NBER WORKING PAPER SERIES

LIFE-CYCLES IN INCOME AND WEALTH

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Working Paper No. 1146

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge MA 02138

June 1983

NBER Working Paper #1146
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ABSTRACT

Using panel data for a sample of households in Utah from 1850 to 1900 we find income and wealth age profiles that are concave and that have a peak within the age distribution of the relevant sample. This finding holds for cross sections at five-year intervals, for pooled cross section time-series data, for cohort data, for households when individual differences are accounted for with a variance-components model and when we account for vintage measured as duration within the economy.

We also find a relationship between age-income and age-wealth profiles that is consistent with a life-cycle model of consumption given a concave and peaked age-income profile: households accumulate and then begin to draw down wealth holdings, the age-wealth profile consistently peaks at an age later than the age-income profile for the same households, and the age-wealth profile for young households is considerably steeper than is the age-income profile.

We have data, then, that in many respects appear to be capable of having been generated by individual decisions in a contemporary economy. This is particularly interesting since the data were, in fact, generated within a very different economy, one where formal education, on-the-job training and labor-leisure choices were probably considerably less important than in a contemporary economy.

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It is generally accepted that individual decisions and, hence, observed outcomes at any moment, reflect time horizons that extend beyond the present. Indeed, the notion that there are life-cycle considerations involved in particular decisions and, consequently, in observable outcomes has influenced much of modern economics, both micro and macro. Given a patterned life-cycle in income, specific patterns of consumption, human and nonhuman wealth accumulation, demographic choice, mobility, etc., may follow. Two general questions are of interest: Why should there be a patterned life-cycle in income? And second, are the patterns in consumption, wealth accumulation, demographic choice, mobility, etc., consistent with a given life-cycle pattern in income and optimizing individual or household behavior?

In this paper we touch on elements of both of these questions. We first use data from an extended panel (Utah, from 1850 to 1900) to demonstrate the robustness and pervasive nature of stylized life-cycle patterns in important economic variables across time, economic development and, to some degree, across cultures. This descriptive section is followed by a consideration of the consistency of wealth accumulation patterns with given life-cycle patterns in income. We then consider the consistency of our data with the leading models of life-cycle income patterns. Finally, we consider the role of rents in life-cycle behavior. While we hope that the results are interesting in their own right, our interests go beyond the particular issues of this paper to the nature of the mechanism that generates the distribution of economic rewards. We turn to this larger issue in a concluding section.

I

While notions of life-cycle individual behavior pervasively influence much thinking about economic issues, the evidence for life-cycle patterns in important economic attributes of households is less pervasive and, in many respects, ambiguous. There are a fairly large number of studies of age-income patterns, over cross sections, with cohort data and more recently using panels of individual data. These include descriptive efforts and more narrowly focused uses of particular data sets to test models of age-income profiles, usually some variant of a human capital model. The latter group of studies usually assumes that there is an age-income pattern that needs explanation and rationalization. Studies seeking evidence of such patterns include those of Swedish data (Creedy, Hart, Jonsson, and Klevmarken, 1980), British data (Creedy and Hart, 1979; Lydall, 1955), Dutch data (Fase, 1970), and U.S. data (Fisher, 1952; Miller, 1964; Heckman, 1976; Weiss and Lillard, 1978). There are fewer contemporary studies of age-wealth patterns but more of an historical nature. These include those for British data (Lydall, 1955; Shorrocks, 1975), and U.S. data (Jones, 1980; Soltow, 1975; Atack and Bateman, 1980; Mirer, 1979; Smith, 1975; Lampman, 1962; Projector and Weiss, 1966). Only a handful of studies consider age-income and age-wealth profiles for the same group of individuals (Lydall, 1955; King and Dicks-Mireaux, 1981; Projector and Weiss, 1966), and we know of only one study of age-income and age-consumption patterns for the same group of individuals (Ghez, 1975).

Three separate effects are potentially present in observations that combine age with either wealth or income observations for an individual: the effects of age, vintage, and economic growth. The accumulation and

depreciation of human capital, the aging process with its physical and mental effects and the choices the individuals make about labor and leisure occurring over time are, hence, age related and may impart a life-cycle to the income profile. A desire to smooth consumption relative to fluctuations in income, from any of these sources or from transitory stochastic shocks, and bequest motives may then create an age-wealth profile. Unfortunately, these effects of age upon income and wealth are often confounded by the two other effects, vintage and economic growth. There is a vintage effect in that each cohort starts from a different economic position due to the context of the economy when that cohort enters the labor force as well as the state of knowledge when a particular cohort concentrates on the accumulation of human capital. Finally, there is an economic growth effect that may shift the age-income profile upward. Since age, vintage and growth are all related to the passage of time, they are often tightly intermingled and it is difficult to isolate the effect of age alone upon income and wealth independent of growth and vintage.

