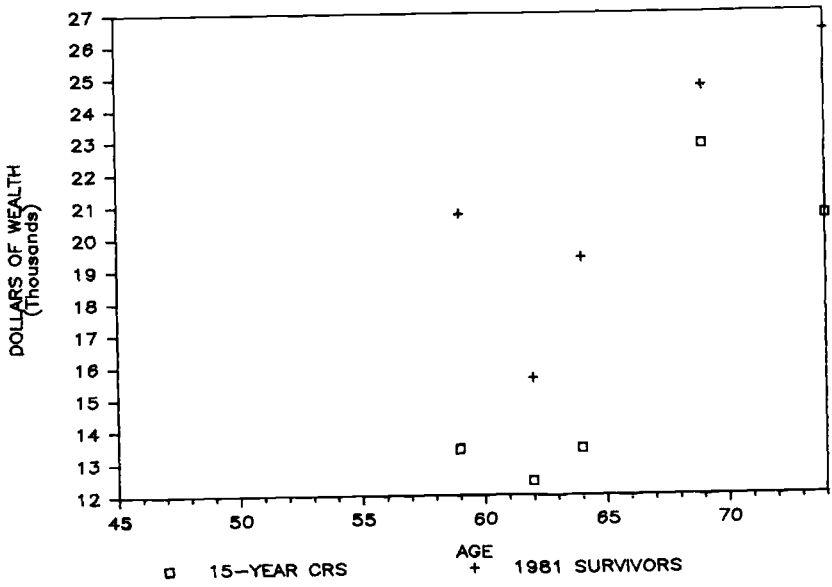

Fig. 11.16 1907 cohort median WEALTH

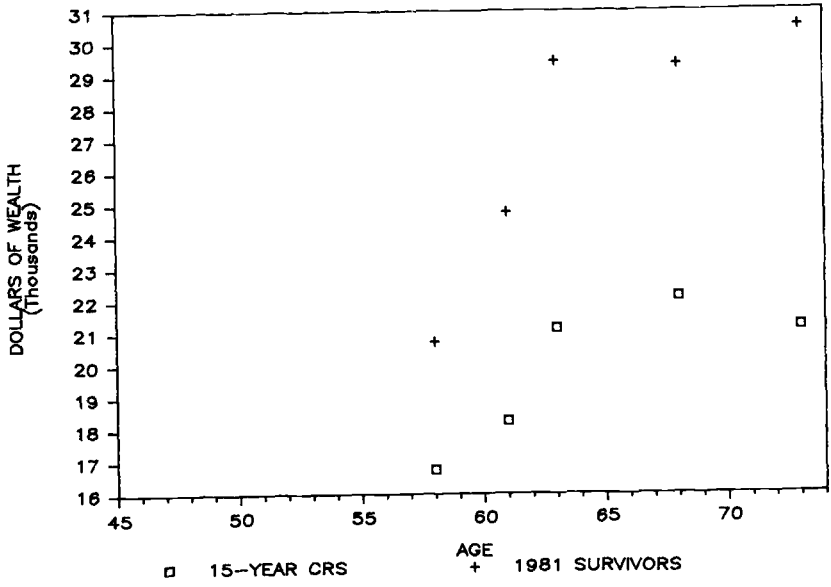

Fig. 11.17 1908 cohort median WEALTH

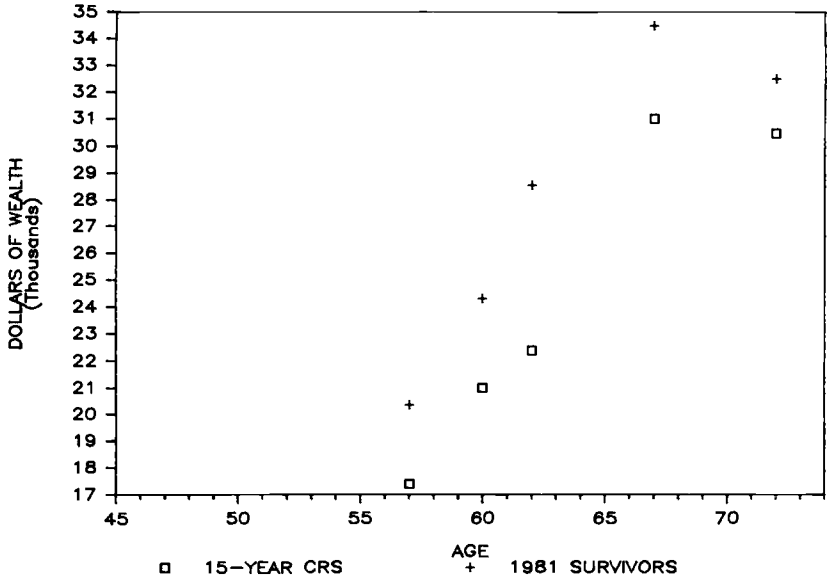

Fig. 11.18 1909 cohort median WEALTH

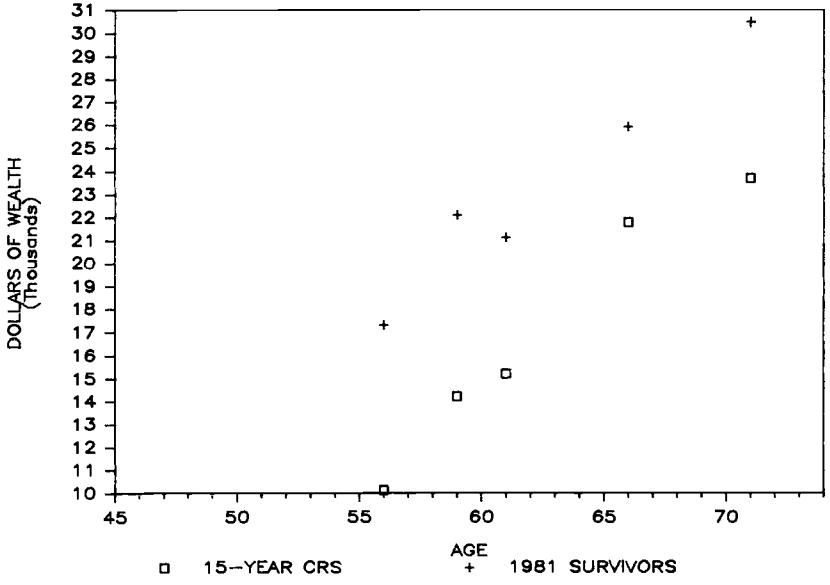

Fig. 11.19 1910 cohort median WEALTH

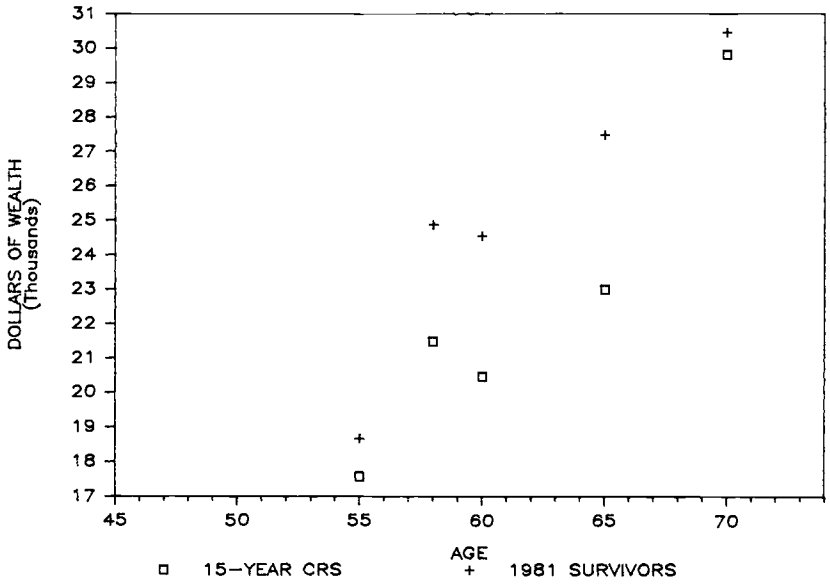

Fig. 11.20 1911 cohort median WEALTH

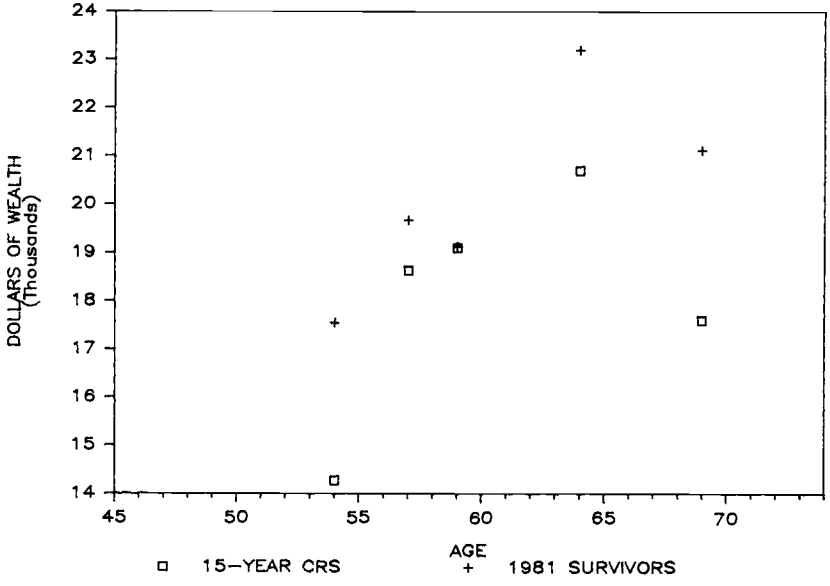

Fig. 11.21 1912 cohort median WEALTH

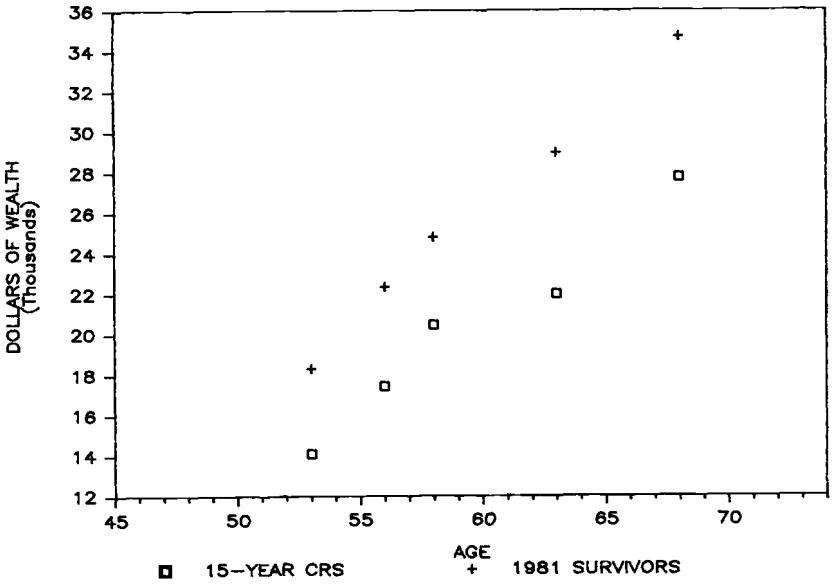

Fig. 11.22 1913 cohort median WEALTH

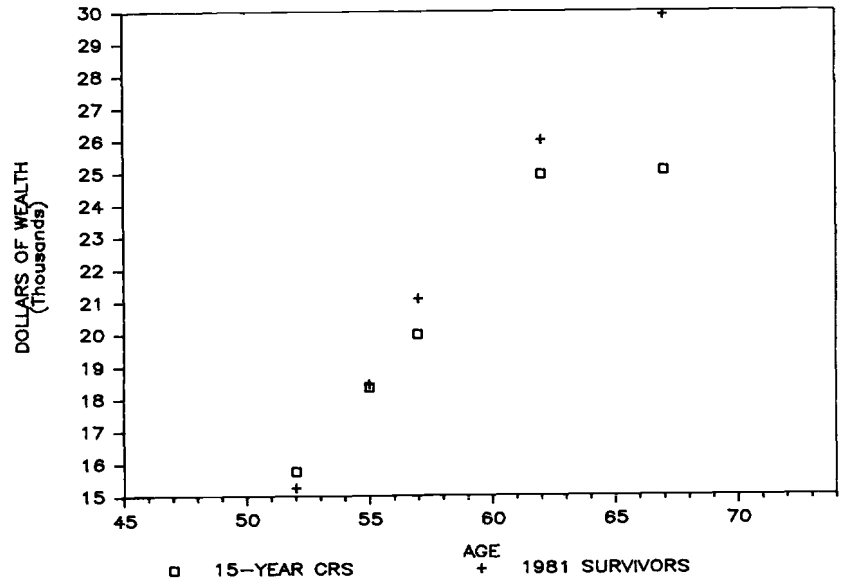

Fig. 11.23 1914 cohort median WEALTH

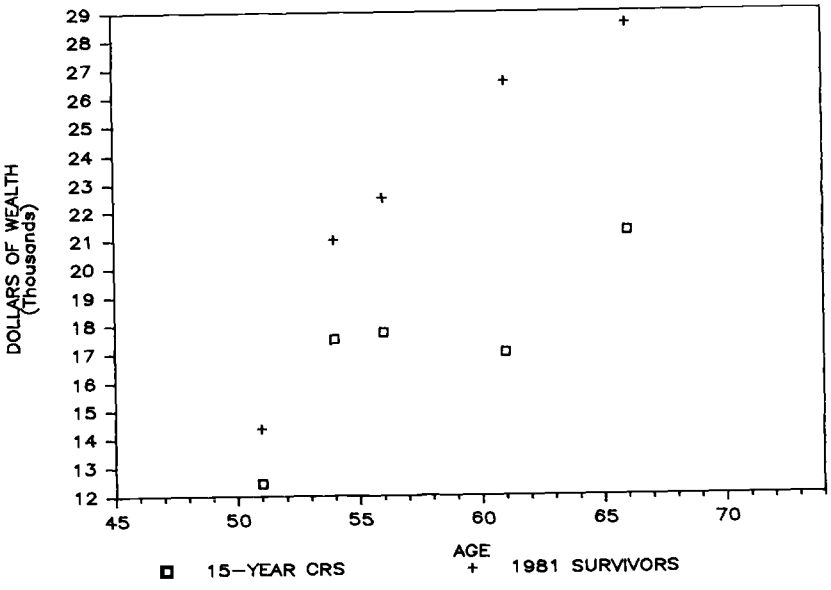

Fig. 11.24 1915 cohort median WEALTH

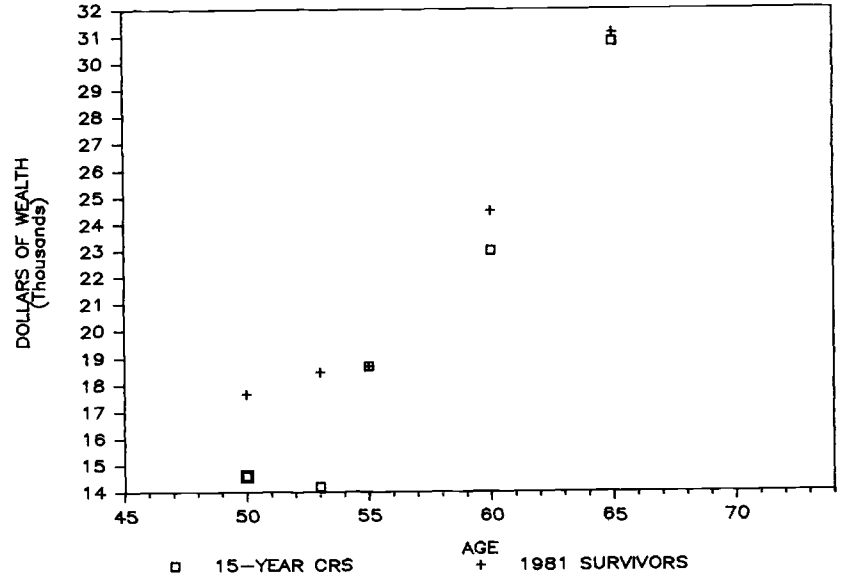

Fig. 11.25 1916 cohort median WEALTH

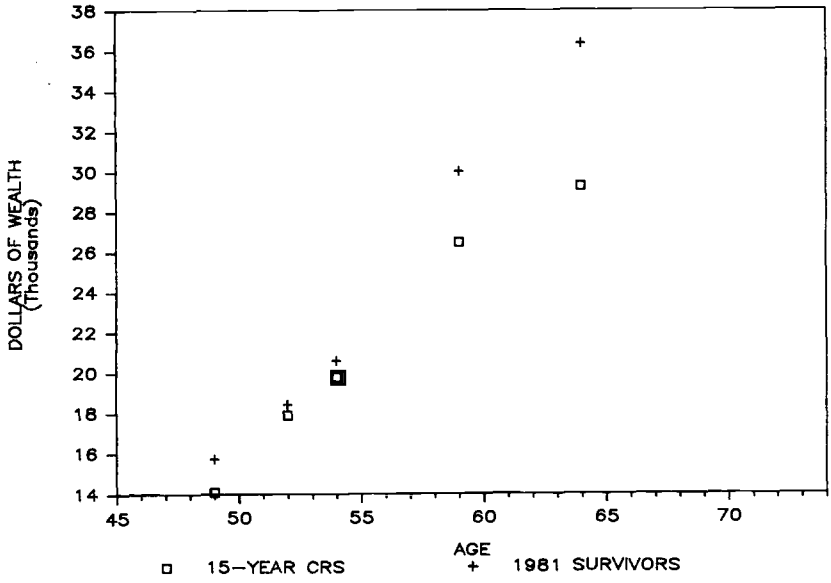

Fig. 11.26 1917 cohort median WEALTH

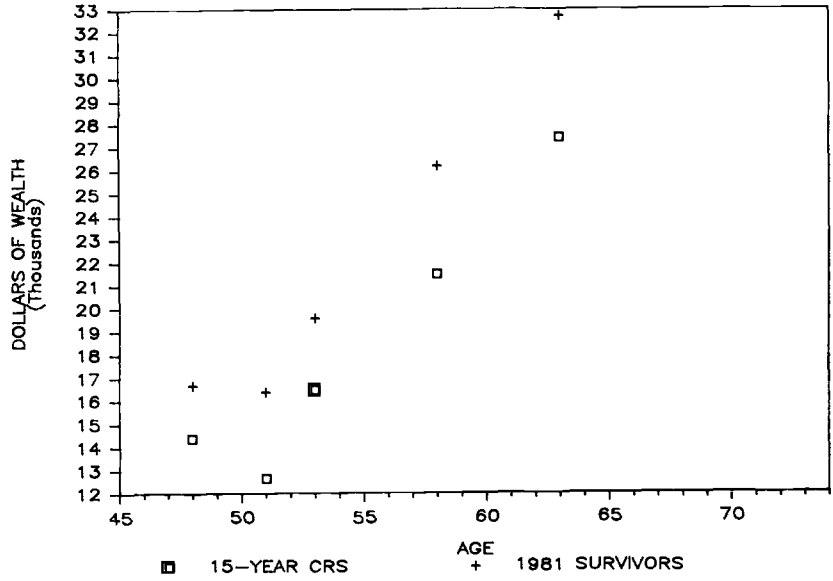

Fig. 11.27 1918 cohort median WEALTH

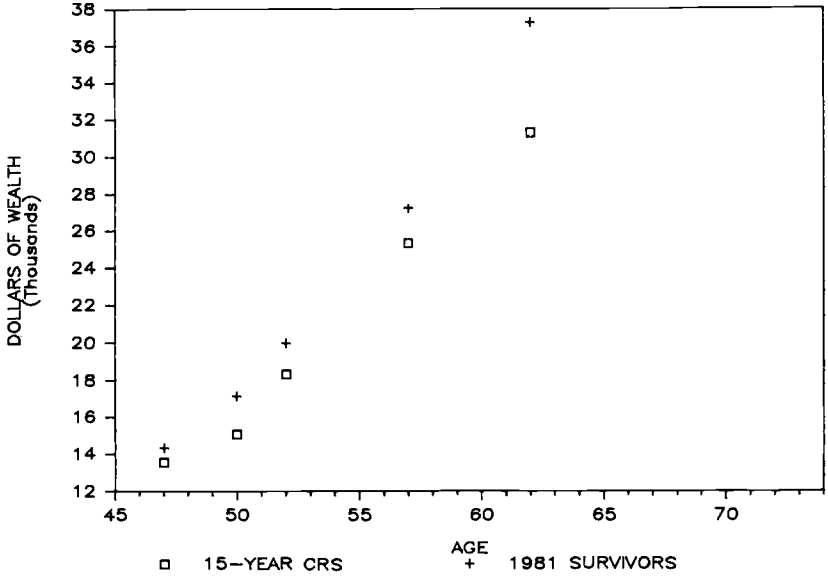

Fig. 11.28 1919 cohort median WEALTH

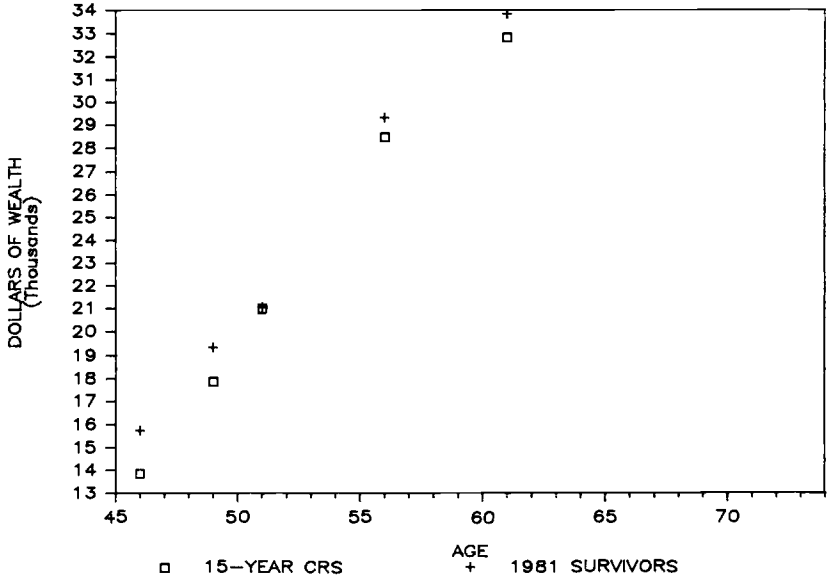

Fig. 11.29 1920 cohort median WEALTH

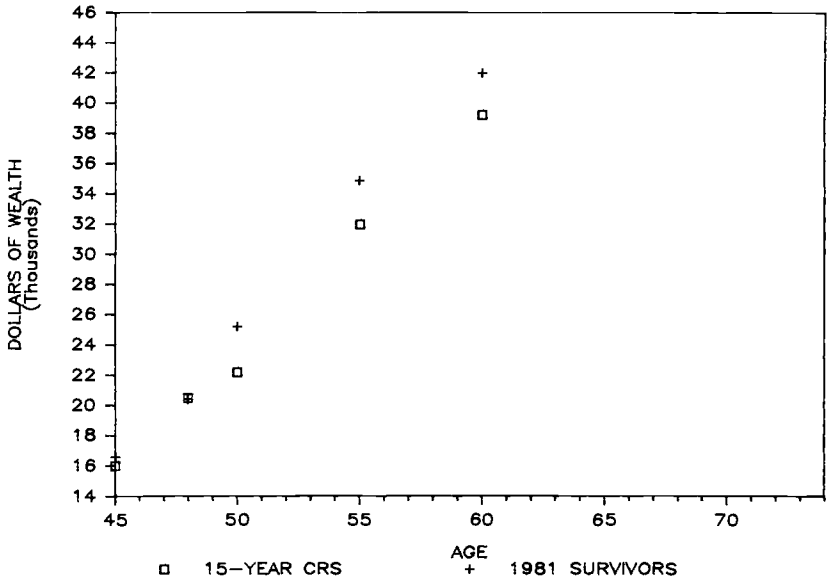

Fig. 11.30 1921 cohort median WEALTH

data in one or more of the 1966, 1969, 1971, or 1976 samples; that is, this age-wealth profile is based on the usable data from all households who survived until 1981. Data for this "survivors, including partial reporters with reentry" (SURVIVOR) sample are reported in table 11.11. These data do not contain any differential mortality effect. Rather, the difference between the age-wealth profiles based on the SURVIVOR sample and on the 15-YEAR CRS sample illustrates the effects of differential attrition (and reentry). Generally, the SURVIVOR age-wealth profile lies above the 15-YEAR CRS sample age-wealth profile. This is consistent with the fact that attrition due to bad data/refusal is more frequent among the rich. The size of this differential attrition effect varies considerably across cohorts; however, it is definitely larger in the older cohorts. As an examination of the figures for the 1907, 1908, 1910, and 1914 cohorts illustrates, it can have an effect on the shape of the age-wealth profile. In comparing points along any cohort's age-wealth profile from the SURVIVOR sample, one must remember that between surveys there is exit and entry of households; therefore, the points for the cohort are not based on the same households. This differential attrition and reentry could easily bias the age-wealth profile; hence, a comparison of shapes is probably inappropriate.

We have illustrated that differential mortality tends to bias downward (and sometimes steepen) cohort age-wealth profiles while differential attrition tends to raise cohort age-wealth profiles. These two biases

Table 11.11 **WEALTH by Cohort for Sample of Survivors, Including Partial Reporters with Reentry (1976 dollars)**

Age in 1966: Sample Statistic	WEALTH in Survey Year					Age in 1981
	1966	1969	1971	1976	1981	
45:						60
Mean	28,566	36,915	46,987	66,770	78,832	
Median	16,584	20,417	25,239	34,850	41,977	
Twenty-fifth percentile	4,398	8,942	9,959	15,658	18,957	
Seventy-fifth percentile	30,680	40,238	49,836	64,000	88,016	
Ninetieth percentile	66,219	78,987	88,677	153,000	162,492	
N	204	201	205	200	219	
46:						61
Mean	37,894	37,457	40,271	55,142	76,970	
Median	15,755	19,353	21,078	29,350	33,852	
Twenty-fifth percentile	4,643	4,471	6,821	5,900	10,190	
Seventy-fifth percentile	35,987	34,277	42,394	57,100	86,662	
Ninetieth percentile	93,367	85,693	107,776	165,000	165,877	
N	182	175	175	171	197	
47:						62
Mean	35,967	39,003	44,055	54,457	66,529	
Median	14,324	17,139	19,986	27,244	37,238	
Twenty-fifth percentile	2,620	2,832	3,820	9,000	11,456	
Seventy-fifth percentile	40,216	45,395	51,842	62,060	82,092	
Ninetieth percentile	74,337	89,419	103,683	142,500	156,398	
N	190	186	191	190	208	
48:						63
Mean	32,380	35,031	38,721	50,159	57,852	
Median	16,683	16,393	19,612	26,188	32,702	
Twenty-fifth percentile	3,483	4,471	6,139	7,500	9,827	
Seventy-fifth percentile	39,221	44,113	46,931	54,100	68,923	
Ninetieth percentile	75,870	78,241	87,653	98,350	114,421	
N	180	173	172	170	190	
49:						64
Mean	52,558	42,089	44,733	51,633	64,169	
Median	15,755	18,406	20,600	30,000	36,357	
Twenty-fifth percentile	4,975	4,322	7,367	10,600	12,187	
Seventy-fifth percentile	42,786	41,729	45,020	59,000	72,038	
Ninetieth percentile	100,539	99,106	88,677	107,000	130,569	
N	159	150	161	154	173	
50:						65
