A NAIVE HISTORY OF INDIVIDUAL INCOMES IN WISCONSIN, 1947–1959

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The paper develops a descriptive history of the changing level and sources of income of the male population of Wisconsin from 1947 to 1959, as a preliminary step in building a model of income determination. The history is based on data from a one percent sample of the taxpaying population of Wisconsin from 1947 to 1959. Analysis of income sources received by male birth cohorts is followed by summary data on individual income variation.

Changes in earnings of birth cohorts appear to be determined by changes in labor force participation, general productivity increases, and acquisition of skills. Education, as reflected in occupational status, appears to affect the initial level and lifetime profile of earnings; however, education has played a changing role in the dynamics of earnings.

Movements in non-earned income appear to be determined by rising real yields on capital, accumulation of wealth, and possibly by asset conversion and selective migration and mortality favoring wealth holders. Cohort asset accumulation for the period seems to have been determined by the growth rate of earnings, life cycle contingencies, and the pattern of asset prices and yields during the period.

Analysis of individuals' incomes over the period reveals great heterogeneity of experience of individuals within birth cohorts and within occupations. This suggests that study of micro units is necessary to obtain behavioral information obscured in aggregate cohort data.

1. INTRODUCTION

In this paper we explore the first findings of a new research tool—a sample of individuals who filed tax returns in the State of Wisconsin at any time during the period 1947–1959. Each individual is represented by the tax returns that he filed during this thirteen-year period. Some individuals are represented for each year; others are represented only for scattered years during which they received enough income, were resident in the State, and had a surname that was included in the sample. The sample and the associated documents that have been collected for the sample are described in Bauman, David, and Miller [3]. The sample was constructed in such a way as to represent the taxpaying population of the State of Wisconsin in any one year. The sample is validated in a study by Moyer [30].

Since a sample of taxpayers represents only those individuals whose income and honesty force them to comply with the tax authority's request for information, an immediate concern is to relate the sample of tax return data to the population of the State of Wisconsin. Part 2 of this paper is devoted to a study of the changing level and sources of income of the *adult, male population* of the State of Wisconsin as best as can be estimated from the *tax return* sample.

Attention is focussed on the experience of persons born in particular years to obtain a descriptive history of birth cohorts. We study this history by analyzing sources of income and changes in market conditions which may have influenced the magnitude of earnings, dividends, and other forms of income received by each cohort. While a fully developed structural model of income determination is the

best way to test hypotheses about these sources of income, we adopt a less sophisticated approach in which we simply set out to describe the changes that occurred as a precursor to the kind of model-building that is clearly required. The analysis raises fundamental questions about portfolio behavior over an individual's lifetime, and it raises doubts about cross-section methods that have been used in the past to estimate lifetime incomes of individuals with various educational attainments.

In Part 3 of the paper we describe information about individual experiences that is lost by aggregating to population groups, such as the birth cohorts studied in Part 2. Some measures of the heterogeneity of individual experience are derived for a sample of individuals who are represented by at least four pairs of consecutive tax returns in our original sample. In the course of measuring the heterogeneity of experience we raise some difficult questions concerning the appropriate methodology for dealing with a time-series of data on individuals, or micro-units.

2. Histories of Male Birth Cohorts in Wisconsin—1947–1959

2.1 *Adjusted Gross Income*

Figure 2.1-1 indicates the income experience of males residing in Wisconsin during the period 1947–1959.[1] The income shown is only that portion of personal income which is subject to tax in the State of Wisconsin. The most important excluded items are transfer payments from public and private agencies, especially Social Security payments to retired persons over 64 years of age.[2] The amount of income shown is obtained as a weighted average of means obtained from the tax return sample and an assumed amount of income for non-tax return-filing individuals. The weights were estimated from 1950 and 1960 Census data on the population by age group, with appropriate interpolations and extrapolations for the remaining years of the sample.

The curves in Figure 2.1-1 represent the mean income experience of males born in successive ten-year intervals from 1875 to 1924. The youngest males are represented by two five-year birth cohorts, 1925–1929 and 1930–1934. Explanation of the varying movements displayed in the figure is clearly a challenge since the impact of market forces on each cohort must be inferred from a comparatively short time-series of thirteen years. Many macro-economic variables are potentially relevant to the experience of each cohort, and it will be no easy task to distinguish among them in rigorous model-building on the data.

Before attempting explanations, we point out the principal features of Figure 2.1-1:

1. Males born prior to 1885 (as shown the two lowest curves on the figure) retained an essentially steady money income over the period.

[1]Tax return data on incomes were combined with information from the 1950 and 1960 Censuses to produce the mean values shown. See Appendix A.

[2]Interest on Federal government bonds and a portion of wages paid to members of the Armed Forces were also excluded. Unemployment compensation, though probably understated, was taxable under Wisconsin law until 1964 when the State modified its tax computations to conform generally to Federal tax provisions. Capital gains were fully taxable as income, as was the interest income from State and local bonds. See Moyer [30].