Cross-sectional observations on age and income confound the effects of age and of vintage since age and vintage tend to be closely correlated. Typically, cross-sectional age-income profiles display a hump shape with a peak in income in middle age. The 1947 cross section described by Fisher (1952) shows a peak income in the 35-44 age group, although the mean income of the 45-64 age group is nearly as high. A 1950 cross section drawn from census data by Miller (1965) peaks in the 45-54 age group while a cross section drawn from the 1960 census peaks earlier with the 35-44 age group. Lydall (1955) finds similar patterns for Great Britain. Household income peaks in the 35-44 age group for a

survey of British households in 1953. Creedy et al. (1981) find a cross-sectional peak in the forties in the Swedish data.

Earnings as well as income display a concave age profile. Ruggles and Ruggles (1977) show peaks in earnings from age 40 to 50 for cross-sectional earnings profiles from 1957 to 1969 using a sample drawn from Social Security records. Lydall (1955) finds an earlier earnings peak for British workers, the peak occurring in the 35-44 age group. For estimated relationships (usually using a quadratic in age and log earnings) using males from the 1960 census the peak occurs near age 50.

Heckman (1976) estimates an equation with data for males with some college education which suggests that the age-earnings profile of educated or skilled workers may peak somewhat later. Lydall (1955) finds this to be the case for British workers.

This is certainly not an exhaustive survey but it gives the flavor of the results in a number of studies and strongly suggests a concave relationship between income or earnings and age that has a peak for ages well within the range of ages of the samples and population from which they are drawn. As we detail later, comparable inferences can be made from our data.

While there is a fairly consistent set of results for the age-income profile, particularly concerning concavity in age, the cross-sectional relationship between age and wealth is less clear. In general, historical cross sections of wealth yield peaked concave profiles while cross sections that utilize more contemporary data generate more ambiguous results. Alice H. Jones (1981) found both net worth and total wealth peaked in the 55-64 age group for New England in 1774. Similar results were found for the Middle Colonies. Soltow

(1975) does not find a peak for wealth in his study of wealth drawn from the mid-nineteenth century censuses. However, Atack and Bateman (1980) do find an age peak in a sample of data drawn from the same censuses. Total wealth appears to peak at about 55 years of age in their data with the peak implied by their regressions (which include other variables besides age and age squared such as race, occupation and birthplace) at about 63 years of age. Lydall (1955) finds that total wealth peaks in the 45-54 age group for British households in 1953 while net worth peaks in the 55-64 age group. Most studies utilizing contemporary data do not find either concavity in age nor a peak in wealth holdings for any age within the age spread for the sample or population. Lampman (1962) finds that the size of estates increases with age for males who are among the top wealth holders. Smith (1975) allows for age categories in a regression analysis of log wealth for household estates in Washington, D.C. in 1967. He finds that there is an increasing relationship between age and wealth even beyond age 80. Projector and Weiss (1966), who have data on both income and wealth, regress log wealth on log income, age, employment, and inheritance status and find wealth to be positively correlated with age when these other independent variables are included. The simple mean of wealth, however, peaks within the 55-64 age group.

Again, while not an exhaustive survey of age-wealth studies, these studies do give a flavor of the results--the evidence for a concave relationship in age and for one that peaks is mixed. Failure to at least find concavity is a puzzle. The continuous rise in wealth with age does not fit well with life-cycle theories of consumption and savings nor does it fit well with the evidence on age-income profiles. (With regards to life-cycle consumption theories, Ghez finds that

consumption and income cross between age 50 and 60 which would suggest declining wealth beyond that age.) Extending the considerations to include bequest motives and risk aversion in the uncertainty about the age of death do not really make a monotonic relationship between wealth and age plausible. It is of some comfort that the adjustment for differential mortality rates by Shorrocks (1975) and an examination of the ratio of wealth to permanent income by King and Dicks-Mireaux (1981) reintroduces a peaked, concave age-wealth profile in contemporary data. As noted below, the Utah data display a clearly concave age-wealth relationship for cross-sectional samples from 1850, 1860, and 1870. For the latter two cross sections there is a peak in wealth holdings for ages between 55 and 60 which is essentially independent of the specification. This result is consistent with most historical samples. It is possible that the differences between historical and contemporary age-wealth patterns is attributable to the failure to account for the rise of pensions as an important component in contemporary wealth holdings.

There is now a widespread dissatisfaction with the usage of cross-sectional data for analysis of the sort we have discussed due to the confounding of age and vintage or cohort effects. This dissatisfaction has led to the belief that the age-wealth or age-income relationships should be studied from the vantage point of cohorts rather than cross sections. However, the supposed dominance of cohort data for these purposes is not clear--cohort profiles confound the effects of age and economic growth. As Weiss and Lillard (1979) point out, there is a fundamental identification problem in disentangling the effects of age, vintage, and growth. Cohort data are not immune to the problem. While

one would like to observe the effect of age independent of both vintage or cohort effects and growth effects, neither cross section nor cohort data allow for these observations. However, cohort data do allow the researcher to examine lifetime earnings or income. There have been some more sophisticated attempts to disentangle the effects of age, time, and vintage using these kinds of data, notably those studies of Creedy et al. (1979), Weiss and Lillard (1979), and Fase (1970).