Mean	35,385	44,553	45,403	44,794	55,276	
Median	17,662	18,480	18,690	24,500	31,144	
Twenty-fifth percentile	1,078	2,981	3,411	7,372	9,343	
Seventy-fifth percentile	36,650	43,964	43,656	60,000	67,705	
Ninetieth percentile	83,458	99,851	80,491	103,800	135,410	
N	180	187	181	181	198	

Table 11.11 (continued)

Age in 1966: Sample Statistic	WEALTH in Survey Year 1966	1969	1971	1976	1981	Age in 1981
51:						66
Mean	45,796	58,055	58,956	45,031	61,628	
Median	14,386	21,013	22,510	26,550	28,571	
Twenty-fifth percentile	1,824	1,164	3,956	5,200	8,490	
Seventy-fifth percentile	41,501	49,553	52,251	52,000	64,320	
Ninetieth percentile	77,114	105,067	110,505	91,750	134,394	
N	177	164	173	166	189	
52:						67
Mean	31,213	36,402	41,128	51,169	59,425	
Median	15,257	18,443	21,112	26,000	29,875	
Twenty-fifth percentile	4,809	5,216	4,952	7,851	9,479	
Seventy-fifth percentile	36,899	44,747	50,102	50,500	61,611	
Ninetieth percentile	75,622	90,909	124,829	123,000	155,721	
N	143	145	148	144	158	
53:						68
Mean	35,040	42,304	48,175	52,343	60,755	
Median	18,325	22,355	24,829	28,975	34,699	
Twenty-fifth percentile	3,259	1,639	3,683	8,000	10,021	
Seventy-fifth percentile	45,357	46,498	54,570	66,000	67,705	
Ninetieth percentile	88,557	120,715	118,145	156,000	141,842	
N	168	157	165	159	176	
54:						69
Mean	31,147	40,574	39,604	47,111	51,581	
Median	17,546	19,672	19,127	23,200	21,124	
Twenty-fifth percentile	4,312	5,589	6,446	5,000	3,385	
Seventy-fifth percentile	39,303	58,006	47,749	58,000	61,070	
Ninetieth percentile	82,919	99,851	90,144	130,000	115,098	
N	133	129	130	126	139	
55:						70
Mean	53,204	81,384	66,541	57,055	66,532	
Median	18,673	24,888	24,557	27,500	30,467	
Twenty-fifth percentile	3,400	7,526	6,194	5,525	7,109	
Seventy-fifth percentile	44,113	55,440	56,480	70,000	74,475	
Ninetieth percentile	107,794	152,012	129,604	135,000	174,001	
N	129	123	129	124	142	
56:						71
Mean	42,344	60,148	56,057	59,430	51,824	
Median	17,330	22,132	21,146	25,900	30,467	
Twenty-fifth percentile	3,267	2,235	2,729	6,000	6,821	
Seventy-fifth percentile	44,569	58,122	54,570	59,250	55,857	
Ninetieth percentile	96,352	112,364	109,413	121,500	117,129	
N	116	118	113	112	128	

(*continued*)

Table 11.11 (continued)

Age in 1966: Sample Statistic	WEALTH in Survey Year 1966	1969	1971	1976	1981	Age in 1981
57:						72
Mean	40,197	48,097	47,151	54,667	62,929	
Median	20,357	24,330	28,554	34,500	32,498	
Twenty-fifth percentile	5,804	8,383	10,505	10,450	12,187	
Seventy-fifth percentile	54,726	58,831	60,113	63,050	64,320	
Ninetieth percentile	111,111	128,167	131,992	150,000	158,429	
N	114	108	120	116	125	
58:						73
Mean	60,620	50,696	58,325	50,288	60,957	
Median	20,730	24,739	29,413	29,300	30,467	
Twenty-fifth percentile	3,483	2,385	7,776	6,828	7,038	
Seventy-fifth percentile	59,701	58,867	57,981	53,000	74,475	
Ninetieth percentile	127,363	127,720	136,426	118,750	117,806	
N	112	111	114	110	123	
59:						74
Mean	71,742	41,145	48,664	42,269	70,009	
Median	20,730	15,648	19,372	24,700	26,405	
Twenty-fifth percentile	4,519	5,663	5,484	8,960	10,359	
Seventy-fifth percentile	47,788	52,744	54,570	47,500	52,810	
Ninetieth percentile	193,035	103,577	120,055	107,900	115,775	
N	101	96	97	98	109	

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of those respondents who provided both usable wealth and usable age data in any survey as long as they provided these data in the 1981 survey.

can be eliminated by examining cohort age-wealth profiles based on respondents who both survive to the end of the period under analysis and report usable data in every survey during this period, that is, our 5-YEAR and 15-YEAR CRS samples.

11.4 Assessing the Bias in Age-Wealth Profiles Based on Cross-sectional Data

As Shorrocks and others have pointed out, age-wealth profiles based on cross-sectional data suffer from both a productivity bias, which tends to flatten the profile, and a differential mortality bias, which tends to steepen the cross-sectional age-wealth profile. Using the NLS data, we have constructed cross-sectional age-wealth profiles based on the

1966, 1969, 1971, 1976, and 1981 samples. Presumably, these suffer both productivity and differential mortality biases. To assess the extent of these biases, we compare the cross-sectional profiles with the cohort age-wealth profiles that suffer from neither of these biases (the cohort profiles based on the 15-YEAR CRS sample as described in the previous section). This will be done first through figures and then through simple age-wealth regressions.