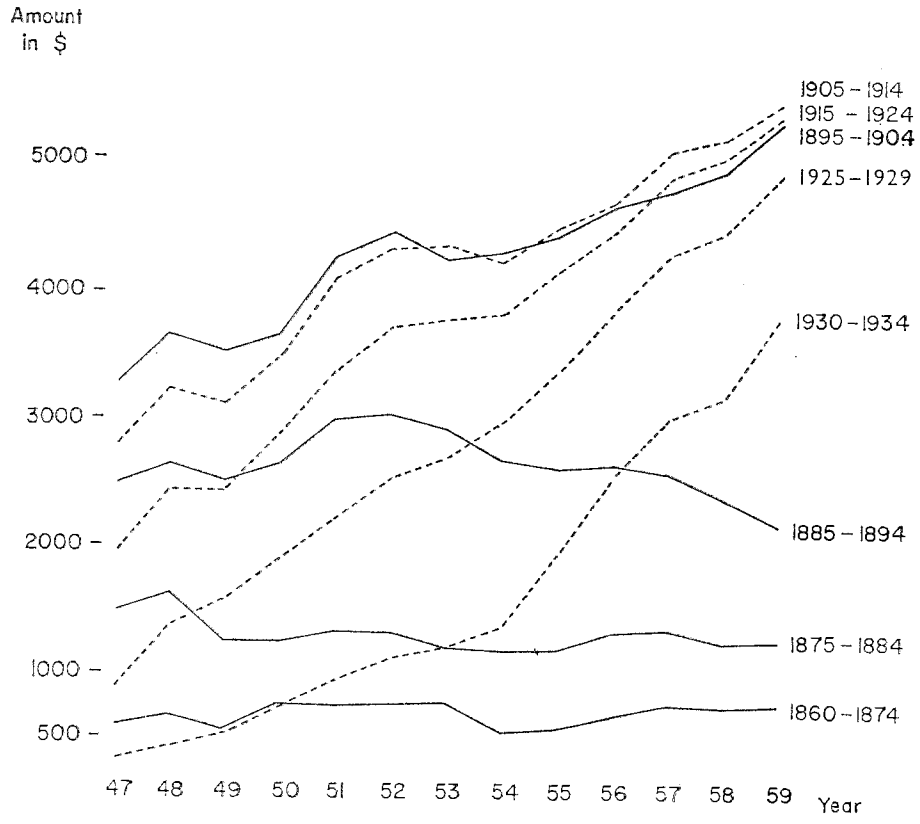

FIGURE 2.1-1 Mean Adjusted Gross Income (adjusted for non-filing) within Birth Year Group, by Year (Wisconsin Males)

2. Males born 1885–1894 experienced a reasonably continuous decline in the rate of change of income that resulted in absolute declines in income after 1953. If the pattern shown for the 1875–1884 cohort is repeated, the decline will continue for another year or two; thereafter income for the group will stabilize at some low level.

3. Males born from 1895–1904 received the highest average income of any cohort during the first half of the period under study, after which the 1905–1914 cohort dominates the income heap. There appear to be some common fluctuations in the income of these two cohorts. These fluctuations appear to be in phase with the recessions of 1947, 1949–1950, 1954 and 1958 as measured by the rate of unemployment for the state. The clearly marked fluctuations in the incomes of the 1895–1914 cohorts appeared as changes in the rates of increase of incomes of younger cohorts; they are not really identifiable for the retired cohorts.

4. Cohorts born after 1924 show a marked rise in income levels. The rate of increase appears larger the later the year of birth.

2.2. *Digression on the Relationship of Birth Cohort Data to Alternative Data Sources Classified by Age*

The curves in Figure 2.1-1 differ from the more common classification of mean income by *age* (Miller [26]), since all members of the cohort are one year older after the passage of 12 months; the 1895–1904 cohort was 45–54 years old in 1950; 46–55 years old in 1951, and so forth. Statistics on the distribution of income by birth cohort were derived from the Current Population Survey of the U.S. Census by Brady [7]. Estimates of the population mean income based on those data and the 1950 and 1960 Census of Population for Wisconsin were derived by the authors in David, Miller, and Bauman [10] (See also Appendix). Both studies suffer from the fact that cohort statistics had to be estimated from existing distributions on the basis of age.[3]

Comparison of the curves shown in Figure 2.1-1 in any given year reveals the inverted U-shaped pattern that is characteristic of the size of mean (or median) income classified by age. (See for example Miller [26], or [35]). The information extracted in the Figure is the same as that which could be extracted from any cross-section sample of the Wisconsin population.[4] What cannot be readily seen in classifications of successive cross-sections by age is the elapsed time before income attained by an older cohort is surpassed by the income of a younger cohort. For example, the 1950 income of males born in 1895–1904 was exceeded by the income of persons approximately twenty years younger (born, 1915–1924) in 1954. This fact can easily be seen by investigating the year in which successive cohorts attain given ordinates in the figure. The crossing of two cohort ogives indicates the date on which cohorts interchange their rank order of mean income; that event cannot be easily deduced from age-income distributions in successive cross sections.

2.3. *Change in Adjusted Gross Income—Price Increases*

A ready explanation for part of the increase in income shown for most of the birth cohorts in Figure 2.1-1 is the general rise in prices during the period. Economic theory leads us to expect that labor is paid a *real* wage based on its productivity. Similarly the return to invested capital is a *real* return that compensates even the investor in financial securities for the depreciating value of money (Mundell [31]). On both counts we would expect money incomes to rise as price levels rise. Table 2.3-1 indicates the money rate of increase and the real

[3]In Brady's analysis the estimates were made exact by a judicious choice of years and birth cohorts. In the David, Miller, Bauman study interpolations were made in order to obtain an annual time series of mean income for birth cohorts. The latter series was used in Section 3 of this paper. Direct tabulation of data on tax returns obviates the need to transform age-related income distributions to a birth cohort basis. The direct estimates are more satisfactory for any cohort experiencing a rapid change in income level. It also has the advantage that components of income can be studied in detail; distributions of components of income by either age or cohort are virtually non-existent for non-earned forms of income.

[4]One property of the sample makes these data more suitable for longitudinal time series analysis than a series of successive and independent cross-sections. Identical individuals are sampled in successive years so that sampling variation is less than the sampling variation in two independent samples. The sample thus is similar to the Current Population Survey sample, with its rotation groups, except that the number of new members in the sample is far smaller in these data. (Bureau of the Census [8].)

rate of increase of adjusted gross incomes for the birth cohorts shown in Figure 2.1-1.[5] Both the rates of increase make it clear that substantial differences in the experiences of different birth cohorts must be accounted for by some underlying theory.

2.4. *Real Earnings*

One explanation that may be offered for the differences in real income growth of the cohorts is the changing productivity of the population during the period under observation. Conceptually, we may identify four distinct elements in the changing productivity of a birth cohort:

1. Changes associated with labor force participation. Aging over the period reduced labor force participation of older persons and increased participation of

TABLE 2.3-1

RATE OF CHANGE OF SELECTED TYPES OF INCOME, 1947–1959, BY BIRTH COHORT
(Wisconsin Males)

Birth Year	Adjusted Gross Income		Wages, Salaries, and Self-employment Income			
	In current dollars	In constant dollars	In current dollars	In constant dollars	Relative to the growth of peak earnings	Relative to earnings growth of maturing workers
Retired and retiring workers						
1875–1884	−0.016	−0.038	−0.072	−0.093	−0.111	*
1885–1894	−0.010	−0.032	−0.027	−0.048	−0.068	*
Peak earning decades						
1895–1904	0.036	0.012	0.032	0.009	−0.011	*
1905–1914	0.055	0.031	0.064	0.040	0.020	*
Maturing workers						
1915–1924	0.088	0.063	0.085	0.061	0.039	*
1925–1929 (after 1954)	0.095	0.070	0.084	0.060	0.038	*
Entrants to the labor force						
1925–1929 (between 1947–1954)	0.175	0.149	0.200	0.173	0.149	0.105
1930–1934 (between 1952–1959)	0.242	0.214	0.261	0.233	0.208	0.163
Peak of the cohorts						
1895–1914	0.041	0.018	0.044	0.021	0.000	*

*Not shown as computation is only relevant for workers entering the labor force.