Cohort data seem to support the proposition that income or earnings rise with age but at a declining rate of growth. Ruggles and Ruggles (1977) found that cohorts born successively later have steeper earnings profiles for the 1957-69 period. Miller found that incomes grew with age in cohorts observed between 1950 and 1960 except for the group who were 55-64 in 1950 and therefore beyond retirement in 1960. He also found that the rate of growth of income was higher for the younger age groups. Lansing and Sonquist also examine the average (median in their case) income by cohort and its changes over time. They generally find income rising with age but possibly peaking around sixty. They find the rate of growth of income to be most rapid during the younger years. For example, college graduates who were about 21 in 1950 had a fourfold increase in real income from 1949 to 1965 while college graduates who were 40 in 1950 had less than a twofold increase over the same period. Fase (1970) estimates the cohort peak to be around 50 years of age for professions such as physician and lawyer for a no-growth regime.

Cohort data on wealth show little evidence of concavity and peaking of wealth in the life-cycle and thus do little to dispel the behavioral puzzle noted earlier. Shorrocks (1975) finds that wealth increases with age throughout the life span until an adjustment is made for the

differential mortality rates by wealth level. Mirer (1979) finds that wealth increases with age. Lansing and Sonquist (1969), however, find that wealth increases only through age 60 to 65 and then declines. It should be reemphasized that cohort measures of income and wealth confound growth effects with age effects. There is no particular reason to accept that a particular cohort age-income profile reveals more about the life-cycle than a particular cross-sectional profile since each mixes the effect of age with another effect--either growth or vintage.

We have alluded to age-income and age-wealth patterns in the Utah data. We now consider those patterns more carefully and systematically.

We observe income and a set of household characteristics for a series of cross sections extending over a 45-year period, 1855 to 1900. In Table I.1 we provide the descriptive statistics for each of these cross sections together with those cross sections where we observe wealth and a set of household characteristics for a 20-year period from 1850 to 1870.

In addition to wealth holdings and income estimates in selected years, we also observe the birth year of the individual and hence age (A); year of entrance into the Utah economy or the first vital statistic in Utah (T); birthplace, which we group into U.S. born (USB) and foreign born (FB); place of residence for each wealth or income observation which we have categorized into three geographical rings around Salt Lake City (U, R1, R2); occupations in the four census years from 1850 to 1880 which we first coded in a manner roughly consistent with modern census classifications and then grouped into five categories: farm (F), crafts (C), service (S), common labor (L), and white-collar or professional (W).

From Table I.1 it is clear that our data (about 10,000 households are included) were drawn so that the average age increases with time, from 36 to 67 over the 45-year period. Over half of the sample is foreign born, reflecting the strong immigrant nature of the economy during this period. Well over half of the sample is farming with 15 to 20 percent employed in the crafts and 13 to 15 percent generally employed as common laborers. White-collar and service occupations split the remaining share. We have created a panel of individuals from these cross sections by linking individuals across the time intervals between observations. This desire to create a panel is one of the reasons the average age increases with time since we were interested in individuals we could trace for extended periods. We have, however, sampled younger individuals in the later years so that we can observe new household formations. In addition, we have linked individuals into families, creating a large sample of brothers and fathers/sons/grandsons. This linking effort also brings some younger individuals into the sample in the later years.

Do these data exhibit a concave age-income profile or any other systematic relationship between age and income? We allow for a patterned relationship by including a quadratic in age in a series of cross-sectional regressions where we also account for the effect of other household characteristics, birthplace, area of current residence, occupation held at last available census, time of entry into the economy or "vintage" and, in alternative specifications, log wealth from the last available census. Table I.2 provides estimates of this simple model for each of the cross sections from 1855 to 1900. We will

consider the effects of household characteristics later (Section IV) and presently focus on the age-income relationship.

For these particular data, each cross section exhibits a pronounced concavity in age. Indeed, in each cross section over nearly one-half century, income peaks and then declines at an age well within the range of ages in the population. This peak occurs between the late thirties and mid-forties for each of these cross sections but does vary with the cross section. However, there does not appear to be a systematic relationship between the peak age and the maturing of the economy or the average age of the samples, which, as indicated in Table I.1, increases substantially over the half-century.

We have selected a sample from 1870 for whom we observe both income and wealth estimates in that year together with a set of household characteristics. From that sample, we have drawn a subsample of households whom we observe in each of the five-year intervals from 1870 to 1900. This allows us to compare age-income profiles within a cross section and within a pooled longitudinal data set. Table I.3 provides estimates of the 1870 cross-sectional age-income relationship for a variety of specifications. We note a pronounced, concave age-income profile which peaks at an age within the spread of ages in the sample and which is mostly unaffected by other household characteristics. On the other hand, while the profile is pronounced and significant, it does not account for much of the variance in log income over the sample. Accounting for "vintage" in the sense of duration within the economy doubles the explained variance and allowing for the effect of wealth holdings on income more than doubles the explained variance again.