The cross-sectional age-wealth profiles for 1966, 1971, 1976, and 1981 are plotted in figure 11.31. The 1969 profile is flat, as is the 1966 one. Hence, we observe three flat profiles, one (1981) that slopes down to the right, and one (1976) that is U-shaped. Since the previously examined cohort age-wealth profiles generally slope up at early ages, flatten, and sometimes turn down at later ages, the flat and downward slopes observed on the cross-sectional age-wealth profiles suggest that the downward productivity bias dominates the differential mortality effect bias.

In figure 11.32, the youngest three cohorts are plotted against the 1966 cross section. Clearly, the flat shape of the 1966 cross-sectional profile is not consistent with the rapid wealth accumulation being done by these cohorts. Similar conclusions are drawn from figure 11.33, which shows the 1969 cross-sectional profile and the 1917 and 1918 cohort age-wealth profiles. Figure 11.34 shows that the 1916 cohort

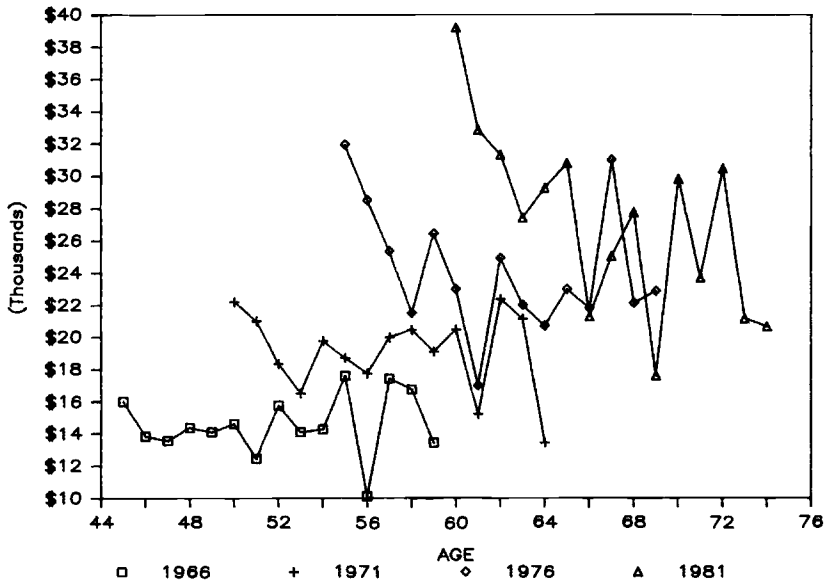

Fig. 11.31 Median WEALTH of 15-YEAR CRS—1966, 1971, 1976, and 1981 cross sections

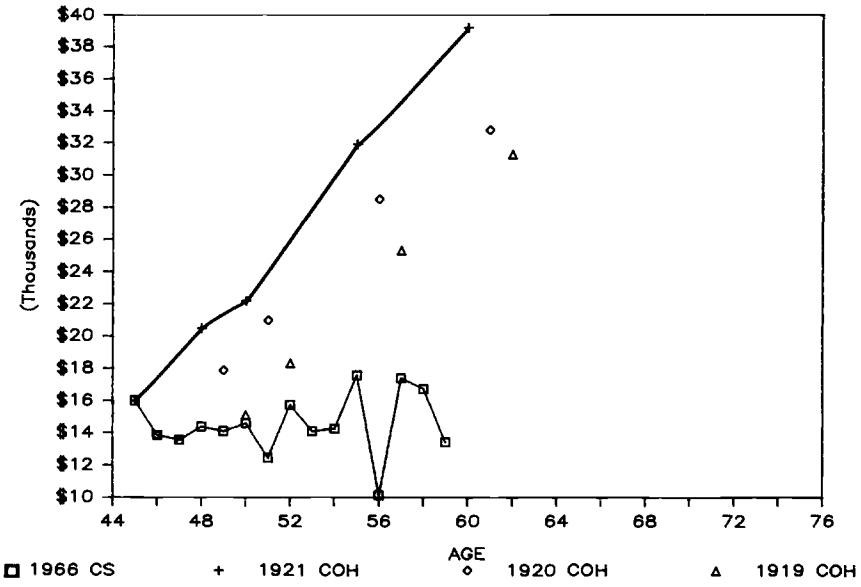

Fig. 11.32 Median WEALTH of 15-YEAR CRS—1966 cross section and 1919, 1920, and 1921 cohorts

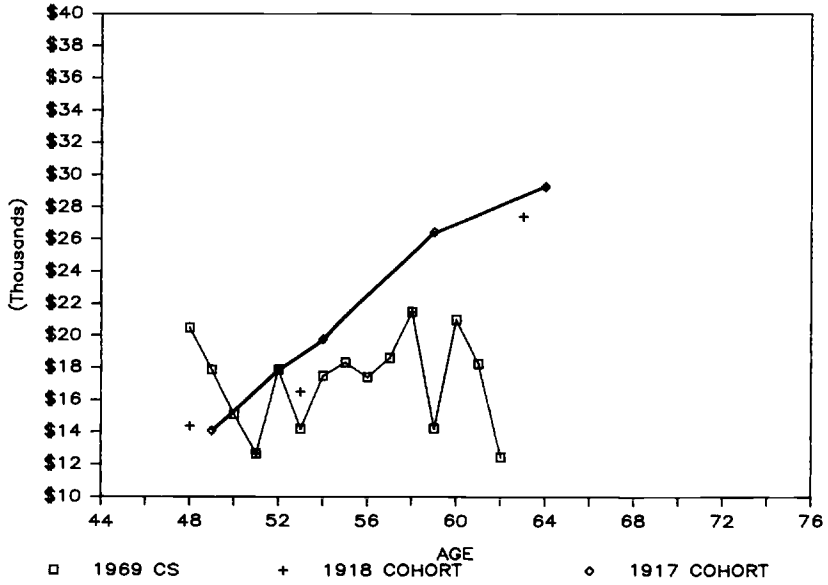

Fig. 11.33 Median WEALTH of 15-YEAR CRS—1969 cross section and 1917 and 1918 cohorts

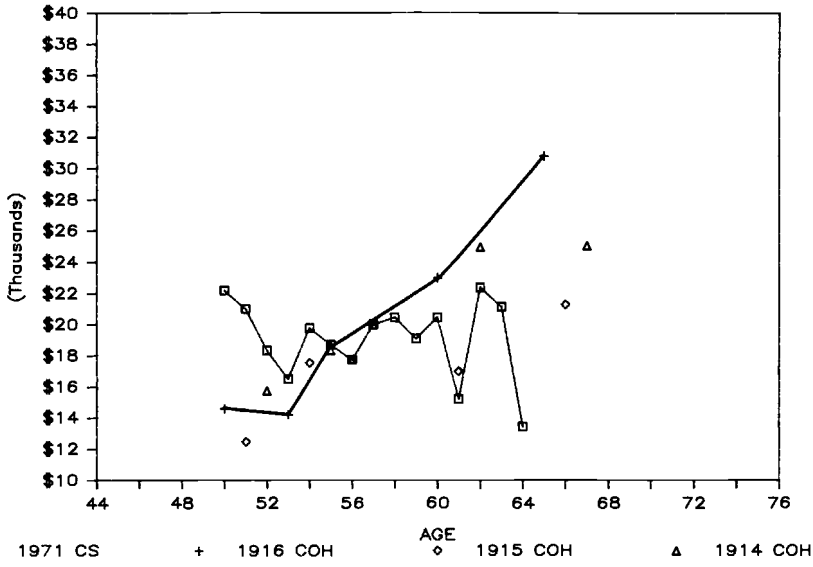

Fig. 11.34 Median WEALTH of 15-YEAR CRS—1971 cross section and 1915, 1916, and 1917 cohorts

also rapidly accumulates wealth between ages fifty-one and sixty-five; this is inconsistent with the flatness of the age-wealth profile from 1971, which also covers these ages. On the other hand, figure 11.34 also shows that the 1915 and 1917 cohorts, which have flatter profiles, are more consistent with the 1971 profile. In figure 11.35, the U-shaped 1976 profile is inconsistent with both the accumulation by the 1911 and 1913 cohorts and the hump-shaped age-wealth profile of the 1912 cohort. In figures 11.36 and 11.37, we see that the downward-sloping 1981 profile is inconsistent with age-wealth profiles of the four older cohorts, which are generally humped shaped. Hence, plotting the correct (longitudinally based) cohort age-wealth profiles against the cross-sectional age-wealth profiles (which overlap the ages covered) leads to the general conclusion that cross-sectional profiles generally take on grossly incorrect shapes.

The data for all the age-wealth profiles in figures 11.31–11.37 come from table 11.6, which reports sample statistics for the 15-YEAR CRS sample. The cohort profiles are obtained by plotting each cohort's median wealth accumulation from 1966 through 1981, which appears across the rows of table 11.6. A cross-sectional profile is obtained by plotting the median wealth taken from a column of table 11.6. The fact that the cross-sectional profiles tend to be flat or downward sloping as mentioned above suggests that the productivity bias outweighs the differential mortality bias.

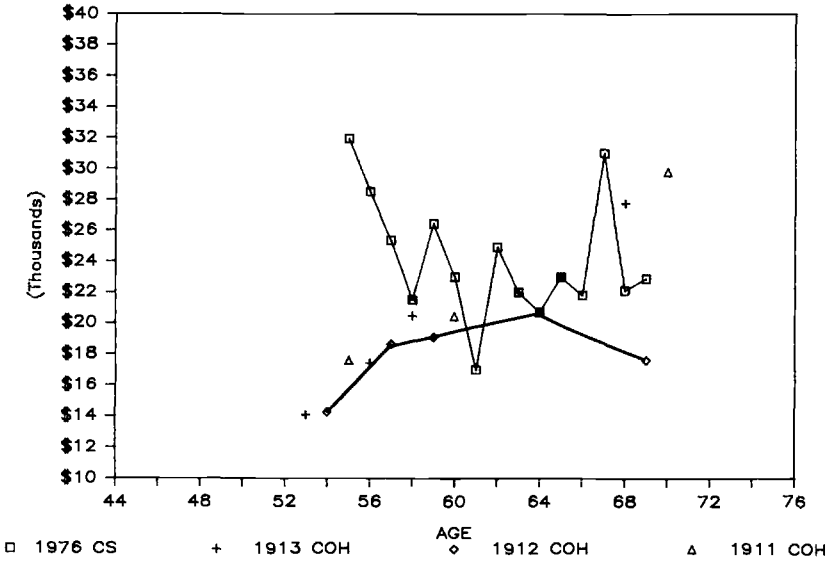

Fig. 11.35 Median WEALTH of 15-YEAR CRS—1976 cross section and 1911, 1912, and 1913 cohorts

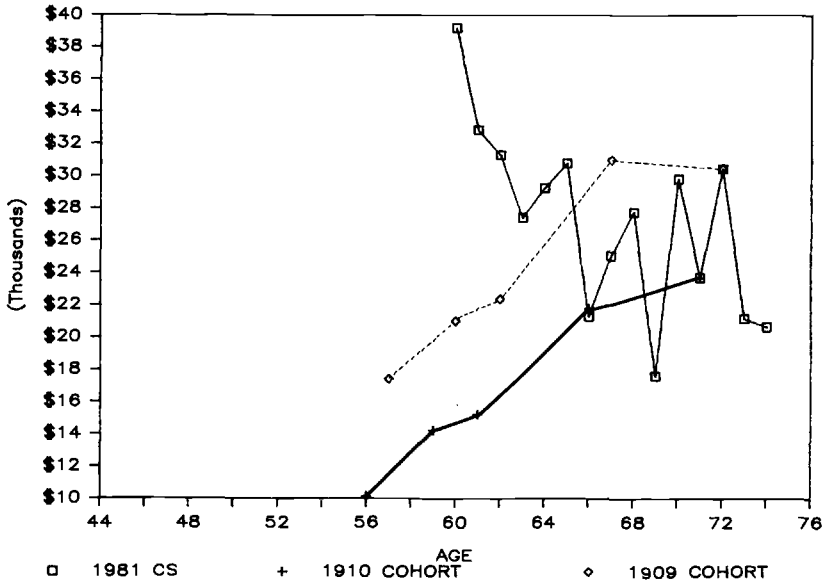

Fig. 11.36 Median WEALTH of 15-YEAR CRS—1981 cross section and 1909 and 1910 cohorts

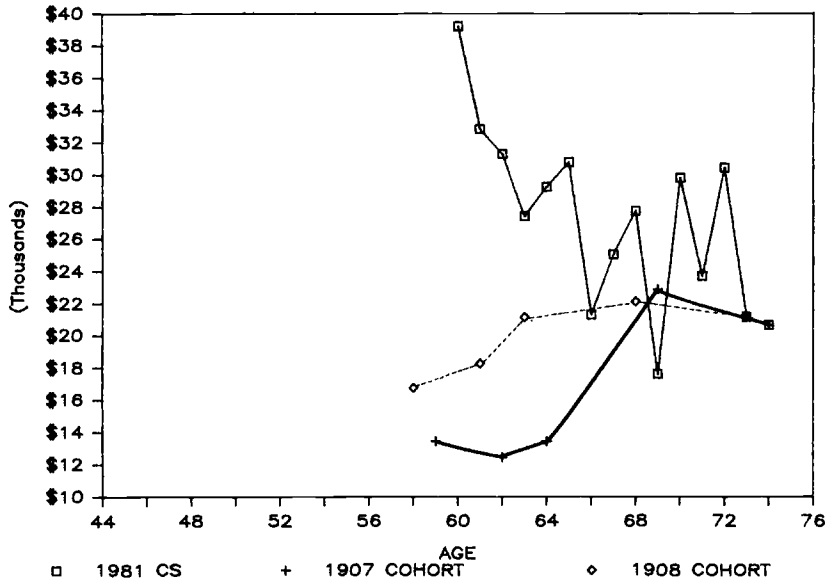

Fig. 11.37 Median WEALTH of 15-YEAR CRS—1981 cross section and 1907 and 1908 cohorts

The hypothesis that this productivity bias is large is supported by the fact that it is quite evident in our most comprehensive sample, that is, the "usable data with reentry" sample. These data, reported in table 11.12, include all households that reported usable data. Consequently, the number and identity of respondents in each cohort change from year to year owing to refusal to respond or to provide usable data and owing to attrition from the sample due to death or other reasons. In other words, these cohort age-wealth profiles, while free from productivity bias, are subject to differential mortality and differential attrition biases. The cross-sectional profiles still have the productivity bias in them. Shorrocks's point about bias due to productivity gain is illustrated quite clearly in table 11.12. If we follow, say, the median wealth by cohort (moving across a row), we see clear and distinct increases with age (albeit far larger for younger than for older cohorts). Looking at individual cross sections (down a column), we observe no clear pattern, showing that the cross sections are biased downward by the productivity effect. For a direct comparison that features an exact age overlap, compare the sequence of medians of the age forty-five cohort (which reveals their experience as they age to sixty) with the 1966 cross section, which has ages forty-five to fifty-nine. Median wealth rises from $15,500 to nearly $42,000 in the cohort but from $15,500 to only about $17,000 in the cross section.