[5]Estimated by least squares regression of the logarithm of real income on the year.

the young. Neither change in participation proceeded in a fixed relation to age as older workers reduced their average age of retirement during this period.

Those rates were inflated by the rate of increase of the consumer price index over the period to show the rate of increase of money income in column 1. (Price increases experienced by all birth cohorts are assumed to be identical, although some modification might be appropriate to take into account the decline in cost of living associated with the retirement of the 1875–1894 cohorts over the period 1947–1959).

(Kreps [22]) and younger workers increasingly postponed entry into the labor market in order to take advantage of continuing formal education (Korbel [21]).

2. Changes in productivity associated with the application of new technology, improved management, and increased amounts of capital per worker (Intrilligator [19]). These changes could be expected to increase the output of the mature, experienced worker who would otherwise be committed to a fixed division of labor and fixed tasks involving static amounts of physical capital.

3. Changes in productivity associated with the acquisition of job-oriented skills. The worker entering a new employment adds to the productivity associated with his general ability and generalized training by acquiring specific skills, special training, supervisory responsibilities, and promotions. Acquisition of any of these job-specific capabilities enhances his productivity and earnings (Mincer [28] and Becker [5]). (A relative shortage of persons born during the depression and the casualties of the Second World War may imply that the increase in earnings associated with maturation in the work force may have been exceptionally high for the 1925–1929 birth cohort in the latter half of the period under observation.)

4. Increased productivity of entrants to the labor force associated with the level of formal education attained. While the magnitude of the increase in productivity that should be assigned to the increase in formal education of entering workers may be in doubt, it is widely accepted that some contribution exists (Dennison [11a]). We describe the change in real earnings of male Wisconsin birth cohorts under these four headings, in the order above.

Figure 2.1-1 makes clear that the steepest rate of decrease of incomes of the 1875-1884 cohort occurs between 1947 and 1950; the steepest rate of decrease for the 1885-1894 cohort occurs from 1953 to 1959. Those years are the years during which members of those cohorts are reaching the age of 65. Only individuals who had reached the age of 65 were entitled to Social Security benefits during the period under observation. Thus reaching 65 is associated with partial or complete retirement from the labor force and the receipt of pension income. Both phenomena reduce taxable income.[6] The only peculiarity of the observed income change is that incomes do not begin to fall for the 1885–1894 cohort until 1953, while some members of the cohort reached age 65 as early as 1950. It seems likely that income rises were peculiar to younger members of the birth cohort while older members retired, since the proportions or the population reporting wages and

[6]Private pensions are taxable in Wisconsin, but only after the employee's contribution has been paid to the taxpayer as a return of capital. This corresponds to Federal practice prior to 1954.

salaries or self-employment income declined from 1948–1952.[7] The exceptionally tight labor market of the Korean War period may have caused some persons to postpone retirement.

Table 2.3-1 documents the nature of the retirement process. Earnings for the 1875–1894 birth cohorts fell between five and nine percent in real terms. Adjusted gross income declined less quickly. Retiring individuals may continue to earn a return on their wealth; they may also be entitled to new returns from their life insurance, pension plans, and the conversion of appreciating to income-producing assets.

The converse of retirement can be observed among the 1925–1934 birth cohorts during the years when members of the cohort completed their education and began full-time employment. The rates of growth computed under the heading "Entrants to the Labor Force" in Table 2.3-1 apply to those years during

[7]One caveat must be laid before the reader at this point. The estimates were made without any knowledge of the actual earnings of non-filing individuals. To the extent that enforcement and compliance with the tax law improved systematically over the period 1947–1959, our results are an artifact of changes in administration rather than an expression of real economic events. Conditional probabilities for the filing of tax returns by income receivers aged 14 or over are given in the following table:

PROBABILITY OF FILING TAX RETURNS

Birth Year Cohort and Census Year	Amount of Income Reported to the Census							
	Any		More than $999		More than $1999		More than $2999	
Prior to 1885								
1950	0.375		0.591		0.750		0.793	
1960		0.352		0.479		0.802		0.929
1885–1894								
1950	0.641		0.836		0.923		0.894	
1960		0.590		0.591		0.619		0.769
1895–1904								
1950	0.823		0.923		0.966		0.966	
1960		0.933		0.985		0.999		0.999
1905–1914								
1950	0.814		0.923		0.951		0.966	
1960		0.942		0.971		0.957		0.943
1915–1924								
1950	0.763		0.865		0.894		0.923	
1960		0.889		0.915		0.901		0.901
1925–1929								
1950	0.604		0.850		0.966		1.10	
1960		0.876		N.A.		N.A.		N.A.

Rates greater than unity can occur because the definitions of income used by the Census and tax authorities differ.

which members of the cohort attained at least 18 years of age and not 30. The members of the cohort entering the labor force on a regular basis early in the period are those with least schooling; college graduates and professionally trained workers show regular full-time earnings only at the end of the period. The observed rate of growth of earnings for the cohort does not reflect a growth in earnings for those at work at the beginning of the period; instead it documents entry into the labor force by highly-trained and skilled workers whose initial earnings are relatively greater than workers in employment at the beginning of the period. (Further evidence supporting this interpretation will be presented in Section 2.6.)

Table 2.4-1 illustrates the changing labor force participation of the retiring and entering birth cohorts by an alternative measure: the proportion of the population who report wages and salaries and the proportion who report self-employment income on tax returns. About 40 percent of the 1925–1929 and the 1930–1934 cohorts report wages and salaries when the youngest member of the cohort reaches the age of 19. By the time the youngest member of these cohorts reached the age of 25 seventy percent of the cohorts reported wages and salaries and more than one in twelve reported self-employment income.