The effect of wealth on income ought to reflect the return on wealth (since we are measuring income and not earnings) unless holding wealth provides substantial advantages in the exploiting of one's skills that are related to earnings. Because of the age-income profile, the "return" on wealth varies, but at the point of means it is about 10 percent. We do not know what the effective market return for capital was in this economy, but the estimate is certainly within a reasonable range, by modern standards, and we conclude that the effect of wealth was primarily reflected in a stream of returns it provided and not in some additional advantage it provided for exploiting one's human capital.

In Table I.4 we provide pooled cross-sectional, time-series estimates for a sample of individuals from the 1870 data whom we observe for the following 30 years. The age-income profile does not explain much of the variance in the log of incomes--nothing does--but in the longitudinal data it does explain a good deal more than in the cross section. However, again we find a pronounced life-cycle pattern across time for a single group and not simply across ages at a single moment of time. Indeed, the profiles are quite similar when we account for the year-specific effects, with peaks at similar ages for comparable specifications in the cross section. The implied return on wealth is again about 10 percent.

The longitudinal data, while having a narrower age spread than the cross section, still have a substantial spread in ages. It is possible then that we are simply replicating the cross section in each year and the age effect can be accounted for by the cross section. Unfortunately, specific age cohorts are quite small in these data. As

an alternative, we have created a synthetic panel of data, selecting all those between 18 and 24 (the average age in each "generation" is about 21) in each of the years we have a cross section--1855, 61, 66, 70, 75, 80--and following them for either 20 or 30 years. We pool these "generations" into a panel of 20-year olds and then account for the generation from which they come (but we have not controlled for the variance of the year of observation). As Table I.5 illustrates, we again observe a pronounced age-income profile for these 20-year olds over the next 20 or 30 years of their lives. The effects of the other household characteristics have very much the same pattern as that observed for either the cross sectional or panel of households. The "generation" dummies factor out growth and price change effects. Since prices were likely either stable or declining slightly over much of this period, the coefficients indicate substantial growth or vintage effects for the generations. But since these have been accounted for, they cannot be contributing to the age-income profile. For these data, however, the peak in the age-income profile occurs at a younger age than for either the cross-sectional or panel data. The ages are within the range of the cross-sectional estimates over the entire period.

As we noted earlier, there is an identification problem which will be reflected in an errors-in-variables bias in <u>both</u> the cross-sectional and panel estimates. This makes the factoring out of the real age-income relationship problematic. However, we have found a relationship, concave in shape with a peak age between the late thirties and mid-forties for 1) a variety of cross sections, 2) a panel of households observed over a 30-year period, and 3) a synthetic panel of 20-year olds observed over either a 20- or 30-year period. In addition,

we have found that other household characteristics, while important in explaining incomes or households, do not much affect the age-income profile. When such characteristics do affect the profile, it remains concave.

II

The economy from which our data are drawn appears to generate a pronounced age-income profile. Are individuals making optimal choices about wealth holdings given these profiles? To answer that question we would have to have data on individual inheritance, intended bequests, and consumption patterns. Since these data are not available (and unlikely, except perhaps for the first, to become available) we can only consider the consistency of the observed behavior with the usually held notions about life-cycle behavior. That is, we concern ourselves with the consistency of aggregate patterns of wealth holdings with the observed age-income profile.

If, as it is generally assumed, individuals have lifetime horizons because they desire to smooth consumption relative to the given income life-cycle, then, assuming that there is no net borrowing over an individual's lifetime, 1) there should be a corresponding "life-cycle" pattern in nonhuman wealth holdings that 2) is concave, 3) peaks at an age later than that of the corresponding individual income life-cycle, and 4) has a steeper slope than the income life-cycle over the range where the income life-cycle is increasing. We illustrate possible life-cycles in income and consumption and the implied life-cycle in wealth in Figure II.1.

It is possible, depending upon the consumption path, for wealth accumulation to increase at an increasing rate at least until the peak

of the income path at which point it would assume a concave pattern. Sizeable bequests (comparable, of course, to net lifetime borrowing) may substantially alter the suggested implications noted above. For example, with a large bequest, it would be possible for an individual to consume more at each point in life than income would warrant, thus continuously drawing down the stock of wealth from the day of the bequest. A bequest motive would also alter the implied accumulation path given the age-income profile. However, in this case we would expect that the age-wealth pattern would be concave and if it peaked, to peak at some age later than that of the age-income pattern. Both would be consistent with the implications suggested above so that it is not possible to test whether there is a bequest motive. It is possible that bequest is the only motive for accumulation; if so, there need not be consistency between income and wealth profiles since wealth is not being used as a buffer against income variance. Thus, bequests or bequest motives could lead to any pattern of wealth accumulation as could individual behavior that was not concerned with lifetime horizons. However, if we find in our data the elements suggested above, the consistency of age-income and age-wealth profiles would provide support for the life-cycle model of behavior and is, essentially, a weak test for the life-cycle theory.

We impose essentially the same specification on log wealth as we did on log income, allowing for concavity in age with a quadratic term. We also allow for individual characteristics to affect wealth holdings. We presently have three cross sections for wealth, those drawn from the 1850, 60, and 70 federal censuses. The data for 1850 only include estimates of real wealth holdings, while those for 1860 and 1870 include

separate estimates of real and personal wealth. We use the log of total wealth for those two years. Results are summarized in Table II.1.