Table 11.12 WEALTH by Cohort for Usable Data with Reentry Sample (1976 dollars)

Age in 1966: Sample Statistic	WEALTH in Survey Year					Age in 1981
	1966	1969	1971	1976	1981	
45:						60
Mean	29,204	35,753	45,715	61,563	78,832	
Median	15,506	20,119	23,874	34,140	41,977	
Twenty-fifth percentile	3,317	7,452	7,094	11,000	18,957	
Seventy-fifth percentile	33,167	42,623	47,749	63,000	88,016	
Ninetieth percentile	66,219	81,967	84,857	140,000	162,492	
N	331	285	286	242	219	
46:						61
Mean	37,801	35,511	45,599	51,924	76,970	
Median	13,847	15,499	18,213	25,500	33,852	
Twenty-fifth percentile	768	3,353	5,334	4,390	10,190	
Seventy-fifth percentile	30,514	32,787	41,201	52,500	86,662	
Ninetieth percentile	91,211	83,458	95,498	154,000	165,877	
N	329	278	267	224	197	
47:						62
Mean	37,775	35,999	38,710	49,479	66,529	
Median	13,267	14,791	16,440	23,000	37,238	
Twenty-fifth percentile	1,327	1,043	2,968	6,000	11,456	
Seventy-fifth percentile	31,509	38,003	43,452	61,050	82,092	
Ninetieth percentile	71,891	79,136	95,498	126,100	156,398	
N	357	301	288	241	208	
48:						63
Mean	28,715	34,152	37,399	46,368	57,852	
Median	14,403	16,097	19,714	24,000	32,702	
Twenty-fifth percentile	2,488	3,726	6,139	8,250	9,827	
Seventy-fifth percentile	36,487	43,964	47,476	51,850	68,923	
Ninetieth percentile	66,335	83,160	85,266	95,000	114,421	
N	312	270	255	224	190	
49:						64
Mean	40,136	37,115	42,482	51,538	64,169	
Median	12,604	15,797	17,735	29,000	36,357	
Twenty-fifth percentile	3,648	3,577	4,366	10,000	12,187	
Seventy-fifth percentile	36,318	34,277	39,973	58,500	72,038	
Ninetieth percentile	81,758	78,912	79,945	105,000	130,569	
N	317	255	255	207	173	
50:						65
Mean	41,506	47,597	48,888	48,923	55,279	
Median	14,594	18,480	19,100	25,100	31,144	
Twenty-fifth percentile	1,286	3,726	4,297	8,000	9,343	
Seventy-fifth percentile	33,665	43,964	43,656	64,000	67,705	
Ninetieth percentile	81,758	95,678	81,855	109,000	135,410	
N	324	295	274	230	198	

Table 11.12 (continued)

Age in 1966: Sample Statistic	WEALTH in Survey Year					Age in 1981
	1966	1969	1971	1976	1981	
51:						66
Mean	40,421	45,016	44,213	43,151	61,628	
Median	14,925	17,756	18,008	24,500	28,571	
Twenty-fifth percentile	1,526	1,313	2,947	5,925	8,490	
Seventy-fifth percentile	38,972	42,996	45,634	50,150	64,320	
Ninetieth percentile	91,542	87,779	90,041	91,050	134,394	
N	349	292	283	216	189	
52:						67
Mean	40,356	35,604	40,866	43,203	59,425	
Median	14,895	14,818	18,281	23,700	29,875	
Twenty-fifth percentile	1,493	2,854	4,502	5,000	9,479	
Seventy-fifth percentile	37,479	40,238	47,749	50,000	61,611	
Ninetieth percentile	83,333	103,577	106,262	104,000	155,721	
N	300	260	249	211	158	
53:						68
Mean	37,528	36,604	45,730	51,929	60,754	
Median	18,305	17,884	21,555	27,000	34,699	
Twenty-fifth percentile	2,828	969	1,828	5,730	10,021	
Seventy-fifth percentile	40,630	44,709	48,840	65,500	67,705	
Ninetieth percentile	83,582	105,067	113,233	137,500	141,842	
N	312	265	261	206	176	
54:						69
Mean	40,596	35,213	40,743	39,685	51,581	
Median	14,925	17,884	19,727	21,000	21,124	
Twenty-fifth percentile	1,990	3,353	6,446	4,685	3,385	
Seventy-fifth percentile	36,111	44,709	43,656	48,300	61,070	
Ninetieth percentile	66,750	95,082	90,041	109,500	115,098	
N	280	229	226	178	139	
55:						70
Mean	41,361	51,155	50,124	56,572	66,532	
Median	14,926	17,813	20,464	22,100	30,467	
Twenty-fifth percentile	995	1,565	3,411	4,300	7,109	
Seventy-fifth percentile	43,449	47,362	54,843	58,500	74,475	
Ninetieth percentile	98,673	134,128	129,604	136,000	174,001	
N	280	236	221	173	142	
56:						71
Mean	35,003	38,566	38,635	56,837	51,824	
Median	15,091	15,052	15,450	23,000	30,467	
Twenty-fifth percentile	2,488	2,086	546	6,350	6,821	
Seventy-fifth percentile	35,158	36,811	43,520	57,990	55,857	
Ninetieth percentile	79,602	96,870	77,080	121,200	117,129	
N	298	229	203	152	128	

(*continued*)

Table 11.12 (continued)

Age in 1966: Sample Statistic	WEALTH in Survey Year					Age in 1981
	1966	1969	1971	1976	1981	
57:						72
Mean	37,056	54,099	43,561	56,069	62,929	
Median	17,081	17,884	20,737	28,500	32,498	
Twenty-fifth percentile	3,317	4,471	5,901	7,500	12,187	
Seventy-fifth percentile	38,972	50,224	47,442	59,950	64,320	
Ninetieth percentile	109,453	138,599	122,783	138,000	158,429	
N	263	213	216	161	125	
58:						73
Mean	51,292	47,950	49,175	48,176	60,957	
Median	17,247	17,884	20,464	22,813	30,467	
Twenty-fifth percentile	1,658	466	2,729	3,250	7,038	
Seventy-fifth percentile	45,605	47,988	47,749	52,500	74,475	
Ninetieth percentile	120,232	114,426	122,783	111,000	117,806	
N	255	208	199	152	123	
59:						74
Mean	58,671	47,081	53,281	49,981	70,009	
Median	17,123	15,115	17,053	23,250	26,405	
Twenty-fifth percentile	829	943	2,729	8,600	10,359	
Seventy-fifth percentile	44,776	47,958	41,201	47,000	52,810	
Ninetieth percentile	106,136	100,596	99,318	107,900	115,775	
N	255	196	173	136	109	

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: WEALTH is the sum of net residential housing assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. The sample consists of those respondents who provided both usable wealth and usable age data in any survey whether or not they reported these data in prior or subsequent surveys.

The cohort and cross-sectional age-wealth profiles plotted in figures 11.1–11.30 are based on the 15-YEAR CRS sample of households, which both survived through 1981 and provided usable data in every year. Since inclusion criteria for the 15-YEAR CRS sample are stringent and limit the sample to 1,691 households, we decided to check these results with those obtained using the 5-YEAR CRS samples. From those households in the 5-YEAR CRS 1966–71 sample, we constructed a 1966 cross-sectional age-wealth profile. For each cohort, we constructed a five-year segment of its age-wealth profile by comparing the median wealth of all cohort households in this sample. These cohort segments are free from differential mortality, productivity, and attrition biases. Some can be matched with a similar five-year segment from the 1966 cross section. The five-year segment from the cross section

is constructed by taking the median wealth of individuals five years apart in age. It is thus subject to biases introduced by productivity and differential mortality. For the 1966 cross section, ten segments are plotted against ten cohort segments in figure 11.38. For example, the left-most lines compare the forty-five to fifty range on the cross-sectional profile (dashed line) to the 1921 cohort (solid line), which ages from forty-five to fifty from 1966 to 1971. From table 11.7, we see that the 1921 cohort's median wealth rose from $14,925 to $20,920 over this period, whereas the cross-sectional wealth declines from $14,925 for forty-five-year-olds to $14,449 for fifty-year-olds. These data and figures confirm what we observed earlier, that the younger cohorts accumulate wealth at considerably faster rates than the flat 1966 cross-sectional age-wealth profile suggests.

Figure 11.39 makes similar comparisons using the 5-YEAR CRS 1971–76 sample. In this case, segments of the 1971 cross section are compared to cohort segments constructed for 1971–76. Again, the cohort segments are steeper than the relatively flat 1971 cross section; this again illustrates the biases in the cross-sectional profile. Notice also that the cohort segments for ages ending in the early sixties are less steep; this is consistent with the flattening out of the fifteen-year cohort age-wealth profiles plotted in figures 11.1–11.15. This flattening is observed even more in figure 11.40, which uses the 5-YEAR CRS 1976–81 sample to plot the cohort segments as they age from 1976 to 1981 against the 1976 cross-sectional segments. Two of the four segments for ages ending in the late sixties are downward sloping, indicating cohort dissaving. Again, we conclude that the 1976 cross-sectional

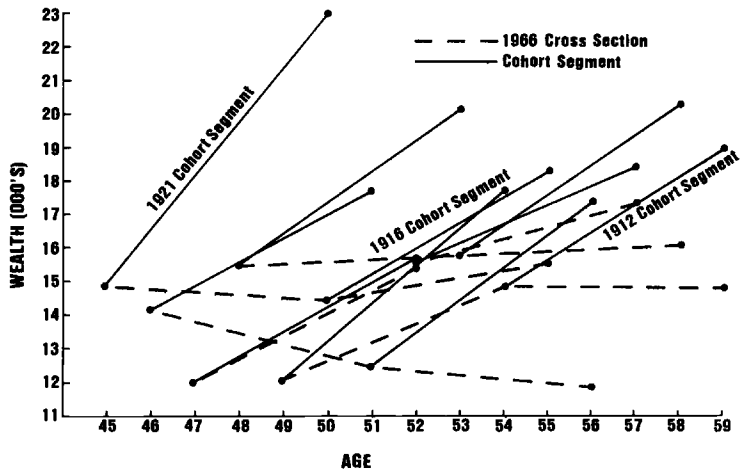

Fig. 11.38 Median WEALTH of 5-YEAR CRS 1966–71 sample

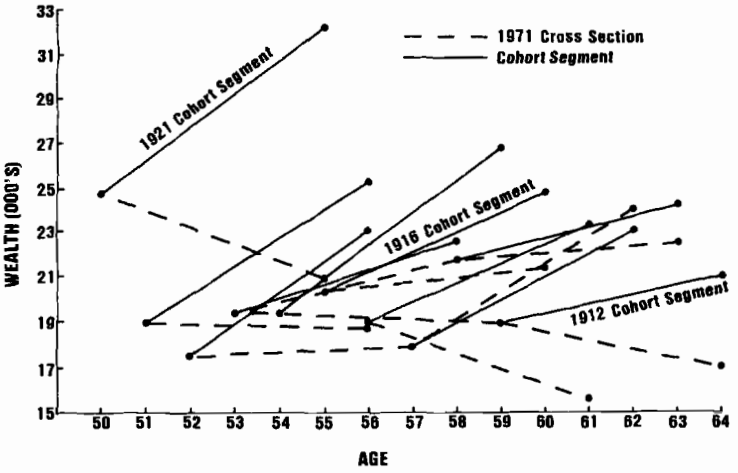

Fig. 11.39 Median WEALTH of 5-YEAR CRS 1971–76 sample

segments are not consistent with the cohort segments. The respective cross-sectional segments do not capture the rapid accumulation by the younger cohorts or the reduced saving or dissaving by the older cohorts.

Comparison of cohort segments based on the larger 5-YEAR CRS samples with the respective cross-sectional profiles supports our earlier conclusion based on the 15-YEAR CRS sample that the cross-sectional profiles are seriously biased by the presence of productivity and differential mortality effects.

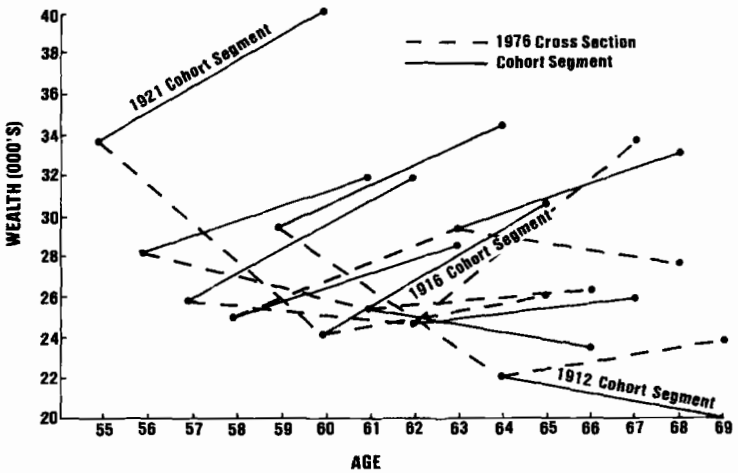

Fig. 11.40 Median WEALTH of 5-YEAR CRS 1976–81 sample

Another way to describe age-wealth profiles is to run a simple regression with wealth as the dependent variable and with AGE and AGE-SQUARED as the independent variables:

(2) $\quad \text{WEALTH} = a_1 + a_2\,\text{AGE} + a_3\,\text{AGE-SQUARED}.$

We estimated these for each cross section and each cohort. Generally, the estimated coefficients of both AGE and AGE-SQUARED had very large standard errors and, hence, did not test to be statistically different from zero. The standard errors were reduced by the deletion of AGE-SQUARED as an independent variable. These regressions are reported in table 11.13. As one can see, the coefficient on age is positive and statistically significant in the equation estimated over the 1966 cross section, statistically insignificant in the equations estimated over the 1969, 1971, and 1976 cross sections, and negatively signed and statistically significant in the equation estimated over the 1981 cross section.

Table 11.13 **Regression Results, Dependent Variable WEALTH: WEALTH = $b_0 + b_1$ AGE**

Sample	$\hat{b}_0$	S.E.	$\hat{b}_1$	S.E.	$\bar{R}^2$	SSR (10^{12})	N
1966 cross section	−5,390	20,804	751	406	.0014	8.2811	1,691
1969 cross section	1,799	24,945	641	460	.0006	10.6290	1,691
1971 cross section	8,497	22,590	523	402	.0004	8.1097	1,691
1976 cross section	62,406	27,864	−274	455	−.0004	10.0410	1,691
1981 cross section	124,661	35,992	−1,094	544	.0018	14.8500	1,691
1921 cohort	−98,020	28,512	2,752	550	.0296	5.3114	790
1920 cohort	−61,952	31,301	1,948	592	.0148	4.2340	655
1919 cohort	−55,806	36,948	1,855	686	.0084	7.4548	750
1918 cohort	−40,852	26,326	1,389	480	.0112	2.7817	655
1917 cohort	−22,775	24,232	1,099	434	.0094	1.7513	575
1916 cohort	−39,801	30,836	1,374	542	.0080	3.7744	675
1915 cohort	−7,375	34,830	829	602	.0015	3.7353	605
1914 cohort	−43,200	31,363	1,437	533	.0115	2.3309	540
1913 cohort	−15,489	26,354	907	440	.0049	2.3430	655
1912 cohort	−28,138	27,425	1,050	451	.0085	1.5164	515
1911 cohort	36,809	68,220	301	1,103	−.0021	6.4756	435
1910 cohort	1,765	63,569	708	1,012	−.0013	4.6029	400
1909 cohort	−63,441	45,208	1,785	708	.0117	2.9206	455
1908 cohort	886	43,949	624	678	−.0004	2.0669	400
1907 cohort	43,910	29,694	−201	451	−.0023	.7002	350

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: The underlying sample is the 15-YEAR CRS, the 1,691 respondents who provided both usable wealth and usable age data in each of the five surveys. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

These signs merely confirm the shapes of the cross-sectional age-wealth profiles reported in figure 11.31.

Also reported in table 11.13 are equations estimated on data from each individual cohort. The slope coefficients on AGE are generally positive but decline in size the older the cohort. Most of the estimated coefficients on AGE for the youngest ten cohorts test to be statistically different from zero at the 5 percent level by a one-tailed t-test. Only one of the five oldest cohorts has a statistically significant coefficient on AGE. The decline in size of the coefficient on AGE and the decline in its statistical significance presumably reflects the tendency of the older cohorts' age-wealth profiles to flatten out and even decline at older ages (as we observed in figures 11.1–11.15).

Formal F-tests of whether the estimated cohort coefficients are statistically different from the coefficients estimated on each cross section are reported in table 11.14. Each cross section was tested against those cohorts whose observed ages overlapped with at least 50 percent of the ages observed in the cross section. The asterisks indicate that the F-statistic exceeds the 5 percent critical value of 2.99. The conclusion one draws as to whether the estimated cohort age-wealth profiles are consistent with the estimated cross-sectional age-wealth profiles clearly depends on which cross section and which cohort one compares. Rejections are obtained most frequently for the youngest three and the oldest three cohorts. The 1976 and 1981 cross-sectional age-wealth profiles appear to be inconsistent with the estimated age-wealth profiles of most cohorts. Given how poorly all these equations fit, bear in mind that failure to reject does not mean acceptance of the hypothesis that the coefficients are the same.

Overall, these regression estimates suggest that age-wealth profiles estimated on cross-sectional data are likely to be inconsistent with the age-wealth profile one would estimate using cohort data. This is the same conclusion we reached in comparing plots of cohort and cross-sectional age-wealth profiles.

11.4.1 Evaluation of Possible Fixups of Cross-sectional Profiles

Faced with Shorrocks's criticisms, previous researchers with only cross-sectional data available have attempted a variety of fixups. Most have involved transforming the dependent variable through the use of some assumption about how it is distorted. We will evaluate two commonly proposed fixups. The first involves dividing observed wealth by an estimate of the household's permanent income (as King and Dicks-Mireaux did in their often-cited 1982 paper). The second involves scaling up the older households' wealth by an assumed productivity growth factor (as Mirer [1979] did).