Self-employment appears more common in the 1925-1929 cohort than the 1930–1934 cohort at a comparable age. This may be partly attributed to the increase in professionals with extended training, such as doctors and lawyers who enter the labor force on a regular basis relatively late in life and who have increasingly taken salaried work for their first jobs rather than their ultimate position of self-employment. Fewer self-employed among the 1930–1934 cohort undoubtedly reflects the decline in farming in the state.

We now return to our discussion of Table 2.3-1. Following the years during which young workers enter the labor force there appears to be an extended period during which real earnings grew rapidly. The rate of growth of real earnings reaches six percent for the 1915–1924 birth cohort and the 1925–1929 cohort after 1954. As suggested before, part of this growth reflects promotion, improved productivity associated with the acquisition of on the job experience. Part of the growth reflects improvement in the means of production associated with turnover and investment in physical capital, changes in organization, and so forth.

While measures of the rate of technological change are certainly conjectural (Intrilligator [19]), it seems reasonable to attribute the rate of growth of the *peak* of real earnings to that source. That is, the rate of growth of the maximum real earnings reported by any cohort was estimated.[8] Thus in Table 2.3-1 the rate of growth of real earnings tapers off from the six percent rate of maturing workers to four percent for the 1905–1914 cohort, and to one percent for the 1895–1904 birth cohort. The rate of increase of the maximum mean earnings (shown as the peak of 1895–1914 cohort earnings in Table 2.3-1) was approximately two percent in real terms. Deflating the rate of growth of real earnings by this two percent

[8]This procedure is identical to the procedure by which Klein [20] estimates measures of capacity from industrial production indices. Owing to the inverted U-shaped relationship between earnings and age in any given year, it will not be overly sensitive to the choice of birth cohort groupings.

TABLE 2.4-1

LOWER BOUNDS TO THE PROPORTION OF THE POPULATION RECEIVING INCOME FROM WAGES OR SELF-EMPLOYMENT
(Wisconsin Males)

	Entrants Birth Years 1930–1934			Entrants Birth Years 1925–1929			No Presumed Change Birth Years 1895–1904			Departures Birth Years 1885–1894			Departures Birth Years 1875–1884		
Year	Age	Per cent receiving wages	Per cent with self employ-ment income	Age	Per cent receiving wages	Per cent with self employ-ment income	Age	Per cent receiving wages	Per cent with self employ-ment income	Age	Per cent receiving wages	Per cent with self employ-ment income	Age	Per cent receiving wages	Per cent with self employ-ment income
1947	**	2.3	0.12	*	36.8	1.9		65.1	21.0		49.4	15.2	†	31.7	10.3
1948	**	7.6	0.36	*	53.0	3.7		64.0	23.3		51.5	16.3	†	32.2	10.7
1949	**	14.6	0.85	*	56.3	4.9		64.0	23.1		49.9	16.1	‡	26.1	9.8
1950	**	24.0	0.95	*	60.9	7.3		63.9	24.4	†	50.4	16.1	‡	24.1	8.8
1951	**	32.6	2.0	*	60.1	9.1		66.9	24.5	†	53.5	17.0	‡	23.9	9.7
1952	*	37.0	2.6	*	64.1	9.8		68.2	24.8	†	54.1	18.5	‡	23.5	9.7
1953	*	38.6	4.2	*	64.1	13.4		65.5	26.5	†	51.7	19.4	‡	20.5	10.6
1954	*	41.0	4.2		69.3	13.7		66.7	27.6	†	49.1	18.4	‡	19.3	10.4
1955	*	53.9	4.3		72.3	13.8		66.1	27.1	†	47.0	17.1	‡	17.7	11.4
1956	*	65.1	5.8		72.5	15.0		68.0	28.7	†	45.4	17.8	‡	17.2	11.6
1957	*	70.3	6.8		77.4	15.2		69.5	28.0	†	44.2	17.6	‡	16.4	10.3
1958	*	69.7	7.8		77.2	16.8		69.4	28.2	†	39.0	16.3	‡	16.0	9.4
1959		72.4	8.7		78.3	17.4		72.4	24.6	†	35.9	13.0	‡	16.1	8.7

* Members of the cohort under 25 years of age.
** Members of the cohort under 18 years of age.
† Members of the cohort 65 years of age or older.
‡ No members of the cohort under 65 years of age.

"generalized increase in productivity" produces the relative experience of each cohort in the next to last column of Table 2.3-1. Maturing workers show four percent increases in earnings in excess of what might be expected from price rises or "generalized productivity increases."

If it is correct to suppose that education has its primary impact on the level of earnings at entry into full-time employment, the rate of increase of earnings for labor force entrants may yield some clue as to the contribution of training to the earnings position of younger workers. Assume that the four percent rate of increase of real earnings averaged by the maturing worker, relative to "generalized productivity increases," reflects the return to acquisition of experience. We assume each worker would experience this relative improvement in earnings after entry into full-time employment. Thus the rate of growth of earnings for the cohorts entering full-time employment may be thought of as a combination of the appearance of new workers who delayed entry to obtain additional formal training and four percent relative earnings growth for those already in full-time employment. Deflating the observed rate of increase of earnings relative to "generalized productivity increase" by the four percent return to maturation, we obtain the residual in the last column of Table 2.3-1. The younger cohort shows the larger residual. This finding supports the hypothesis that the residual is associated with the level of training received by the cohort, since educational attainment has risen historically for each new cohort of workers.

2.5. *Non-earned Income*

Money income from invested capital (interest, dividends, rents, and so forth) showed a steady increase for all cohorts born after 1874. These yields also comprised an increasing share of adjusted gross income for cohorts born between 1875 and 1914. Comparing the increase in earnings with the increase in adjusted gross income in Table 2.3-1 provides evidence of the role of non-earned income. Adjusted gross income grew at a slightly faster rate for the 1875–1894 birth cohorts than earnings. Conversely, earnings grew sufficiently quickly for the maturing workers born between 1895–1924 so that no clear change in the ratio of non-earned income to adjusted gross income occurred during the period.[9]

The pattern of increase typical of both interest and dividends is shown in Figures 2.5-1 and 2.5-2.