We do find an age-wealth profile in each of these cross sections. For each, the profile is concave in age. Moreover, for each, the profile peaks at an age within the range of ages within the particular sample used--from 47 in 1850 to 50 in 1870.

In Table II.2 we present estimates for a subsample of those we observe in 1870 for whom we observe both income and wealth in 1870. The data on income and wealth are drawn, however, from separate sources, Mormon Church financial records and U.S. censuses, respectively.

We find, again, age-wealth profiles that are concave in age with peaks at ages within the range of ages in the sample. Excluding or including household characteristics does not change either of these observations although different specifications change somewhat the slope of the aggregate profile. Moreover, we find that the age-income profile, in every case, peaks at an earlier age than that for the age-wealth profile. Usually the age-income profile peaks in the mid-forties while the age-wealth profile peaks in the mid-fifties. Since this is not an economy with mandated or socially imposed retirement, these relationships cannot result from externally imposed decisions. Finally, we note that the implied increment in wealth from aging one year is substantially above the implied increment in income in dollar terms. Thus, the wealth profile is steeper in dollars than the income profile over the range of increasing income with age. Each of these observations indicates a remarkable consistency of these data with individual behavior suggested by a life-cycle hypothesis for savings and consumption, given that an individual confronts an age-income profile.

Moreover, there is nothing in the specification that forced these results. That is, it is possible for the quadratic in age and wealth to both peak earlier and have a flatter slope or to peak later and have a flatter slope than the age-income profile even with wealth holdings being substantially greater than income (the ratio obviously varies with age in this economy, but the mean ratio is about 4 to 1).

III

We have ignored to this point individual characteristics other than age. It is clear from the reported regressions that these characteristics also affect individual income and individual wealth holdings at least in cross sections. Thus one's place of birth, place of residence and occupation all matter for both income and wealth positions. Those living in rural areas have lower incomes and lower wealth holdings than do comparable individuals living in the urban county. This is also true for those employed in craft, service or common labor occupations (when compared with farmers or with white-collar professional workers). The pattern, both in terms of the sign of the coefficient and the relative size of the elasticity, is essentially the same for cross-sectional, pooled and cohort data although the magnitude of the effects changes with the particular data set. The pattern of signs is also the same for log income as it is for log wealth. The major exception is for the foreign born--foreign born have higher incomes than U.S. born but they have lower nonhuman wealth holdings.

Duration within the economy or "vintage" is an important determinant of both income and wealth positions. We have found no evidence of concavity or convexity in income or wealth with respect to

duration. Nor have we found evidence of interaction between time of entry and age. We find that duration simply shifts the age-income or age-wealth profile upward so that those with more experience in the economy have higher incomes and higher wealth holdings than those with less experience. When an estimate of nonhuman wealth is included in the specification, the effect of "vintage" decreases sharply. In the cross-section regression (Table I.3) it falls from .035 to .019; in the pooled regression (Table I.4) it falls from .025 to 0. This suggests that much of the effect of this type of "vintage" is being capitalized and may simply represent a classical Ricardian land rent.

While there are some simultaneity problems that we have not yet adequately handled, it does appear that individual characteristics have independent effects on income and wealth. Thus, when income is included in the log wealth specification (Table II.2) the explained variance increases and some of the parameter estimates decrease, but we continue to observe individual characteristics affecting wealth independent of their effects on income. Conversely, when we include the log of wealth in a log income specification, the elasticities generally decline, indicating that the effects of household characteristics are capitalized, but they do not decline to zero, indicating that the effects are not fully capitalized in nonhuman wealth but retain independent effects on the income stream of an individual.

IV

We observe life-cycle age-income profiles and corresponding consistent life-cycle age-wealth profiles. We also observe that individual characteristics affect both income flows and wealth holdings. Are these effects compensatory or do they represent ability, land or

other rents? Compensatory income flows, where lower incomes early in the life-cycle are compensated for by higher incomes later, leaving the discounted income streams unaffected for differing life-cycle paths, are suggested by human capital models of behavior, particularly on-the-job training models. Indeed, the existence of compensatory flows has come to be viewed as a test of the on-the-job training models (c.f Hause, 1972; or Lillard and Weiss, 1979)--the so-called "slope-intercept" tests. While these models are sometimes viewed as rationalizations of age-income life-cycle profiles, the slope-intercept tests only examine systematic individual deviations from a given age-income profile. We return to this observation in our concluding remarks.

We have considered systematic deviations from a given age-income profile for groups of individuals sharing common characteristics by considering the interaction of some characteristics, specifically occupation, with age. We have considered specifications that would allow for differences in intercepts and slopes, thereby allowing for compensatory differences for these aggregate groups. For log income we find no important interaction effects. We cannot reject the hypothesis that individuals with different occupations share a common slope in the age-income profiles. At least at the aggregate level, the only differences between individuals with different occupations are differences in intercepts--the life-cycle itself appears, on this evidence, not to systematically differ across characteristics. For log wealth, as indicated in Table II.2, the interaction effects are significant so long as the intercepts are constrained to be the same at age 0. This is consistent with intercept differences for income but only if consumption does not change by the same amount as the income

"rent" for the characteristic. On the other hand, the specifications in columns 6 and 7 of Table II.2 do not explain any more of the variance in log wealth than do those in columns 5 and 8 of the same table. There are slight differences, apparently, in the shapes of the age-wealth profiles with characteristic differences but these differences are not substantial.