Table 11.14 ***F*-Tests of the Equality of Cross-sectional and Cohort Regression Coefficients, Dependent Variable WEALTH: WEALTH = b_0 + b_1 AGE**

	F-Statistic		*F*-Statistic
1966 cross and:		1976 cross and:	
1921 cohort	9.312*	1919 cohort	3.799*
1920 cohort	2.938	1918 cohort	5.345*
1919 cohort	3.422*	1917 cohort	2.970
1918 cohort	.764	1916 cohort	3.956*
1917 cohort	.232	1915 cohort	1.859
1916 cohort	.469	1914 cohort	3.120*
1915 cohort	.189	1913 cohort	3.398*
1914 cohort	.523	1912 cohort	5.233*
		1911 cohort	2.441
1969 cross and:		1910 cohort	.760
1921 cohort	9.167*	1909 cohort	3.964*
1920 cohort	2.759	1908 cohort	.983
1919 cohort	3.432*	1907 cohort	5.075*
1918 cohort	.874		
1917 cohort	.239	1981 cross and:	
1916 cohort	.606	1914 cohort	7.228*
1915 cohort	.055	1913 cohort	8.636*
1914 cohort	.511	1912 cohort	10.384*
1913 cohort	.267	1911 cohort	1.016
1912 cohort	1.279	1910 cohort	2.536
1911 cohort	5.341*	1909 cohort	6.166*
		1908 cohort	4.410*
1971 cross and:		1907 cohort	9.612*
1921 cohort	12.128*		
1920 cohort	3.747*		
1919 cohort	4.719*		
1918 cohort	1.139		
1917 cohort	.437		
1916 cohort	.823		
1915 cohort	.220		
1914 cohort	.921		
1913 cohort	.324		
1912 cohort	1.562		
1911 cohort	5.304*		
1910 cohort	.680		
1909 cohort	2.240		

Source: Computed from the regression results in table 11.13.

Note: Critical *F*-statistics: 2.99 (5 percent), 4.60 (1 percent). Degrees of freedom are 2 and 1,967 or greater.

*Statistically significant at the 5 percent level.

King and Dicks-Mireaux (1982) construct a measure of permanent income based on the predicted value of household earnings obtained from a nonlinear earnings equation. Their data include only one observation on household earnings. The explanatory variables in their earnings equation are a set of demographic characteristics for each household. This technique explains less than 26 percent of log earnings. Their measure of permanent income is the predicted value of the earnings equation plus half the residual. They then estimated an equation like (3) below, with the log of wealth scaled by their estimate of permanent income as the dependent variable:

$$\text{(3)} \qquad \ln(\text{WEALTH/PERMANENT INCOME}) = a_1 + a_2\,\text{AGE} + a_3\,\text{AGE-SPLINED} + \ldots$$

This transformation is an attempt to correct for the productivity bias. As independent variables they included a spline on AGE, a farm dummy, the number unemployed, the number of adults, the number of persons with life insurance, and the log of social security and pension wealth, each scaled by their permanent-income measure. They also included a Mills ratio since they estimated the equation only for households with greater than $2,500 of wealth.

We are interested in investigating whether scaling wealth by permanent income makes cross-sectional age-wealth profiles similar in shape to age-wealth profiles based on cohort data. Our permanent-income measure, TREARNAT, for each household is better than that used by King and Dicks-Mireaux in that it is based on multiple observations of the respondents' earnings (see sec. 11.2). Since we are using all households in the 15-YEAR CRS sample, including those with negative and zero wealth, our dependent variable is simply WEALTH/TREARNAT rather than the logarithm of this ratio. Figures 11.41 and 11.42 contain plots of the 1966, 1971, 1976, and 1981 median WEALTH/TREARNAT - AGE profiles. Comparing these to figure 11.31, we see that the transformation has imparted a considerable upward slope to the 1966, 1971, and 1976 cross-sectional profiles and reversed the downward slope of the 1981 cross-sectional profile.

Are these transformed cross-sectional age-wealth profiles consistent with observed cohort age-wealth profiles? Regressions of WEALTH/TREARNAT on AGE and a constant are reported in table 11.15. All the cross-sectional regressions now have positive and statistically significant coefficients on age. As in the earlier regressions (table 11.13), the youngest ten cohorts have positively signed, statistically significant coefficients on AGE, while the oldest five cohorts have smaller, statistically insignificant coefficients on age. Again, this insignificance presumably reflects the flattening and decumulation of wealth at older ages

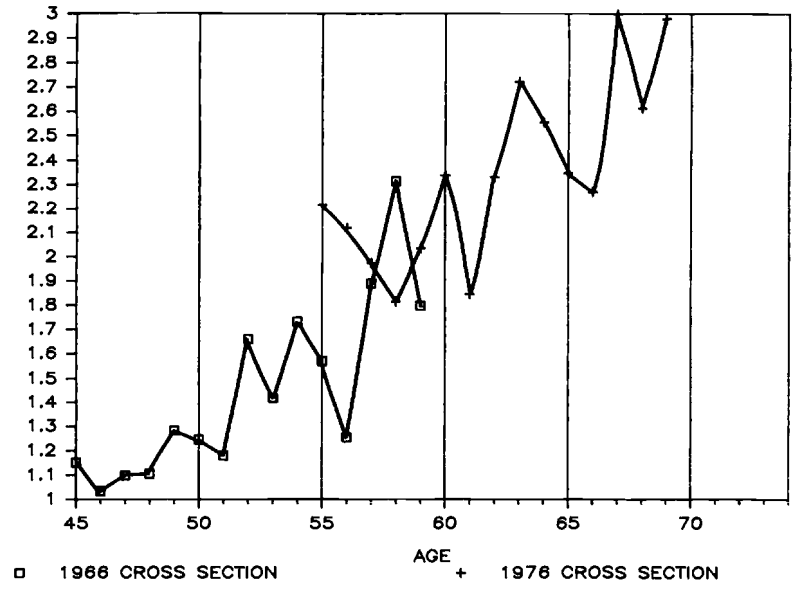

Fig. 11.41 Median WEALTH/TREARNAT—15-YEAR CRS sample

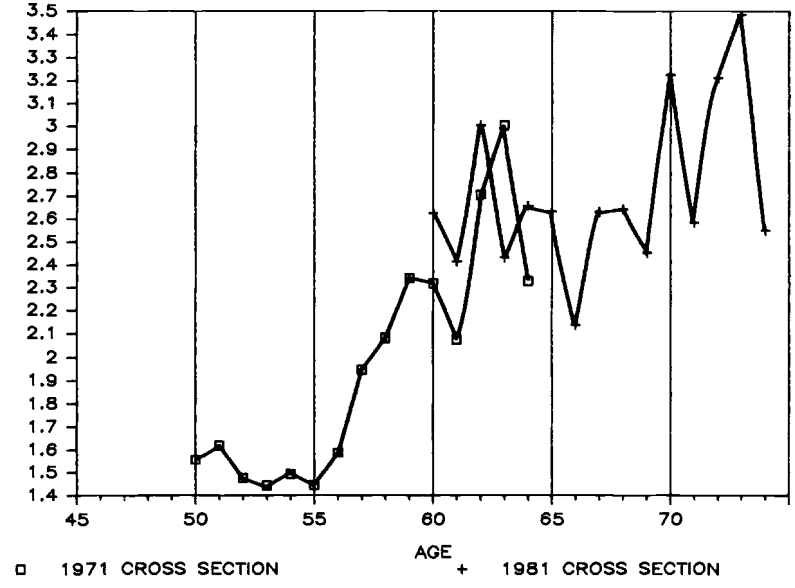

Fig. 11.42 Median WEALTH/TREARNAT—15-YEAR CRS sample

Table 11.15 **Regression Results, Dependent Variable WEALTH/TREARNAT: WEALTH/TREARNAT = b_0 + b_1 AGE**

Sample	$\hat{b}_0$	S.E.	$\hat{b}_1$	S.E.	$\bar{R}^2$	SSR	N
1966 cross section	−11.725	3.107	.291	.061	.0133	167,463	1,625
1969 cross section	−12.985	3.711	.303	.069	.0113	213,222	1,625
1971 cross section	−12.216	3.317	.281	.059	.0131	158,501	1,625
1976 cross section	−12.949	4.313	.282	.071	.0091	225,968	1,625
1981 cross section	−7.426	4.313	.182	.065	.0042	193,120	1,625
1921 cohort	−5.104	1.294	.150	.025	.0431	10,798	785
1920 cohort	−4.103	1.314	.123	.025	.0369	6,578	615
1919 cohort	−5.064	1.741	.152	.032	.0284	15,464	725
1918 cohort	−2.698	1.514	.094	.028	.0164	8,786	640
1917 cohort	−2.360	3.222	.103	.058	.0039	30,417	570
1916 cohort	−3.340	1.584	.107	.028	.0199	9,962	675
1915 cohort	−1.915	2.164	.089	.037	.0080	13,479	585
1914 cohort	−5.823	3.909	.172	.066	.0110	32,920	515
1913 cohort	−3.521	2.847	.122	.048	.0086	26,100	640
1912 cohort	−.945	2.116	.072	.035	.0068	7,674	475
1911 cohort	3.833	6.332	.027	.102	−.0022	54,502	430
1910 cohort	14.478	20.704	−.092	.330	−.0024	440,553	380
1909 cohort	−8.812	14.094	.245	.221	.0005	253,456	430
1908 cohort	−.115	4.093	.075	.063	.0012	15,332	370
1907 cohort	7.124	6.317	−.052	.096	−.0024	21,727	290

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: The underlying sample is the 15-YEAR CRS, the 1,691 respondents who provided both usable wealth and usable age data in each of the five surveys and, in addition, those for whom TREARNAT could be computed, resulting in a sample of 1,625. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. TREARNAT is the average of the respondent's after-tax wage, salary, self-employment, and farm income discounted to age sixty-two.

by these cohorts. Formal F-tests of whether the estimated cohort coefficients are statistically different from the coefficients estimated on each cross section are reported in table 11.16. The F-statistics are generally larger here than they are in table 11.14. The conclusion one draws as to whether the estimated cross-sectional age-wealth profiles are consistent with the estimated cohort age-wealth profiles again depends on which cross section and which cohort are compared. Rejections are obtained most frequently for the older and middle cohorts. The WEALTH/TREARNAT age-wealth profiles are most consistent with the rapid accumulation by the three youngest cohorts. Overall, these F-tests suggest that the correction is a failure. Age-wealth profiles estimated on transformed cross-sectional data are likely to be inconsistent with similar equations estimated on transformed cohort data.

Looking further at the table 11.15 regressions, one observes that the cross-sectional slope coefficients on AGE are all considerably larger

Table 11.16 ***F*-Tests of the Equality of Cross-sectional and Cohort Regression Coefficients, Dependent Variable WEALTH/TREARNAT WEALTH/TREARNAT = b_0 + b_1 AGE**

	F-Statistic		*F*-Statistic
1966 cross and:		1976 cross and:	
1921 cohort	2.919	1919 cohort	1.506
1920 cohort	5.128*	1918 cohort	2.084
1919 cohort	2.631	1917 cohort	1.408
1918 cohort	7.686*	1916 cohort	2.479
1917 cohort	3.013*	1915 cohort	1.923
1916 cohort	8.474*	1914 cohort	.992
1915 cohort	5.619*	1913 cohort	1.393
1914 cohort	1.471	1912 cohort	2.957
		1911 cohort	3.491*
1969 cross and:		1910 cohort	11.913*
1921 cohort	1.933	1909 cohort	2.788
1920 cohort	2.683	1908 cohort	1.766
1919 cohort	1.466	1907 cohort	5.734*
1918 cohort	4.879*		
1917 cohort	2.024	1981 cross and:	
1916 cohort	5.889*	1914 cohort	1.320
1915 cohort	3.962*	1913 cohort	.261
1914 cohort	.853	1912 cohort	.988
1913 cohort	3.485*	1911 cohort	3.445*
1912 cohort	5.447*	1910 cohort	9.803*
1911 cohort	2.501	1909 cohort	7.738*
		1908 cohort	.678
1971 cross and:		1907 cohort	3.113*
1921 cohort	1.630		
1920 cohort	2.044		
1919 cohort	1.322		
1918 cohort	4.118*		
1917 cohort	1.801		
1916 cohort	5.021*		
1915 cohort	3.347*		
1914 cohort	.640		
1913 cohort	2.500		
1912 cohort	5.098*		
1911 cohort	3.550*		
1910 cohort	10.893*		
1909 cohort	.951		

Source: Computed from the regression results in table 11.15.

Note: Critical *F*-Statistics: 2.99 (5 percent), 4.60 (1 percent). Degrees of freedom are 2 and 1,851 or greater.

*Statistically significant at the 5 percent level.

than the coefficients on AGE in the cohort regressions. This suggests that many of the F-test rejections result because the cross-sectional profiles are too steep. This steepness may be due to the fact that the differential mortality effect is still present in the cross-sectional profiles. Scaling wealth by permanent income is an attempt to correct for the productivity effect. It does nothing to correct for the fact that the median wealth of the older cohorts is biased upward by the poor dying young.

Mirer (1979) proposes another sort of adjustment that attempts to eliminate the productivity effect in a cross-sectional sample. He proposes to multiply each household's wealth (other than that of the youngest cohort) by a factor $(1 + g)^A$, where A is the difference between the cohort's age and the age of the youngest cohort. This is based on the assumption that, if income and hence "wealth grows at the rate g, then the typical profile of any given cohort is $(1 + g)$ times as high as that for the cohort which is one year older" (440). Mirer assumed that g was 2 percent per year. Transforming our data by the same 2 percent growth rate yields the cross-sectional age-wealth profiles for 1966, 1971, 1976, and 1981 plotted in figures 11.43 and 11.44. Comparing these to the unadjusted cross-sectional age-wealth profiles we examined earlier (fig. 11.31), one sees that the obvious occurs: the previously flat 1966 and 1971 profiles now slope up somewhat, the U-shaped 1976 profile

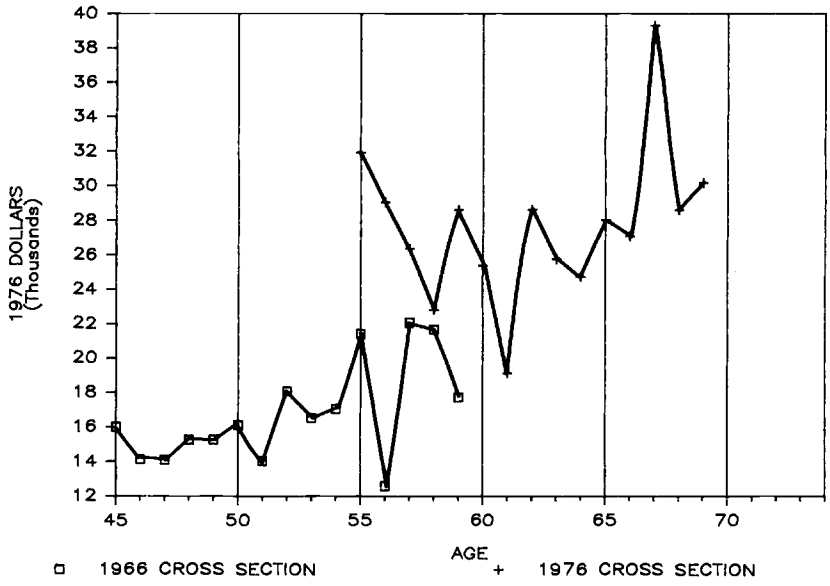

Fig. 11.43 Median TRANSFORMED WEALTH—15-YEAR CRS sample

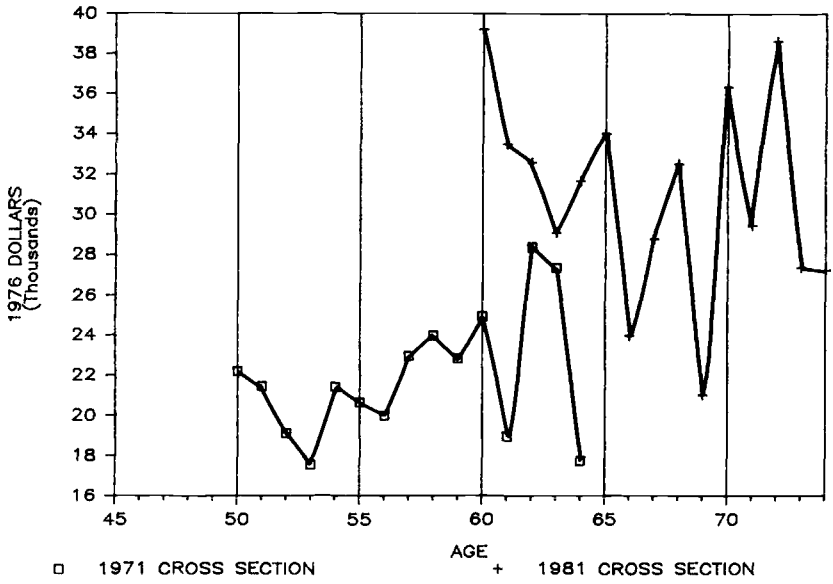

Fig. 11.44 Median TRANSFORMED WEALTH—15-YEAR CRS sample

is now less pronounced, and the previously downward-sloping 1981 profile has become much flatter.