Logically the increase in non-earned income for the population must be associated with one of four processes:

(1) rising real yields on capital;
(2) the accumulation of wealth through saving, appreciation, and inheritance;
(3) the conversion of assets from those providing unrealized capital gains to those providing interest or dividend income, or the conversion of unincorporated business assets (that yield self-employment income discussed above) to financial assets; or

[9]The 1925–1929 cohort shows an unexpectedly high rate of growth of adjusted gross income relative to earnings after 1954. As only five observations are available the result may well be idiosyncratic to the years involved, which include the 1957–1958 recession.

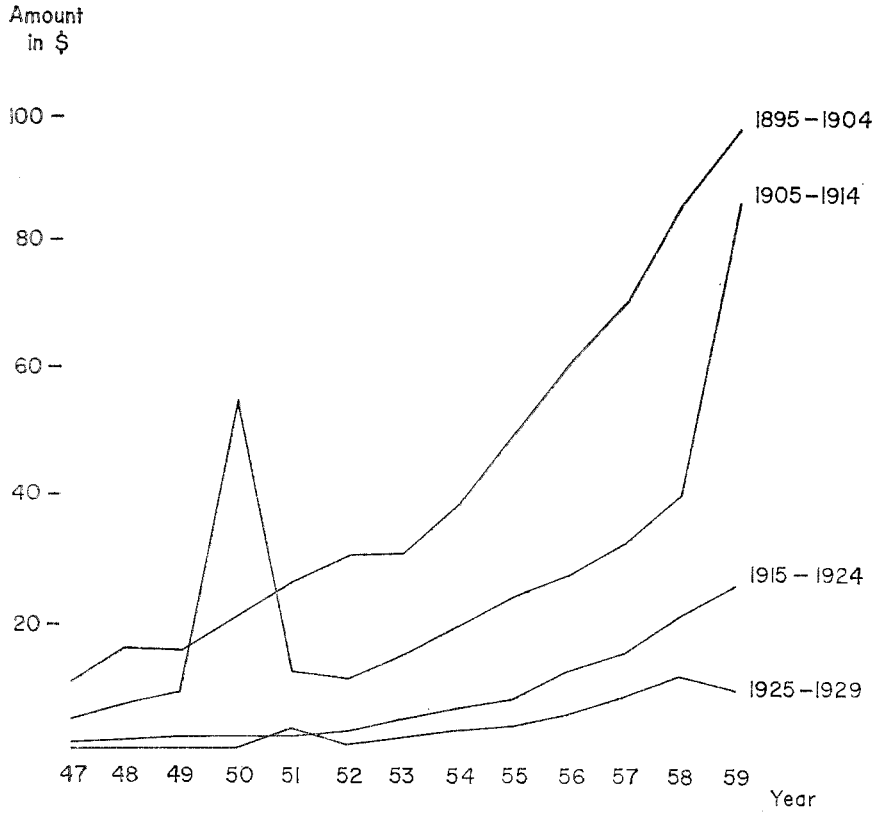

FIGURE 2.5-1 Mean Interest within Birth Year Group and Year (Wisconsin Males)

(4) selective migration and mortality favoring holders of wealth.

The rise in interest rates from 1947–1959 was reflected in an increase of Moody's Aaa corporate bond rate from 2.61 to 4.38 percent. Dividend yields also rose from 1947 to 1949; then declined steadily to 1959. However, the decline in yields on current market prices was associated with a sufficient increase in the price-earnings ratio so that an investor could expect twenty percent growth in the money value of dividends, quite aside from the appreciation of shares being held at the beginning of our period of observation.

In order to investigate points 2 through 4, the actual amount of interest received and the value of dividends were capitalized by indices of the yield of those assets. Conceptually it would be desirable to capitalize the return from other forms of non-earned income, but indices of market rates of return on rental properties, real estate, and trusts are not readily available.[10] Figure 2.5-3

[10]This problem also confounded Atkinson [1b] who studied financial asset holdings of Wisconsin tax return filing individuals by capitalizing each asset according to its particular yield. Miller [27] proposed a parallel investigation on the individual time series available in this sample, and that work is currently in progress.

The unique contribution of the present analysis to earlier work by Atkinson and Hanna, Pechman, and Groves [15] is that the sample identifies individuals by date of birth, enabling us to organize data to demonstrate the impact of economic history on particular individuals.

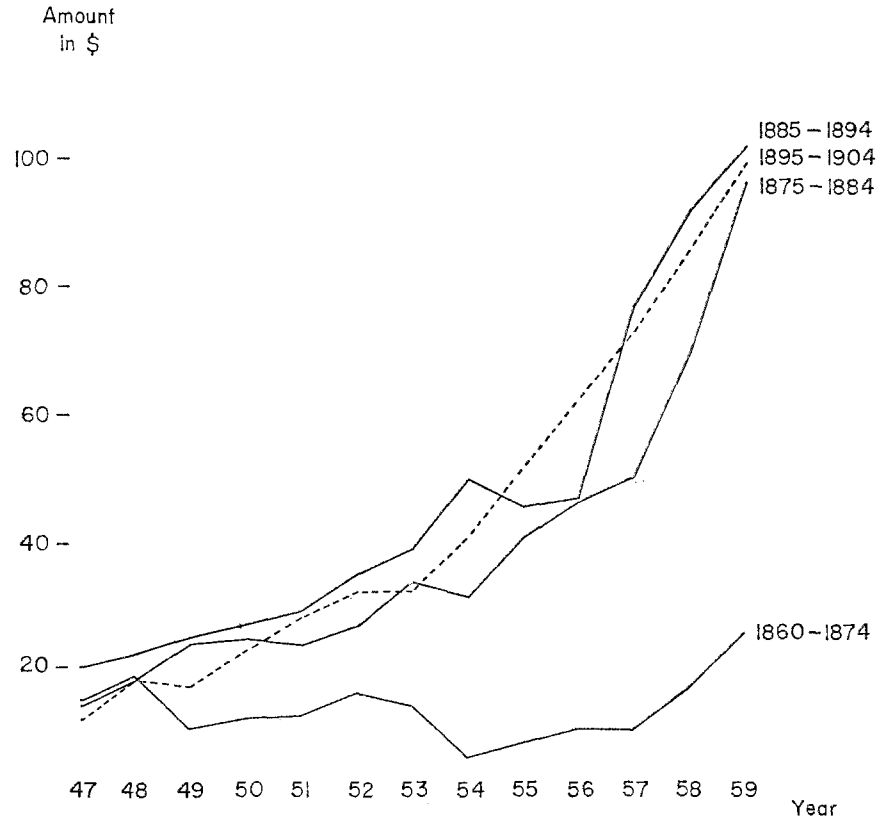

FIGURE 2.5-2 Mean Interest within Birth Year Group and Year (Wisconsin Males)

indicates largely what might have been expected. Taxpayers active in the labor force (born 1895–1924) during this period accumulated substantial amounts of income-earning assets. The older workers began the period with more assets than the younger; but, as might be anticipated from the rapid rise in their earnings, younger cohorts acquire comparable levels of interest-yielding assets earlier in life.[11]