Thus, we find no evidence of compensating differentials in age-income profiles by characteristic groupings and no particularly strong evidence for compensating differentials in age-wealth profiles for the same characteristic groupings. Hence, occupational choices as a whole do not compensate. Instead, we find something closer to a rent model for choices of this sort. It may be that compensating differences are always individually determined and hence masked by aggregation and the consideration of mean differences by occupational groups.

We have allowed for individual differences by using a very simple variance components specification where individual differences are allowed intercepts alone. That is,

$$\log y_{it} = a + b\, A_{it} - c\, A_{it}^2 + u_{it} \qquad \begin{matrix} i = 1, N \text{ individuals} \\ t = 1, T \text{ time periods} \end{matrix}$$

$$\text{where } u_{it} = g_i + e_{it} + x_t$$

Estimating this variance components specification over the pooled data from 1870 to 1900 we obtain

$$\log y_{it} = .0985\, A_{it} - .00093\, A_{it}^2 + .12\, D75 + .11\, D80 + .20\, D85 + .13\, D90 - .38\, D95 - .18\, D00$$

This is a so-called "fixed effects" model for both individuals and years. Again we find, allowing for individual differences, a pronounced age-income profile that is concave with a peak age of 53. Hence, the

observed life-cycle is not the outcome of aggregation over individual differences but is independent of those differences.

V Concluding Remarks

We have data that in many respects appear to be capable of having been generated by individual decisions within a contemporary economy. This is particularly so for the concavity and peak in the age-income profile and perhaps for the age-wealth profile as well. It is also apparent in the consistency between the actual age-wealth profile and that implied by the observed age-income profile together with some reasonable assumptions about consumption patterns and bequest motives. Yet these data are the observable outcomes of individual behavior within a quite different socioeconomic environment, one that would hardly be considered contemporary. In some ways, the consistency across a century is comforting for our notions about the meaning of the underlying "economic" behavior. But in other ways, the consistency ought to be a bit discomforting. After all, this is an economy where formal education mattered very little if at all. It is also an economy where on-the-job training was considerably less important than such training is in modern industrial, technologically complex economies. Finally, labor-leisure choices were less influential since this was a poor economy. Why then do we observe an age-income profile? Moreover, why do we observe an age-income profile that has such a contemporary appearance where, for contemporary data, individual choices about education, on-the-job training, and labor-leisure substitution are of much more importance?

We also find that the age-income life-cycle profile persists when consideration is taken of individual differences, observed and unobserved. Everyone appears to share a common age effect although

individual differences certainly lead to different incomes. Perhaps the importance of biology has been underestimated. That is, it may be that the age-income profile is primarily driven by depreciation that is purely biological, having to do with a declining ability to work intensely, physically or mentally. If this speculation were an accurate description of the underlying cause of the age-income profile it has strong implications for a society, like our contemporary one, where there is a shift in the demographic profile of the population toward an older population. It is possible, for example, for the decline in productivity, which is after all some weighted average of the productivity of the individuals of the society, to be explained by the demographic shift which increases the weights for segments of the population with lower productivity (because of vintage effects) and declining productivity (because of age depreciation effects that are reflected in the age-income profile).

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TABLE I.1
Sample Characteristics, Cross Section

	Year											
	55	57	59	61	66	70	75	80	85	90	95	00
$\bar{LNY}$	6.23	6.20	5.98	6.02	5.86	5.49	5.51	5.61	5.80	5.74	5.15	5.31
VAR(LNY)	.40	.53	.77	.93	1.40	1.53	1.71	1.46	1.24	1.40	1.69	1.60
$\bar{A}$	36.40	36.20	38.60	38.90	41.20	43.50	47.30	51.40	55.20	58.60	62.60	67.10
$\bar{T}$	2.07	3.07	4.74	6.10	9.04	11.80	15.90	20.10	24.80	21.20	33.80	39.00
%FB	37	44	45	46	52	53	53	56	57	57	58	57
%R1	47	47	36	38	32	24	32	27	34	33	27	30
%R2	21	19	24	34	49	64	52	57	52	51	57	54
%W	4	3	4	4	4	5	5.4	6	7	7	7	7
%C	12	17	19	18	17	17	17	19	18	17	17	16
%S	.3	1	1.3	2	2	4	5	5	6	5.4	5	6
%L	13	16	16	15	16	14	13	13	13	13	14	13
%F	71	62	59	61	61	60	60	57	56	58	56	58
#	1540	2642	1961	3388	3763	3865	3643	3373	3140	2446	2244	2019

See note on Table II.1 for variable descriptions.