Remembering the shapes of the age-wealth profiles reported for each cohort in figures 11.1–11.15, one might guess that the Mirer transformation makes the 1966 and 1971 cross-sectional profiles more consistent with the correct cohort age-wealth profiles. Formal F-tests based on regressions of TRANSFORMED WEALTH on AGE and a constant reported in table 11.17 confirm that this is true (results of F-tests are reported in table 11.18). On the other hand, the frequency of rejection of the hypothesis that the 1976 and 1981 cross-sectional coefficients are the same as the individual cohort coefficients is about the same. Hence, we conclude that the Mirer transformation might or might not transform a cross-sectional age-wealth profile into one that looks like a true longitudinal cohort profile. It all depends on which cross section one selects for comparison. It also heavily depends on the growth rate, g, assumed. Mirer reports that his results are quite sensitive to changes in g. Clearly, our conclusion as to the similarity of a transformed cross-sectional profile to a cohort profile also depends heavily on the growth rate assumed. With panel data, one can estimate the growth rate. With one cross section, as many researchers have had, the growth rate must be assumed. By varying the growth rate assumed, the researcher can considerably alter the age-wealth profile produced. Hence, it is our conclusion that this is an unreliable fixup method.

Table 11.17 **Regression Results, Dependent Variable TRANSFORMED WEALTH: TRANSFORMED WEALTH = $b_0 + b_1$ AGE**

Sample	$\hat{b}_0$	S.E.	$\hat{b}_1$	S.E.	$\bar{R}^2$	SSR (10^{12})	N
1966 cross section	−44,990	23,673	1,617	462	.0066	10.723	1,691
1969 cross section	−43,128	28,729	1,566	530	.0046	14.098	1,691
1971 cross section	−37,992	25,782	1,445	458	.0053	10.563	1,691
1976 cross section	7,455	31,410	722	513	.0006	13.228	1,691
1981 cross section	60,606	40,364	−26	610	−.0006	18.676	1,691
1921 cohort	−98,020	28,512	2,752	550	.0296	5.3114	790
1920 cohort	−61,952	31,301	1,948	592	.0148	4.234	655
1919 cohort	−55,806	36,948	1,855	686	.0084	7.4548	750
1918 cohort	−40,852	26,326	1,389	480	.0112	2.7817	655
1917 cohort	−22,775	24,232	1,099	434	.0094	1.7513	575
1916 cohort	−39,801	30,836	1,374	542	.008	3.7744	675
1915 cohort	−7,375	34,830	829	602	.0015	3.7353	605
1914 cohort	−43,200	31,363	1,437	533	.0115	2.3309	540
1913 cohort	−15,489	26,354	907	440	.0049	2.343	655
1912 cohort	−28,138	27,425	1,050	451	.0085	1.5164	515
1911 cohort	36,809	68,220	301	1,103	−.0021	6.4756	435
1910 cohort	1,765	63,569	708	1,012	−.0013	4.6029	400
1909 cohort	−63,441	45,208	1,785	708	.0117	2.9206	455
1908 cohort	886	43,949	624	678	−.0004	2.0669	400
1907 cohort	43,910	29,694	−201	451	−.0023	.7002	350

Source: Computed from the National Longitudinal Surveys of Mature Men.

Note: The underlying sample is the 15-YEAR CRS, the 1,691 respondents who provided both usable wealth and usable age data in each of the five surveys. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt. TRANSFORMED WEALTH is WEALTH multiplied by the factor 1.02^x, where x is the difference between the cohort's age and the age of the youngest cohort.

In summary, these fixups for the productivity effect appear to be unreliable. Also, they do not correct for the differential mortality effect. We conclude that there is no substitute for having panel data. Inferences from cross sections about time-series age-wealth profiles are unreliable.

11.5 Assessing the Bias in Household Portfolio Reallocation Over Time Based on Cross-sectional Data

Although far more studies have examined the relation between age and total wealth, the effect of age on the composition of household wealth has been the subject of a number of recent investigations (see, e.g., Kane 1980, 1985; Shorrocks 1982; and Dicks-Mireaux and King 1982). Because assets differ in the degree of liquidity and risk as well as other characteristics, one might hypothesize that a household's demand for particular classes of assets varies as the household ages. For

Table 11.18 ***F*-Tests of the Equality of Cross-sectional and Cohort Regression Coefficients, Dependent Variable TRANSFORMED WEALTH TRANSFORMED WEALTH = b_0 + b_1 AGE**

	F-Statistic		*F*-Statistic
1966 cross and:		1976 cross and:	
1921 cohort	2.265	1919 cohort	.907
1920 cohort	.078	1918 cohort	3.373*
1919 cohort	.150	1917 cohort	1.926
1918 cohort	2.471	1916 cohort	2.848
1917 cohort	1.304	1915 cohort	2.065
1916 cohort	2.080	1914 cohort	2.215
1915 cohort	1.388	1913 cohort	4.868*
1914 cohort	1.596	1912 cohort	7.327*
		1911 cohort	.345
1969 cross and:		1910 cohort	.632
1921 cohort	2.928	1909 cohort	1.240
1920 cohort	.191	1908 cohort	3.314*
1919 cohort	.356	1907 cohort	11.423*
1918 cohort	1.902		
1917 cohort	1.016	1981 cross and:	
1916 cohort	1.772	1914 cohort	4.120*
1915 cohort	1.186	1913 cohort	6.599*
1914 cohort	1.264	1912 cohort	8.516*
1913 cohort	3.172*	1911 cohort	.188
1912 cohort	5.161*	1910 cohort	2.192
1911 cohort	1.555	1909 cohort	3.468*
		1908 cohort	5.149*
1971 cross and:		1907 cohort	12.509*
1921 cohort	4.843*		
1920 cohort	.538		
1919 cohort	.923		
1918 cohort	1.485		
1917 cohort	.780		
1916 cohort	1.382		
1915 cohort	1.008		
1914 cohort	1.113		
1913 cohort	3.276*		
1912 cohort	5.853*		
1911 cohort	1.582		
1910 cohort	.452		
1909 cohort	.348		

Source: Computed from the regression results in table 11.17.

Note: Critical *F*-statistics: 2.99 (5 percent), 4.60 (1 percent). Degrees of freedom are 2 and 1,967 or greater.

*Statistically significant at the 5 percent level.

example, households might demand assets with more liquidity to finance consumption spending in the absence of labor income when they retire.

In regressions estimated using cross-sectional data, both Shorrocks (1982) and Dicks-Mireaux and King (1982) found a significant relation between age and portfolio shares for certain classes of household assets. Kane (1985) used three cross sections of households surveyed in 1962, 1970, and 1977 to look at the change in the percentage of wealth held in various asset categories by household type between survey dates. He made two types of comparisons: (1) between households in the same age class in different surveys (for example, 55 to 64 years old in both 1962 and 1970) and (2) between households in the same age cohort between surveys (e.g., fifty- to fifty-nine-year-olds in 1962 become fifty-eight- to sixty-seven-year-olds in 1970). On the basis of comparisons of the second type, he inferred that the rate of homeownership, in particular, at first increases with age and then declines after late middle age while mortgage debt declines "as a household ages" (Kane 1985, 134).

Just as in the case of the age-wealth profile, there is the potential for both a mortality effect and a productivity effect to cause cross-sectional inferences made about changes in the composition of household wealth as households age, such as those just described, to differ from those obtained using panel data. In addition, inferences about household portfolio reallocation as a household ages made by comparing mean portfolio shares of households in a cross section may be misleading because of cohort-specific asset preferences. Finally, comparison of mean household portfolio shares across surveys mixes up changes that are the result of portfolio reallocation by existing asset owners with those that result from net entry or exit into ownership of a particular type of asset. The remainder of this section discusses each of these potential biases in cross-sectional data.

The discussion of differences between portfolio shares based on cross-sectional versus longitudinal data which follows is subject to a number of caveats. The large dispersion around the means of the portfolio shares makes statistical tests of differences in the means across age classes unlikely to indicate statistically significant differences in portfolio shares. Our comparisons of differences in the reallocation of household portfolios between cross sections and panels of survivors might possibly be modified if this analysis were conducted using a finer breakdown of asset and liability categories or considered assets separately from liabilities, rather than using net values. Differences might also be perceptible if we controlled for differences in household wealth within age classes.

11.5.1 Differential Mortality and Productivity Effects

Differential mortality by wealth class (i.e., the poor die young) can lead to bias in using cross sections to make inferences about changes in the composition of an individual household's portfolio over time if holdings of certain types of assets are disproportionately concentrated in particular wealth classes. As we observed in table 11.3, the poor in our sample have a higher mortality rate than do the wealthier members of the sample. Table 11.19 reports the number of households by cohort in each percentile range of the distribution of 1966 cohort wealth that owned assets in each of four categories—HOUSE/FARM, BUSINESS/LAND, FINANCIAL, and STOCK/BOND—as a percentage of all households in that age-wealth class.

The only category of asset that is widely owned by households in all but the lowest deciles is HOUSE/FARM. Over 90 percent of the households above the fortieth percentile own HOUSE/FARM assets, on the average. Table 11.19 shows that a larger percentage of the wealthier

Table 11.19 Asset Ownership in 1966 by Percentile of 1966 Wealth Cohort

	Birth Year Cohort (fraction of initial cohort)				
Asset Type	1921	1920	1919	1918	1917
Percentile 1–20:					
HOUSE/FARM	.119	.060	.041	.063	.062
BUSINESS/LAND	.060	.045	.027	.016	.000
FINANCIAL	.343	.134	.178	.250	.200
STOCK/BOND	.030	.030	.000	.000	.000
Percentile 21–40:					
HOUSE/FARM	.809	.591	.563	.714	.766
BUSINESS/LAND	.147	.182	.197	.143	.141
FINANCIAL	.647	.606	.676	.524	.563
STOCK/BOND	.059	.045	.070	.079	.031
Percentile 41–60:					
HOUSE/FARM	.896	.894	.959	.905	.938
BUSINESS/LAND	.194	.106	.205	.302	.156
FINANCIAL	.701	.606	.699	.714	.656
STOCK/BOND	.075	.091	.096	.127	.094
Percentile 61–70:					
HOUSE/FARM	.971	.879	.917	.939	.906
BUSINESS/LAND	.265	.333	.167	.364	.188
FINANCIAL	.765	.848	.750	.636	.813
STOCK/BOND	.324	.182	.194	.091	.250

(continued)

Table 11.19 (continued)

	Birth Year Cohort (fraction of initial cohort)				
Asset Type	1921	1920	1919	1918	1917
Percentile 71–80:					
HOUSE/FARM	.933	.818	.972	.933	.938
BUSINESS/LAND	.267	.364	.306	.400	.438
FINANCIAL	.833	.909	.833	.867	.875
STOCK/BOND	.333	.152	.333	.200	.281
Percentile 81–90:					
HOUSE/FARM	.914	.970	.972	.906	.969
BUSINESS/LAND	.486	.545	.417	.563	.500
FINANCIAL	.857	.848	.750	.906	.906
STOCK/BOND	.429	.333	.139	.375	.406
Percentile 91–100:					
HOUSE/FARM	.906	.969	.941	1.000	.970
BUSINESS/LAND	.531	.781	.676	.633	.727
FINANCIAL	.938	.875	.971	.933	.939
STOCK/BOND	.563	.594	.588	.600	.515
Percentile 1–100:					
HOUSE/FARM	.736	.670	.691	.711	.730
BUSINESS/LAND	.234	.267	.240	.286	.245
FINANCIAL	.676	.615	.638	.629	.637
STOCK/BOND	.195	.158	.156	.165	.171
	1916	1915	1914	1913	1912
Percentile 1–20:					
HOUSE/FARM	.030	.085	.066	.046	.070
BUSINESS/LAND	.090	.000	.016	.046	.018
FINANCIAL	.179	.099	.115	.200	.193
STOCK/BOND	.000	.000	.000	.000	.000
Percentile 21–40:					
HOUSE/FARM	.652	.629	.677	.714	.696
BUSINESS/LAND	.121	.157	.129	.127	.071
FINANCIAL	.470	.600	.548	.587	.536
STOCK/BOND	.030	.029	.048	.063	.054
Percentile 41–60:					
HOUSE/FARM	.924	.957	.932	.873	.857
BUSINESS/LAND	.227	.271	.220	.222	.304
FINANCIAL	.667	.657	.627	.683	.607
STOCK/BOND	.121	.100	.119	.095	.107
Percentile 61–70:					
HOUSE/FARM	.971	.971	.966	.938	.963
BUSINESS/LAND	.353	.257	.172	.281	.296
FINANCIAL	.765	.629	.862	.906	.630
STOCK/BOND	.147	.114	.103	.281	.148

Table 11.19 (continued)

Asset Type	Birth Year Cohort (fraction of initial cohort)				
	1916	1915	1914	1913	1912
Percentile 71–80:					
HOUSE/FARM	.938	.943	.967	.967	.931
BUSINESS/LAND	.375	.543	.433	.233	.483
FINANCIAL	.906	.800	.933	.700	.862
STOCK/BOND	.375	.286	.267	.300	.103
Percentile 81–90:					
HOUSE/FARM	.970	.914	.967	1.000	.964
BUSINESS/LAND	.606	.429	.400	.484	.500
FINANCIAL	.848	.971	.900	.871	.929
STOCK/BOND	.424	.400	.400	.161	.250
Percentile 91–100:					
HOUSE/FARM	1.000	.941	.968	.933	.897
BUSINESS/LAND	.690	.618	.613	.733	.655
FINANCIAL	.931	.912	.903	.867	.862
STOCK/BOND	.690	.618	.484	.533	.379
Percentile 1–100:					
HOUSE/FARM	.703	.709	.719	.704	.699
BUSINESS/LAND	.284	.269	.235	.248	.273
FINANCIAL	.602	.600	.616	.624	.596
STOCK/BOND	.187	.166	.159	.156	.121

	1911	1910	1909	1908	1907	All
Percentile 1–20:						
HOUSE/FARM	.048	.037	.037	.058	.036	.058
BUSINESS/LAND	.016	.000	.037	.038	.000	.028
FINANCIAL	.032	.259	.241	.173	.073	.178
STOCK/BOND	.000	.000	.000	.000	.000	.004
Percentile 21–40:						
HOUSE/FARM	.525	.796	.679	.647	.633	.672
BUSINESS/LAND	.148	.167	.245	.118	.102	.147
FINANCIAL	.492	.500	.642	.471	.531	.563
STOCK/BOND	.049	.037	.057	.039	.061	.050
Percentile 41–60:						
HOUSE/FARM	.885	.906	.906	.885	.902	.909
BUSINESS/LAND	.295	.283	.264	.308	.255	.238
FINANCIAL	.738	.736	.679	.654	.588	.668
STOCK/BOND	.066	.132	.075	.096	.098	.099

(*continued*)

Table 11.19 (continued)

Asset Type	Cohort Birth Year (fraction of initial cohort)					
	1911	1910	1909	1908	1907	All
Percentile 61–70:						
HOUSE/FARM	.933	.852	.889	.917	1.000	.934
BUSINESS/LAND	.400	.333	.259	.417	.320	.290
FINANCIAL	.733	.667	.815	.708	.680	.749
STOCK/BOND	.167	.074	.148	.250	.080	.172
Percentile 71–80:						
HOUSE/FARM	.933	.963	.923	.880	.923	.931
BUSINESS/LAND	.433	.370	.308	.520	.385	.390
FINANCIAL	.700	.704	.808	.840	.731	.823
STOCK/BOND	.300	.222	.308	.240	.308	.268
Percentile 81–90:						
HOUSE/FARM	.967	1.000	.889	.963	.920	.952
BUSINESS/LAND	.500	.444	.667	.481	.560	.503
FINANCIAL	.800	.815	.889	.926	.800	.868
STOCK/BOND	.400	.222	.333	.593	.200	.338
Percentile 91–100:						
HOUSE/FARM	.933	1.000	.920	.920	.963	.951
BUSINESS/LAND	.633	.480	.560	.720	.667	.650
FINANCIAL	.967	.920	.920	.920	.852	.915
STOCK/BOND	.667	.240	.560	.520	.556	.545
Percentile 1–100:						
HOUSE/FARM	.664	.727	.683	.684	.686	.701
BUSINESS/LAND	.286	.251	.287	.305	.264	.264
FINANCIAL	.569	.607	.653	.598	.539	.615
STOCK/BOND	.174	.109	.158	.188	.147	.161

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of 4,546 households that provided valid age and wealth data in the 1966 survey. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm asssets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

households own BUSINESS/LAND, FINANCIAL, and STOCK/BOND assets than poorer households. In the case of STOCK/BOND, for example, almost no household in the poorest twenty percentiles owns STOCK/BOND, while over half the households in the top decile own stock. Thus, cross sections could give the impression that the share of

wealth in stock increases with age, whereas the larger proportion of stocks in the portfolio of older households could be the result of the fact that there are more rich households among the older households in a cross section. None of the studies mentioned above that found a relation between age and household portfolio composition made adjustments for differential mortality in cross sections.