The retiring cohort, born 1885–1894, accumulated less interest-yielding assets than the oldest non-retired birth cohort, born 1895–1904. (Earnings of the

[11]Underreporting of interest and dividend income on tax returns implies that both the number of recipients of such income and the mean value is understated by these estimates. Comparisons and validations have been made by Holland [17] and U.S. Treasury [36]. The bias in reporting may be presumed to have declined over the period of observation as the use of information returns by dividend and interest paying agents became more common. Without additional evidence it does not seem likely that relative experience of different birth cohorts would be distorted.

Failure to include any estimate of dividends and interest received by non-tax return filing individuals implies that mean interest and dividend income is likely to be relatively more understated for the aged than for the other groups, since the rate of tax return filing drops sharply as individuals reach the age of 65.

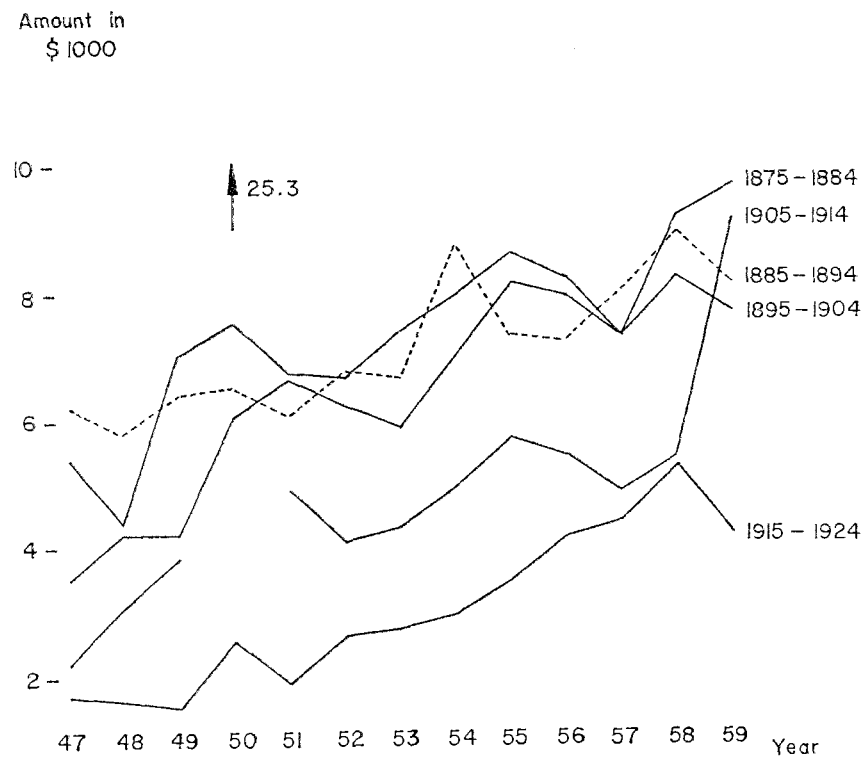

Figure 2.5-3 Mean interest capitalized by Moody's index of bond yields, within birth cohorts and year (Mean for male taxpayers with interest-bearing assets).

older cohort declined radically in comparison to the non-retired cohort.) The 1875–1884 cohort accumulated assets as rapidly as the oldest non-retired cohort, a finding which may be explained by other facets of the portfolio.

Capitalized dividend payments (Figure 2.5-4) present a picture that complements our interpretation of forces underlying the growth of interest-bearing assets. Among the working taxpayers, those born 1895–1904 have both the largest shareholdings and the highest rate of accumulation (which reflects both new investment and appreciation). Two forces appear to be at work: children have left home and the consumption demands on the earner's income have declined (Lansing and Kish [24]); secondly, the earner responds to a relatively immediate expectation of retirement by actively saving towards that objective (Katona [19a]).

The retiring cohort shows a lower propensity to accumulate shares than do workers born 1895–1904. As we have already observed, the retiring cohort is responding to a loss of earnings. The rate of growth of capitalized interest and dividend-bearing assets for all persons in the retiring cohort is less than for the 1895–1904 birth cohort. See Table 2.5-1.

The exceptionally high rate of growth of shareholdings of the 1875–1884 dividend-receivers and the high rate of increase of interest- and dividend-yielding assets for the population as a whole remain puzzling. Table 2.5-2 indicates that