TABLE I.1 (continued)

Sample Characteristics, Cross Sections, W=0 Included

	Year		
	50	60	70
$\overline{LNW}$	6.40	6.11	5.98
VAR(LNW)	7.68	3.42	6.16
$\overline{A}$	35.70	38.70	44.10
$\overline{T}$	.25	4.67	11.40
%FB	22	49	53
%R1	23	25	32
%R2	48	55	47
%W	6	3.5	6
%C	18	19	18
%S	1	2.4	7
%L	9	19	15
%F	65	56	54
#	1002	3738	4782

See note on Table II.1.

TABLE I.2
Cross Section Regressions, Log Income as Dependent Variance

	Year										
	55	55	57	57	59	59	61	61	66	66	70	70
Peak Age	40		44	44	39	39	41	39	43	40	46.4	44
A_2	.036		.056	.047	.071	.072	.066	.047	.057	.051	.051	.036
A^2	-.00044		-.00064	-.00054	-.0009	-.00092	-.00078	-.0006	-.00067	-.00064	-.00055	-.00041
T	.019		.036	.10	.036	.02	.04	.02	.036	.007	.035	.02
FB	.009		-.04	.03	.0007	.03	.007	.10	.13	.28	.14	.14
R1	-.15		-.13	-.02	-.11	-.05	-.23	-.19	-.60	-.42	-.52	-.35
R2	.11		.16	.21	.14	.10	.16	.17	.27	-.20	-.40	-.16
W	-.16		.004	-.009	.10	-.03	-.007	-.03	.25	.18	.26	.03
C	.05		-.12	-.28	-.05	-.09	-.09	-.06	-.16	-.03	-.22	-.11
S	--		-.31	-.35	-.02	-.46	-.03	.09	-.20	.30	-.49	-.31
L	-.11		-.31	-.61	-.38	-.66	-.27	-.14	-.32	-.07	-.38	-.17
LN(TW)				.11		.09		.25		.34		.36

Note:
All coefficients are significant at at least the .05 level except those with an "-" by the coefficient.

- A_2: Age
- A^2: Age·Age
- T: Time in Utah
- FB: Foreign Birth
- R1: Residence in Rural Counties Nearest to Salt Lake City
- R2: Residence in Other Rural Counties
- W: Whitecollar/Professional
- C: Craft
- S: Service
- L: Labor

Regression is Normalized on U.S. Born Farmers Living in Salt Lake County

#	1540	2642	620	1961	474	3388	2266	3763	2030	3865	2503
C_2	5.57	5.11	4.29	4.66	4.29	4.61	3.46	4.73	2.79	4.40	2.25
R^2	.06	.13	.12	.11	.13	.09	.12	.08	.12	.09	.15

TABLE I.2 (continued)
Cross Section Regressions, Log Income as Dependent Variable

	Year											
	75	75	80	80	85	85	90	90	95	95	00	00
Peak Age	47	44	41	39	36	41	42	33	34	37	--	--
A	.081	.065	.064	.07	.05	.08	.05	.04	.027-	.033-	-.03-	.05-
A^2	-.00086	-.00074	-.00079	-.0009	-.0007	-.00098	-.0006	-.0006	-.0004-	-.00045	-.0003	-.00052
T	.03	.02	.02	.008-	.018	.002-	.017	.006-	.01	-.007-	.01	-.06-
FB	.20	.25	.14	.18	.09	.07-	.14	.21	.15	.25	.04-	.06-
R1	-.40	-.34	-.47	-.26	-.44	-.41	-.56	-.41	-.47	-.39	-.47	-.34
R2	-.37	-.26	-.69	-.52	-.39	-.28	-.71	-.44	-.46	-.28	-.55	-.35
W	.31	.21-	.33	.17	.16	.09-	.63	.54	.75	.62	.67	.53
C	-.20	-.12-	-.16	-.13	-.16	-.14	-.08-	-.06-	-.09-	.04-	-.16	-.06-
S	-.41	-.23-	-.60	-.53	-.57	-.40	-.41	-.20-	-.42	-.37	-.38	-.26-
L	-.47	-.25	-.39	-.37	-.35	-.16	-.26	-.04-	-.25	-.04-	-.31	-.14-
LN(TW)		.34		.37		.30		.36		.31		.30
#	3643	2194	3373	1948	3140	1775	2446	1376	2244	1227	2019	1108
C_2	3.57	1.75	4.64	2.21	5.04	2.55	4.98	3.17	5.09	3.20	7.17	2.80
R^2	.09	.13	.13	.20	.11	.15	.12	.17	.09	.11	.09	.11

TABLE I.3
1870 Cross Section, Log Income Dependent Variable
N=2504

Peak Age	52	48	47	46	47	44
A_2	.093	.057	.06	.046	.053	.035
A^2	-.0009	-.0006	-.00064	-.0005	-.00056	-.0004
T			.038	.016	.035	.019
FB					-.056	.15
R1					-.53	-.36
R2					-.39	-.17
W					.04	-.10
C					-.24	-.13
S					-.45	-.42
L					-.36	-.17
LN(TW)		.41		.38		.37