Table 11.20 reports portfolio shares for households in the "usable data with reentry" sample (the total wealth of these households is reported in table 11.12). We grouped our households into three age classes spanning five cohorts in each survey. Comparisons of portfolios going down a column are the kind made when using a single cross section. Comparisons across columns are the kind made when comparing data from several cross sections surveyed at different times. Neither of these comparisons corrects for the effect of differential mortality. Table 11.21, on the other hand, reports portfolio shares for our 15-YEAR CRS sample and, therefore, corrects for the mortality bias since the portfolio shares across rows of table 11.21 are portfolio shares for the same households in each of the four surveys.[4]

Comparisons across rows of table 11.21 and comparable rows of table 11.20 illustrate the differential mortality bias in table 11.20. For example, in table 11.20, it appears as though the youngest cohort increased its HOUSE/FARM share by 2.2 percent from 1966 to 1981, whereas table 11.21 indicates that households in this cohort actually decreased their HOUSE/FARM shares by 2.7 percent. For the other two cohorts, table 11.20 shares overstate the amount of increase in the cohort's HOUSE/FARM share by 1.4 percent and 2.7 percent, respectively, over the 1966–81 period. Row 1 in table 11.20 suggests that the youngest cohort's share of STOCKS increased by 0.2 percent over the 1966–81 interval, whereas table 11.21 indicates that this cohort's share actually declined by 0.7 percent over the same period. Failure to correct cohort data for differential mortality clearly can lead to wrong conclusions about the reallocation of a cohort's portfolio over time.

Productivity has increased over time, making younger cohorts wealthier than older ones. As indicated in table 11.19, portfolio shares are influenced by the level of household wealth. Differences in cohort wealth resulting from the growth in productivity over time in the economy may, therefore, impart a bias in inferences made using changes in mean portfolio shares in a cross section to describe portfolio reallocation as a household ages. Comparing the rows and columns of table 11.21 illustrates the productivity bias inherent in cross-sectional data. For example, reading across the first row, one observes that the youngest cohort reduces its HOUSE/FARM share by 2.1 percent by the time it reaches age fifty-five to fifty-nine (in 1976). In contrast, reading

Table 11.20 **Mean Portfolio Shares by Age Group, Usable Data With Reentry Sample (fraction of WEALTH)**

	Survey Year			
Asset Type	1966	1971	1976	1981
	Age (N)			
	45–49 (1,509)	50–54 (1,228)	55–59 (1,047)	60–64 (891)
HOUSE/FARM	.630	.624	.645	.652
BUSINESS/LAND	.113	.134	.115	.108
FINANCIAL	.183	.161	.194	.170
STOCK/BOND	.033	.045	.034	.035
	50–54 (1,419)	55–59 (1,163)	60–64 (944)	65–69 (781)
HOUSE/FARM	.608	.610	.643	.672
BUSINESS/LAND	.111	.110	.096	.081
FINANCIAL	.151	.205	.191	.182
STOCK/BOND	.033	.037	.028	.028
	55–59 (1,194)	60–64 (885)	65–69 (691)	70–74 (571)
HOUSE/FARM	.600	.696	.631	.661
BUSINESS/LAND	.133	.101	.076	.062
FINANCIAL	.185	.153	.209	.203
STOCK/BOND	.035	.036	.036	.025

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of all respondents who provided valid age and wealth data in any survey whether or not they reported these data in prior or subsequent surveys. In the 1966, 1971, 1976, and 1981 surveys, which report zero WEALTH, 424, 379, 271, and 231 households are excluded, respectively. These calculations also exclude one respondent in 1971 who reported a 19,900 percent house share in 1971. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

down the first column suggests a much larger reduction (6.8 percent) in HOUSE/FARM share as individuals age from age forty-five to forty-nine to age fifty-five to fifty-nine. Likewise, reading across row 2 in table 11.21, one finds that, as this cohort aged from age fifty to fifty-four to age sixty to sixty-four, it increased its HOUSE/FARM share by 0.8 percent from 1966 to 1976, whereas reading down the second column (the 1971 cross section) suggests an average 2.9 percent reduction in HOUSE/FARM shares by households as they aged from age fifty to fifty-four to age sixty to sixty-four. What we observe here is

Table 11.21 **Mean Portfolio Shares by Age Group, 15-YEAR CRS Sample (fraction of WEALTH)**

Asset Type	Survey Year			
	1966	1971	1976	1981
	Age (*N*)			
	45–49 (684)	50–54 (684)	55–59 (684)	60–64 (684)
HOUSE/FARM	.586	.575	.565	.559
BUSINESS/LAND	.078	.106	.091	.083
FINANCIAL	.192	.15	.194	.168
STOCK/BOND	.036	.041	.031	.029
	50–54 (598)	55–59 (598)	60–64 (598)	65–69 (598)
HOUSE/FARM	.538	.531	.546	.588
BUSINESS/LAND	.092	.075	.086	.067
FINANCIAL	.162	.227	.181	.175
STOCK/BOND	.028	.029	.024	.019
	55–59 (408)	60–64 (408)	65–69 (408)	70–74 (408)
HOUSE/FARM	.518	.546	.540	.552
BUSINESS/LAND	.110	.101	.070	.055
FINANCIAL	.159	.181	.184	.207
STOCK/BOND	.034	.030	.026	.015

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of the 1,691 respondents who provided valid age and wealth data in each of the five surveys. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

clearly a productivity bias in the cross-sectional data. Productivity and home ownership have risen over time, so, when we read down the column, we are observing the portfolio shares of older (poorer) cohorts who own less housing wealth.

11.5.2 Cohort Effect

In addition to the effect of differential mortality, cohort-specific asset preferences may cause cross-sectional inferences to differ from those made using panel data. Macroeconomic events, such as depressions, inflations, and wars, occurred at different stages of the life cycle for each cohort. To the extent that these macroeconomic events influenced

the asset preferences of cohorts, changes in the composition of household wealth between households of different ages in a cross section reflect differences between the cohorts rather than life-cycle differences in wealth composition. For example, members of one cohort may not increase the share of stock in their portfolios as they age between forty-five and fifty-five years old because members of this cohort lived through the stock market crash of 1929, while members of another cohort may increase the share of stock in their portfolios as they age between forty-five and fifty-five years old because the stock market offered them a profitable return on their investments.

Kane's (1985) comparison of households in different cohorts at the same age in different surveys addresses this issue. Differential mortality is not an issue in these comparisons since households are compared at the same age and, thus, all have survived to that point. Table 11.22 makes the same type of comparison using households in our "usable data with reentry" sample. The portfolio shares in this table are the same as those in table 11.20, except that the portfolio shares of each (five-year) cohort in successive surveys are shifted down one row. As we read across a row in table 11.22 with the cohorts arranged in this manner, we observe different cohorts passing through the same age classes. All three of our cohorts are observed when they are aged fifty-five to fifty-nine and sixty to sixty-four. Two of our cohorts are observed when they are aged fifty to fifty-four and sixty-five to sixty-nine. Comparisons of the portfolio shares held by each of the cohorts in the same age interval provide information about cohort-specific asset preferences. Inspection of the means across cohorts does not reveal any systematic differences. The lack of any conclusive evidence of cohort-specific asset references may be the result of the narrow range of cohorts for which we have data.

Table 11.22 **Comparison of Mean Portfolio Shares of Different Cohorts at the Same Age (fraction of WEALTH)**

	Survey Year			
Asset Type	1966	1971	1976	1981
	Age (*N*)			
	45–59 (1,509)			
HOUSE/FARM	.63			
BUSINESS/LAND	.113			
FINANCIAL	.183			
STOCK/BOND	.033			

Table 11.22 (continued)

Asset Type	Survey Year 1966	1971	1976	1981
	50–54 (1,419)	50–54 (1,228)		
HOUSE/FARM	.608	.624		
BUSINESS/LAND	.111	.134		
FINANCIAL	.151	.161		
STOCK/BOND	.033	.045		
	55–59 (1,194)	55–59 (1,163)	55–59 (1,047)	
HOUSE/FARM	.6	.61	.645	
BUSINESS/LAND	.133	.11	.115	
FINANCIAL	.185	.205	.194	
STOCK/BOND	.035	.037	.034	
		60–64 (885)	60–64 (944)	60–64 (891)
HOUSE/FARM		.696	.643	.652
BUSINESS/LAND		.101	.096	.108
FINANCIAL		.153	.191	.17
STOCK/BOND		.036	.028	.035
			65–69 (691)	65–69 (781)
HOUSE/FARM			.631	.672
BUSINESS/LAND			.076	.081
FINANCIAL			.209	.182
STOCK/BOND			.036	.028
				70–74 (571)
HOUSE/FARM				.661
BUSINESS/LAND				.062
FINANCIAL				.203
STOCK/BOND				.025

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of all respondents who provided valid age and wealth data in any survey whether or not they reported these data in prior or subsequent surveys. In the 1966, 1971, 1976, and 1981 surveys, 424, 379, 271, and 231 households, respectively, which report zero WEALTH are excluded. These calculations also exclude one respondent in 1971 who reported a 19,900 percent house share in 1971. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

11.5.3 Ownership Effect

Cross-sectional inferences of changes in portfolio composition over time can also be misleading for a reason that is not tied to aging but that might be termed an ownership effect. Changes in the mean portfolio share of an age class between surveys can be the result of existing asset owners altering the shares they hold or the result of changes in the number of asset owners. Comparisons between cross sections do not allow one to distinguish between these two possibilities. With panel data, however, we can differentiate between these effects.

Tables 11.23–11.25 report the mean and median values of portfolio shares for the four types of assets categories for households in the 15-YEAR CRS sample. Each table compares the portfolio shares in surveys five years apart. Table 11.23, for example, reports portfolio shares from the 1966 and 1971 surveys. The top-most set of shares is calculated for all households. These are the type of portfolio shares that could be calculated using two cross sections, but corrected for mortality bias, since all the households in this sample survived until 1981. It would also be possible to report these shares by cohort and, therefore, control for cohort-specific asset preferences. Since our previous analysis of this issue did not indicate that there was a systematic difference in asset preferences among these cohorts, we have not conducted this type of analysis. We have reported both the mean and the median portfolio shares to illustrate the point that the holding of certain assets such as STOCK/BOND and BUSINESS/LAND is highly concentrated; the medians for these shares, representing the holdings of the "representative" household, are therefore zero.

The set of portfolio shares at the bottom of tables 11.23–11.25 is like those that could be obtained from two cross sections for those households in each survey that held each asset type. When making inferences concerning changes in the means and medians of these portfolios, one cannot tell whether the mean, for example, went up because existing owners of the asset increased the relative share of the asset in their portfolios or whether more households took a position in the asset or whether both events contributed to the change.

Using panel data, however, we can separate the role of each of these effects. The second set of portfolio shares in tables 11.23–11.25 is for those households that owned assets of the type specified in both of the surveys being compared. Changes in these portfolio shares between surveys indicate how existing owners of the asset type rearranged their holdings of this asset. The third set of portfolio shares is for those households that owned the asset in the initial survey but sold off or by some other means completely moved out of the particular asset type. These shares indicate the relative size of the asset in the leavers portfolio. The next-to-bottom set of portfolio shares is for those households

Table 11.23 **Comparison of Mean and Median Household Portfolio Shares in 1966 and 1971, 15-YEAR CRS Sample (fraction of WEALTH)**

	1966			1971		
Asset Type	Mean	Median	*N*	Mean	Median	*N*
All households:						
HOUSE/FARM	.553	.625	1,690	.553	.625	1,690
BUSINESS/LAND	.094	.000	1,690	.091	.000	1,690
FINANCIAL	.184	.035	1,690	.174	.056	1,690
STOCK/BOND	.034	.000	1,690	.033	.000	1,690
Households with asset in 1966 and 1971:						
HOUSE/FARM	.772	.857	1,126	.754	.814	1,126
BUSINESS/LAND	.333	.388	287	.379	.343	287
FINANCIAL	.255	.125	924	.266	.149	924
STOCK/BOND	.205	.136	207	.205	.116	207
Households with asset in 1966 only:						
HOUSE/FARM	1.090	1.000	59	.000	.000	59
BUSINESS/LAND	.417	.259	139	.000	.000	139
FINANCIAL	.322	.058	180	.000	.000	180
STOCK/BOND	.143	.051	93	.000	.000	93
Households with asset in 1971 only:						
HOUSE/FARM	.000	.000	93	.910	.974	93
BUSINESS/LAND	.000	.000	148	.335	.231	148
FINANCIAL	.000	.000	209	.315	.115	209
STOCK/BOND	.000	.000	137	.114	.056	137
Households with asset in 1966 or 1971:						
HOUSE/FARM	.788	.861	1,185	.766	.822	1,219
BUSINESS/LAND	.360	.364	426	.364	.310	435
FINANCIAL	.266	.121	1,104	.275	.143	1,133
STOCK/BOND	.186	.109	300	.169	.086	344

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of the 1,691 respondents who provided valid age and wealth data in each of the five surveys. These calculations exclude one respondent in 1971 who reported a 19,900 percent house share in 1971. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

Table 11.24 **Comparison of Mean and Median Household Portfolio Shares in 1971 and 1976, 15-YEAR CRS Sample (fraction of WEALTH)**

	1971			1976		
Asset Type	Mean	Median	*N*	Mean	Median	*N*
All households:						
HOUSE/FARM	.553	.625	1,690	.552	.619	1,690
BUSINESS/LAND	.094	.000	1,690	.084	.000	1,690
FINANCIAL	.184	.056	1,690	.187	.063	1,690
STOCK/BOND	.034	.000	1,690	.027	.000	1,690
Households with asset in 1971 and 1976:						
HOUSE/FARM	.761	.816	1,172	.744	.813	1,172
BUSINESS/LAND	.355	.323	307	.328	.293	307
FINANCIAL	.273	.150	942	.290	.185	942
STOCK/BOND	.191	.099	231	.154	.080	231
Households with asset in 1971 only:						
HOUSE/FARM	.891	.984	47	.000	.000	47
BUSINESS/LAND	.386	.286	128	.000	.000	128
FINANCIAL	.287	.091	191	.000	.000	191
STOCK/BOND	.125	.056	113	.000	.000	113
Households with asset in 1976 only:						
HOUSE/FARM	.000	.000	75	.813	.883	75
BUSINESS/LAND	.000	.000	122	.341	.207	122
FINANCIAL	.000	.000	197	.222	.084	197
STOCK/BOND	.000	.000	88	.117	.061	88
Households with asset in 1971 or 1976:						
HOUSE/FARM	.766	.882	1,219	.748	.817	1,247
BUSINESS/LAND	.364	.310	435	.331	.265	429
FINANCIAL	.275	.143	1,133	.278	.169	1,139
STOCK/BOND	.169	.086	344	.144	.074	319

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of the 1,691 respondents who provided valid age and wealth data in each of the five surveys. These calculations exclude one respondent in 1971 who reported a 19,900 percent house share in 1971. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm assets, net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

Table 11.25 **Comparison of Mean and Median Household Portfolio Shares in 1976 and 1981, 15-YEAR CRS Sample (fraction of WEALTH)**

	1976			1981		
Asset Type	Mean	Median	*N*	Mean	Median	*N*
All households:						
HOUSE/FARM	.552	.619	1,690	.568	.667	1,690
BUSINESS/LAND	.084	.000	1,690	.071	.000	1,690
FINANCIAL	.187	.063	1,690	.180	.039	1,690
STOCK/BOND	.027	.000	1,690	.022	.000	1,690
Households with asset in 1976 and 1981:						
HOUSE/FARM	.747	.812	1,199	.765	.833	1,199
BUSINESS/LAND	.319	.283	288	.322	.270	288
FINANCIAL	.287	.182	900	.273	.169	900
STOCK/BOND	.161	.085	202	.156	.071	202
Households with asset in 1976 only:						
HOUSE/FARM	.818	.881	48	.000	.000	48
BUSINESS/LAND	.357	.251	141	.000	.000	141
FINANCIAL	.242	.119	239	.000	.000	239
STOCK/BOND	.115	.051	117	.000	.000	117
Households with asset in 1981 only:						
HOUSE/FARM	.000	.000	56	.756	.964	56
BUSINESS/LAND	.000	.000	86	.312	.226	86
FINANCIAL	.000	.000	162	.361	.132	162
STOCK/BOND	.000	.000	66	.093	.043	66
Households with asset in 1976 or 1981:						
HOUSE/FARM	.748	.817	1,247	.764	.846	1,255
BUSINESS/LAND	.331	.265	429	.320	.256	374
FINANCIAL	.278	.169	1,139	.287	.167	1,062
STOCK/BOND	.144	.074	319	.140	.066	268

Source: Computed from the National Longitudinal Surveys of Older Men.