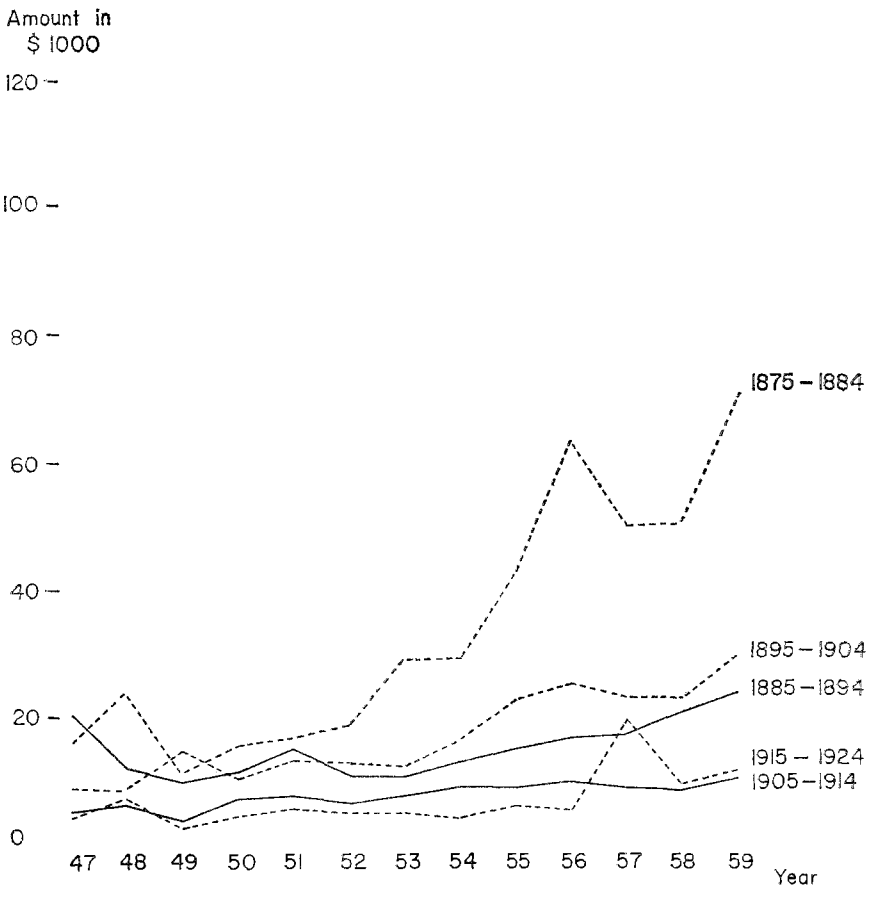

Figure 2.5-4 Mean dividends capitalized by Standard and Poor's Index of Dividend Yields within birth cohorts and year (Mean for male taxpayers receiving dividends).

the rate of reporting income from interest, dividends, and capital gains also has increased for this retired cohort. Indeed, the reporting of these forms of income became generally more widespread in all birth cohorts from 1947–1959.[12] A combination of increased mean payments and more widespread reporting cannot be explained as an artifact of movement of individuals into and out of the tax return filing population; some positive explanations are required. Let us examine the four possibilities enumerated above:

1. Rising real yields on invested capital. The 1875–1884 cohort may have invested more heavily in dividend-yielding securities than the market in general. Since dividends are capitalized by a market index of yield, the actual capital value of shares held by the 1875–1884 cohort may be overstated. If the mix of share-holdings remained constant from 1947–1959, the rate of growth of assets would still not be affected. The rate of growth would be overstated if the birth cohort gradually shifted from a portfolio characteristic of the market in general

[12]A portion of the increase may reflect improved reporting and compliance.

TABLE 2.5-1

RATE OF GROWTH OF CAPITALIZED INTEREST PAYMENTS AND CAPITALIZED DIVIDENDS IN CURRENT DOLLARS (Wisconsin Males)

Birth Cohort	Rate[a]
1875–1884	.1719
1885–1894	.0910
1895–1904	.1558
1905–1914	.1460
1915–1924	.2290
1925–1929 (after 1954)	.2370

[a] Estimated by regression on the logarithm of estimated interest and dividend-bearing wealth.

TABLE 2.5-2

LOWER BOUNDS TO PERCENTAGE RATES OF RECEIVING INTEREST (I), DIVIDENDS (D), AND CAPITAL GAINS (CG) WITHIN BIRTH COHORTS, BY YEAR (Wisconsin Males)

Year	1875–1884			1885–1894			1895–1904		
	I	D	CG	I	D	CG	I	D	CG
	%	%	%	%	%	%	%	%	%
1947	8.5	6.2	3.7	10.5	8.0	4.1	10.7	9.1	5.7
1948	10.2	6.3	3.0	11.6	8.3	4.3	12.6	9.5	7.6
1949	11.1	6.1	2.6	12.1	9.4	5.9	12.7	9.6	6.4
1950	10.8	6.1	3.7	13.5	9.9	4.7	12.2	9.6	7.7
1951	10.4	6.4	2.5	14.9	12.0	6.0	12.9	10.8	6.4
1952	11.6	6.3	2.8	15.3	12.5	5.2	15.7	12.0	6.5
1953	12.7	7.1	3.1	16.6	12.9	5.3	15.6	12.0	6.7
1954	12.0	7.2	2.7	17.4	12.2	6.0	17.9	12.5	7.7
1955	13.9	7.3	3.1	18.8	12.3	6.4	19.3	12.9	7.9
1956	15.1	7.5	3.7	20.2	12.6	6.5	21.2	13.6	8.6
1957	15.7	9.0	4.0	22.6	12.8	6.6	22.9	14.9	6.2
1958	17.7	11.1	3.7	24.5	12.8	5.9	24.8	16.0	6.6
1959	20.7	10.1	6.0	26.8	14.1	7.2	27.6	17.4	9.8

Year	1905–1914			1915–1924			1925–1929		
	I	D	CG	I	D	CG	I	D	CG
	%	%	%	%	%	%	%	%	%
1947	7.0	4.6	5.0	3.5	1.7	2.0	1.0	0.8	0.5
1948	7.0	4.6	5.5	4.3	2.0	3.4	1.1	0.4	1.1
1949	8.0	4.4	5.0	4.6	3.1	2.9	2.4	0.5	1.0
1950	7.6	5.1	7.2	3.9	2.8	3.2	2.3	0.6	1.4
1951	8.1	6.1	6.4	4.9	3.1	3.8	2.0	1.6	1.8
1952	8.7	7.0	5.2	4.6	3.8	3.6	3.0	2.3	1.6
1953	10.3	7.0	4.8	5.5	4.1	3.9	3.7	2.0	2.4
1954	12.6	7.7	6.5	6.7	4.7	4.4	4.2	2.2	2.8
1955	13.2	8.4	6.4	7.6	4.3	4.8	6.7	2.9	2.8
1956	14.0	9.1	7.4	8.1	5.4	4.7	7.0	3.7	4.4
1957	16.2	9.8	5.3	8.6	6.4	4.8	6.2	5.1	2.9
1958	18.5	10.6	5.5	9.7	7.4	5.0	8.2	5.5	3.3
1959	20.7	10.9	6.6	13.4	7.7	6.3	10.6	6.0	4.0

to an income-oriented portfolio. Whether such a gradual shift in assets occurred must be assessed by studying individual portfolios in the tax return sample (a task beyond the scope of the present inquiry). However, a gradual shift seems unlikely. Most of the 1875–1884 cohort had already retired by 1947. It seems improbable that portfolio readjustments would occur any substantial number of years after retirement.