See Note on Table I.2

C_2	1.05	-.82	1.48	-.50	2.13	-.04
R^2	.03	.13	.06	.13	.09	.15

TABLE I.4
1870-1900 Pooled, Log Income Dependent Variable
N=1617

Peak Age	55	48	50	48	49	43
A_2	.12	.10	.11	.10	.079	.06
A^2	-.11	-.00104	-.00011	-.00104	-.0008	-.0007
T			.022	-.04	.025	.005
FB					.10	.22
R1					-.61	-.25
R2					-.60	-.29
W					.68	.40
C					-.21	-.09
S					-.11	-.25
L					-.15	.06
LN(TW)		.46		.47		.45
D75					.27	.33
D80					.34	.45
D85					.47	.61
D90					.44	.62
D95					-.06	.16
D00					.16	.40

See Note on Table I.2

C_2	3.04	.506	3.06	.462	4.09	1.43
R^2	.05	.18	.06	.18	.14	.23

TABLE I.5
Pooled Cohorts, Log Income Dependent Variable

	A=20 30 yr	A=20 20 yr
Peak Age	41	36
A_2	.23	.32
A^2	-.0028	-.0044
T	.055	.030
FB	.20	.12
R1	-.44	-.22
R2	-.31	-.19
W	.53	.11
C	-.32	-.31
S	-.52	-.25
L	-.18	-.21
LN(TW)		
D2	.44	.37
D3	.43	.44
D4	.46	.39
D5	.67	.56
D6		.68
D7		.79

See Note on Table I.2

#	1687	2835
C_2		
R^2	.12	.09

TABLE II.1
Cross Sections, Log Wealth Dependent Variable

	1850	1860	1870
Peak Age	47	49.4	50
A_2	.34	.076	.103
A^2	-.0036	-.00077	-.00103
T	.65	.08	.07
FB	.12	-.22	-.18
R1	-1.24	-.39	-.55
R2	-.57	-.26	-.23
W	.35	.06	.016
C	-.74	-.45	-1.00
S	-.69	-.52	-2.13
L	-.69	-1.14	-2.13

See Note on Table I.2

#	1002	3738	4782
C_2	-.185	4.72	3.83
R^2	.19	.15	.21

TABLE II.2
1870 Cross Section, Log Wealth Dependent Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Peak Age	59	61	54	59	53	56	58	54
A_2	.088	.065	.04	.027	.048	.048	.038	.038
A^2	-.00075	-.00053	-.00037	-.00023	-.00045	-.00043	-.00033	-.00035
T			.057	.05	.042	.042	.036	-.056
FB					-.25	-.25	-.26	-.26
R1					-.46	-.47	-.37	-.36
R2					-.60	-.61	-.54	-.53
W					.42			.41
C					-.30			-.26
S					-.11			-.02
L					-.51			-.44
LN(Y)		.25		.21			.19	.19
W.A						.009	.009	
C.A						-.007	-.006	
S.A						-.003	-.002	
L.A						-.011	-.009	

See Note on Table I.2

(Limited to Those with Income in 1870 Greater Than 0)
N=2504

C_2	4.59	4.33	5.24	4.92	5.88			5.48
R^2	.08	.17	.175	.24	.28	.28	.32	.33

TABLE II.3
Peak Ages For Comparable Specifications

	Cross-section								Pooled			Individual Difference Specification
Log Y	52	47.5	47	46	47.3			44	50	49 w/o W	43 w/W	53 w/o W
Log W	59	61.3	54	58.7	53.3	56	57.6	54.3				

TABLE II.4
60-70 Pooled

	61-70 LN(Y)	61-70 LN(Y)	59-70 LN(Y)	59-70 LN(Y)	60-70 LN(W)	60-70 LN(W)	60-70 LN(W)	60-70 LN(W)
	50	49	51	50	52	53	54	55
A_2	.066	.039	.080	.061	.071	.056	.059	.043
A^2	-.00066	-.0004	-.00079	-.00061	-.00068	-.00053	-.00055	-.00039
T	.043	.022	.017	.07	.058	.048	.05	.046
FB	.018	.17	-.12	.01	-.42	-.42	-.42	-.39
R1	-.33	-.17	-.39	-.25	-.42	-.34	-.42	-.35
R2	-.07	.08	-.05	.07	-.42	-.41	-.38	-.37
W	-.07	-.03	.03	.02	-.10	-.09	.09	.05
C	-.26	-.16	-.35	-.29	-.26	-.20	-.17	-.10
S	-.02	-.05	.16	.10	.08	.08	.18	.15
L	-.42	-.21	-.27	-.09	-.58	-.48	-.54	-.49
LN(W)		.37 (.14)		.33 (.09)				
LN(Y)						.23		.20
D70	-.88	-.82	-.09	-.05	-.18	.03	-.09	-.07
#	1888	1888	1164	1164	1888	1888	1164	1164
C_2	4.64	2.65	3.92	2.10	5.34	4.25	5.53	4.74
R^2	.09	.17	.082	.14	.26	.32	.26	.31