Note: Sample consists of the 1,691 respondents who provided valid age and wealth data in each of the five surveys. These calculations exclude one respondent in 1971 who reported a 19,900 percent house share in 1971. HOUSE/FARM is the sum of net residential housing and net farm assets. BUSINESS/LAND is the sum of net business and net investment real estate assets. FINANCIAL is the sum of deposits in financial institutions, U.S. savings bonds, and personal loans made to others. STOCK/BOND is the value of stocks and bonds owned. WEALTH is the sum of net residential assets, net farm assets net business assets, net investment real estate assets, deposits in financial institutions, U.S. savings bonds, holdings of stocks and bonds, and personal loans made to others less unsecured personal debt.

that did not have a position in a particular asset in the initial survey but moved into the asset by the later survey. These portfolio shares indicate the size of the holdings of the new asset relative to the total household portfolio of the new entrants.

Comparisons between rows of tables 11.23–11.25 indicate that in many cases mean portfolio shares of all households between cross sections increase (decrease) and the mean shares of existing owners (reported in the second row) also increase (decrease). In some instances, however, there are differences between the change in mean shares of all households and the change in the mean of existing asset owners. In these cases, inferences about household portfolio reallocation as households age based on cross-sectional data are misleading.

For example, on the basis of the change in portfolio shares of those owning HOUSE/FARM in each survey (row 2), the inference could be drawn that households on the average reduced the share of HOUSE/FARM in their portfolio between 1966 and 1971 and between 1971 and 1976 but increased the HOUSE/FARM share between 1976 and 1981. However, row 1 for all households does not show decumulation between 1966 and 1976 because, in comparing row 4 to row 3, we see that more households entered the housing market than left in each of the first two five-year intervals compared. The same sort of comparisons regarding the portfolio share of STOCK/BOND indicate that, while the mean portfolio share of all households owning stock in both 1971 and 1976 trended downward, there was net new entry in this period. Between 1976 and 1981, the mean portfolio share across all households (row 1) in BUSINESS/LAND decreased; however, existing owners of these types of assets increased the share of these holdings in their portfolios. The all-household mean BUSINESS/LAND SHARE decreased on the average because there was a net exodus of households holding positions in these assets.

Overall, these examples illustrate that changes over time in the mean holdings of an asset by all households do not necessarily reflect reallocations in individual portfolios. There does not appear to be a reliable way to predict under what circumstances the mean change in the portfolio shares in the cross section will differ from the mean change in the portfolio shares of existing asset owners. Consequently, using cross-sectional data to make inferences regarding household portfolio reallocations over time is a very unreliable procedure.

11.6 Summary and Conclusions

In this paper, we have used panel data to assess the biases that are present in cross-sectional inferences of life-cycle changes in the level and composition of household wealth. We first constructed cross-

sectional estimates of individual household age-wealth profiles and portfolio shares from five NLS surveys considered separately. We then compared these to time-series observations of age-wealth profiles for the fifteen cohorts sampled in the NLS panel. These comparisons of the cross-sectional estimates and the cohort time-series observations provided evidence of the biases present in making inferences about changes in individual household wealth and portfolio composition over time on the basis of cross sections.

Graphic comparisons of cohort age-wealth profiles with the cross-sectional profiles indicated that cross-sectional profiles are seriously biased by the presence of productivity and differential mortality effects. The productivity effect imparts a downward bias to cross-sectional age-wealth profiles, while the differential mortality effect produces an upward bias. The productivity effect appears to outweigh the differential mortality effect in our sample. Consequently, the cross-sectional profiles suggest that there is less accumulation as people age than a true time-series-based profile would show.

Comparisons of simple regression equation estimates of age-wealth profiles estimated using cross-sectional data with those estimated using cohort data suggest that whether cross-sectional age-wealth profiles are consistent with cohort age-wealth profiles depends on which cross section and which cohort one compares. There do not appear to be any systematic differences between cross-sectional and cohort age-wealth profiles that could be used to correct the cross-sectional profiles.

We evaluated two procedures previously used to correct cross-sectional profiles for the productivity bias. One method, used by King and Dicks-Mireaux, scales household wealth by a measure of permanent income. The other method, used by Mirer, scales wealth by a cohort growth-rate factor. Comparisons of cross-sectional age-wealth profiles adjusted in these ways with actual cohort profiles indicate that these fixups are unreliable and, in addition, do not correct for the differential mortality effect.

On balance, our evidence with regard to the bias in using cross-sectional data to make inferences about the reallocation of household portfolios over time suggests that time-series inferences based on cross sections can be misleading. Differential mortality does appear to impart bias into comparisons of changes in portfolio shares between the same age class viewed in successive cross sections relative to changes in portfolio shares of the same members of an age class over time. An examination of how wealth composition varies with age for cohorts versus cross sections suggested that the cross sections suffer from a productivity bias, which can lead to incorrect inferences about how wealth composition changes with age. We found little evidence of differences in cohort-specific asset preferences for the ages covered by

our sample. Data covering a greater number of cohorts might alter this conclusion. Finally, we found evidence that comparisons of sample means between cross sections do not necessarily reflect changes that result from the reallocation of portfolio shares by existing asset owners because the change in means between cross-sections is affected by changes that reflect net entry or exit of households from positions in certain assets.

Given the existence of the substantial biases in cross-sectional age-wealth profiles that we have documented here and the lack of any reliable methods to correct these biases in cross sections, we must conclude that there are no substitutes for panel data in the analysis of household life-cycle wealth accumulation and portfolio allocation. By providing observations on the same households over time, panel data avoid the productivity bias found in cross-sectional data. By limiting members of a cohort sample to those who survived over the entire time period under analysis, one can also correct for the differential mortality effect present in cross sections. However, since attrition occurs in panel data for reasons other than death, one should also correct for this differential attrition bias.

On the basis of the evidence presented in this paper, we believe it would be appropriate to stamp a warning label on research that uses cross-sectional data to make inferences about changes in the behavior of household wealth over time much as the surgeon general puts a warning on cigarette packages. Our suggested warning label would read, "Inferences based on cross-sectional data concerning the behavior of household wealth or the composition of household wealth over time probably are biased by the presence of differential mortality effects, cohort-specific productivity effects, or differential asset-ownership effects." While we recommend the use of panel surveys since these data enable researchers to avoid the biases mentioned above, we also urge users to make adjustments in longitudinal samples to avoid bias resulting from differential rates of sample attrition.

Notes

1. Since the age-wealth profile of men who provide usable data every year may differ from those who do not, this technique may impart selectivity bias into our estimates (under the assumption that the objective of the research is to make inferences about all surviving men, not just those who were willing to be good reporters).

2. To the extent that any sample is representative of the living members of the underlying population, following mean values indicates whether the cohort

is saving or dissaving in the aggregate—dollar weighting vs. people weighting (as in the median).

3. An important aside that is revealed by tables 11.7–11.9 is that, when the mean wealth changes, the median does not necessarily change in the same direction. Note that, even when the mean or median wealth of a cohort decreases, this does not imply that the wealth of a majority of the households in the cohort necessarily also decreased. The number of households in each cohort who dissaved is noted in the last column of tables 11.7–11.9.

4. As mentioned before, the 15-YEAR CRS sample excludes many of the very rich and very poor households. Just as in the case of age-wealth profiles, to the extent that portfolio reallocation is related to wealth, the pattern of portfolio reallocation observed in the 15-YEAR CRS sample may differ from the pattern observed in larger samples such as those in the 5-YEAR CRS, which include more wealthy and poor households.

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Comment B. K. Atrostic

This is a meticulously researched and thoroughly documented paper. The research uses longitudinal data to explore the empirical importance of theoretical biases—differential mortality, attrition bias, and differential productivity—on the shape of age-wealth profiles. A parallel analysis examines the related question of whether these potential biases are empirically important in measuring changes in portfolio composition over time. The empirical importance of any of these biases in measures of age-wealth and portfolio profiles and what their net effect might be have been subjects of debate and objects of a series of proposed "fixups." Notably lacking in this literature, however, were empirical estimates either of total bias or of the bias contributed by any of these factors separately. Filling this gap is a major contribution of this research. This research also provides important information for public policy: current pension and retirement policies, for example, are based in large measure on stylized facts of life-cycle wealth derived from aggregated data, most commonly from the aggregated cross-sectional data that are subject to the potential biases.

The longitudinal nature of the data Jianakoplos, Menchik, and Irvine choose for this research permits direct comparisons of age-wealth and portfolio profiles created by treating the data first as a series of repeated cross-sections and then as a longitudinal data file. These comparisons

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show that each potential source of bias in repeated cross-sectional data matters for modeling the life-cycle path of wealth and portfolio composition. Moreover, for neither age-wealth profiles nor portfolio composition are the differences between cross-sectional and longitudinal changes predictable. This is an important empirical result because the adjustments made by the standard fixups are valid only if the direction and magnitude of the biases can be predicted. If the research shows that the biases vary in ways that are difficult to predict, the usefulness of the standard fixups and, thereby, the usefulness of repeated cross-sectional data are limited. The authors apply the standard fixups to the aggregated cross-sectional data and compare the resulting life-cycle profiles to those computed from aggregated longitudinal data. They find the fixed up repeated cross-sectional approximations to be poor fits to longitudinal profiles and to be sensitive to assumptions (starting year, growth rates, etc.) required by the various fixups. They suggest, only partly in jest, that research using cross-sectional data to make inferences about changes in the behavior of household wealth over time should bear a warning label.

Jianakoplos, Menchik, and Irvine in some sense erect a straw man—the robustness of aggregate cross-sectional data for drawing inferences about individual behavior over time—and, predictably, demolish it. It is well understood that for other life-cycle behaviors, such as earnings and labor force participation, aggregated cross-sectional data can yield misleading inferences about the time path of individual behavior. Finding the same lack of correspondence between aggregate cross-sectional and longitudinal wealth measures should come as no surprise. It is, however, a considerable inconvenience for wealth research. Unlike labor force and demographic data that often are collected in monthly or annual cross sections and for which many longitudinal surveys exist, wealth data are collected infrequently and rarely in longitudinal form or over a long time period.[1]

The authors' complete reporting of data, data-handling techniques, and necessary caveats about limitations of their techniques and data make their conclusions more compelling. They do more than assert that they examined the data carefully. What they did and why it mattered are explained in detail. Their description of how they reviewed responses for consistency in creating their *own* wealth measure from data, rather than relying on the measure created by the National Longitudinal Survey (NLS), is especially illuminating. By reviewing the data, the authors found miscodes serious enough to require the Census Bureau to recode some observations. Additional discussion of the differences between the authors' measure and the NLS measure, perhaps replicating one basic table using the NLS measure, would help readers evaluate the importance of careful data review.

The amount of miscoding the authors found in a widely used data set (albeit in a little-used variable) properly makes the reader uneasy about miscodes in other data sets. Indeed, Avery, Elliehausen, and Kennickell 1987 and McNeil and Lamas (chap. 9, in this volume) both note miscode problems in wealth measures in the Survey of Consumer Finances and the Survey of Income and Program Participation (SIPP), respectively, but imply that miscodes are relatively random and therefore cancel out, at least in cross-sectional comparisons. Readers made skeptical by Jianakoplos, Menchik, and Irvine are unlikely to be reassured because they generally have no way to assess the quality of data handling in empirical work. The tendency of research presentations to focus on theory, econometrics, and results (together with space constraints) leaves little room for data description. But careful documentation of data development is especially important in reporting results derived from data that are proprietary, little known, little known in a new application area, or too complicated and expensive for others to replicate readily. The NLS data are complex, and the wealth measures are less well known and less used than the labor force data. By providing nearly all the summary data available to them, the authors permit their readers to form independent conclusions. Sufficient information is given in the twenty-five tables to reconstruct any of the forty-four figures. The tables themselves always include sample sizes and summary statistics (e.g., standard errors of coefficients and of the equations, and sample sizes, in tables reporting regressions) or sample statistics (mean, median, and three percentile values, in tables reporting various cohort wealth measures), allowing the reader to evaluate conclusions in the text. Work as careful and clear as this is as valuable as it is rare.[2]

The authors convincingly argue that wealth research cannot be based on aggregated, repeated cross-sectional data alone: the fixups do not work.[3] At the same time, McNeil and Lamas demonstrate that collecting longitudinal wealth data is not in itself a panacea because annual longitudinal wealth data from the SIPP are dominated by nonsampling and nonresponse errors. How best to develop the data needed for life-cycle wealth research from existing and future sources clearly demands further research on issues such as sample design, imputation procedures, the timing of surveys, and nonresponse adjustments.

But that research, while vital, is unlikely to resolve the dilemma the authors raise because that dilemma arises as much from uses of data as from sources. Their evaluation compares the life-cycle profiles generated by alternative aggregations of their longitudinal microdata to profiles generated by aggregated cross-sectional data. The more promising use of longitudinal microdata, however (and the more powerful

argument for incurring its costs), is in estimating carefully specified models of individual life-cycle behavior to test alternative theories. How the authors would resolve the dilemma they raise is unclear only because the wealth data so painstakingly computed and reviewed are not used in this paper to model a microdata-based paradigm of life-cycle wealth and portfolio behavior. That work clearly is next on the authors' research agenda, however, and there is every reason to await the results expectantly.

Notes

1. The Panel Survey of Income Dynamics does contain longitudinal wealth data over a relatively lengthy period (Curtin, Juster, and Morgan, chap. 10, in this volume). The Survey of Consumer Finances (described in Avery, Elliehausen, and Kennickell 1987) and the Survey of Income and Program Participation (described in McNeil and Lamas, chap. 9, in this volume), while rich in wealth data, have each just produced their first pair of longitudinal wealth observations, over three- and one-year intervals, respectively.

The National Longitudinal Survey of older men is an exception particularly well suited to the research questions raised in this study. During the fifteen-year survey period, the individuals' ages correspond closely to those for which the "hump" in the hypothesized life-cycle age-wealth profile should be most pronounced because the rate of growth of earnings should have slowed at the same time that a spending down of wealth due to retirement (in the absence of strong bequest or precautionary motives) would have begun. The fifteen-year age range represented by individuals in each survey and the fifteen-year observation period on each individual provide the authors with sufficient information to explore cohort effects and differential mortality, sample attrition, and productivity effects.

2. The absence in general of such clear explication of data sources and data handling has led to eroding credibility for empirical work. This erosion prompted the *American Economic Review* to publish "Replication in Empirical Economics" (Dewald, Thursby, and Anderson 1986) as the lead article in the September 1986 issue and to preface the article with the following statement of editorial policy: "It is the policy of the *American Economic Review* to publish papers only where the data used in the analysis are clearly and precisely documented, are readily available to any researcher for purposes of replication, and where details of the computations sufficient to permit replication are provided" (v).

3. All sources appear to agree about the usefulness, quality, and consistency of national wealth estimates based on alternative cross-sectional wealth data sources (see Avery, Elliehausen, and Kennickell 1987; Curtin, Juster, and Morgan, chap. 10, in this volume; and McNeil and Lamas, chap. 9, in this volume). For alternative views about the usefulness of SIPP cross-sectional data for various policy purposes, see Curtin, Juster, and Morgan (chap. 10, in this volume) and Radner (chap. 12, in this volume).

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