In any case, the hypothesis of incorrect capitalization explains only the rate of growth of share values and not the rise in the proportion of recipients. We therefore investigate alternative hypotheses.

2. Accumulation. The highly skewed distribution of income to the aged implies that asset accumulation of the aged may be disproportionately high in relation to mean income, as dissaving by the poor is limited by the negligible character of their wealth (Epstein and Murray [12]). In addition, inheritance may account for some increase in the assets reported by surviving husbands when assets owned by a deceased wife are transferred.[13] These factors may account for some of the increase in wealth of the 1875–1884 birth cohort. (It is less likely to affect the rate of reporting of asset income as holding of assets is unlikely to occur for the wife only.)

3. Conversion of assets. Unusually frequent sales of assets were not reported by either the 1875–1884 or the 1885–1894 birth cohorts. Table 2.5-2 shows that these cohorts report gain or loss on the sales of assets less frequently in proportion to their reporting of dividend receipts than the younger, employed cohorts. The aged may prefer dividends to capital gains; they may be "locked-in" to their portfolios; they may be less active in managing their portfolios—to suggest a few possibilities.[14] It is not possible to determine whether the low rate of reporting of capital gains for the 1875–1894 cohorts is the result of careful planning of the portfolio over a long period of time to produce high yields as retirement becomes imminent, or whether these cohorts are less well informed on the investment possibilities for producing capital gains.

Despite the relatively low rate of reporting capital gains for individuals born prior to 1895, it is still possible that those cohorts converted self-employed businesses and farms into other asset holdings between 1947 and 1959. Such conversions would not be reflected in rates of reporting capital gains, if self-employed individuals regularly report gains and losses on other types of assets. The average amount of capital gains also need not register such conversions, particularly since gain or loss upon the sale of business assets can be expected to have a high variance; the profitability of particular undertakings reflects highly localized business conditions. Alternatively, asset sales may be reported by

[13]Such a transfer would be common among wealthy aged. The greater life expectancy of women does not rule out the probability that she dies first. Since Wisconsin tax returns distinguish income earned on the wife's assets from income earned on the husband's assets, some apparent increase in assets can arise, despite the fact that the wealth of the marital unit has not changed.

[14]Barlow, Morgan, and Brazer [2] give some indirect evidence for the last hypothesis. Age does not figure directly either in the realization of losses, the level of tax consciousness, or the level of investment activity. However, investment activity was more frequent for rentiers, who would presumably be an important segment of the wealthy retired population. (See pp. 84, 125, and 156.)

businessmen and farmers who would not normally report a gain or loss, but this increase in recipient rates is more than offset by a decline in the reporting of gain or loss by other investors. Thus it seems that only analysis of micro-data will provide the information required to determine the extent to which the character of portfolios has changed as the retired and retiring birth cohorts have aged from 1947–1959.

4. Selective migration and mortality. The evidence for this explanation of the rising values of financial assets held by the 1875–1884 cohort is scanty, but suggestive. Differential migration may occur if middle and low-income workers are more likely to move to retirement communities than the wealthy retired person who may have the option of maintaining more than one residence, or travelling to more salubrious climes.

For the cohort born prior to 1875 the rate of filing tax returns rises after 1955. This movement constitutes speculative evidence on which to base a hypothesis that tax return filers outlive non-filers. However, past studies of mortality by social class and occupation do give evidence that age-specific death rates are higher for the unskilled low-income individual than for the professional, so that the hypothesis has some support. (Antonovsky [1a] and Harbury [16].)

Our analysis thus provides a picture of lifetime accumulation of interest- and dividend-yielding assets that is correlated with the rate of income growth. The youngest cohorts accumulate these assets most rapidly. They are also the cohorts for whom earnings increase most rapidly. The loss of earnings in the retiring cohort leads to a low rate of accumulation. Experience of the retired cohort remains puzzling as their rate of accumulation of assets was large relative to the level and rate of change of their income.

The rise in the rate of reporting interest, dividends, and capital gains in Table 2.5-2 deserves one more comment. The increases reported appear roughly consistent with survey data on shareholdings.[15] Thus a clearly remarkable dispersion of wealth holdings among the population occurred during the years represented by the tax record sample.

2.6. *Education and Lifetime Income*

Data in Section 2.4 suggest that education influenced the level of earnings obtained in the first full-time employment of a young worker. The hypothesis rested on the differential rate of growth of earnings of the 1925–1929 and 1930–1934 cohorts during years in which some members of the cohort were under 25 years of age.

Similar but not identical findings can be developed from data in which educational attainment is somewhat more clearly involved. The time profiles of earnings reported by professional and managerial workers were compared with earnings reported by service workers and by semi-skilled and unskilled workers. Rates of growth of earnings for these occupational groups are shown in Table

[15]N.Y.S.E. *Fact Book* [32], *Survey of Consumer Finances: 1960, 1964* [35], and Projector and Weiss [34]. The reported rate of receiving capital gains is also consistent with Federal tax return data (David [9], p. 66). Reporting rates are compared in the Appendix.

2.6-1.[16] The average rate of growth of earnings for taxpayers in the cohort is shown in column 1 and may be compared with Table 2.3-1.

Implicitly comparison of these occupational groups discloses a difference in experience associated with differences in educational attainments. Professionals almost universally received college training.[17] The managerial group includes somewhat fewer college graduates, while the two remaining groups had the least numbers attaining some college training. Semi-skilled and unskilled workers are grouped together since the reporting of occupational categories on tax returns did not permit a clear division between the two groups.

TABLE 2.6-1
RATES OF GROWTH OF REAL EARNINGS ON TAX RETURNS

Birth Cohort	All Occupations[a]	Professional	Managerial	Service	Semi-skilled and unskilled
1895–1904	0.0002	0.0039	0.0118*	0.0186*	0.0167*
1905–1914	0.0179*	0.0294*	0.0337*	0.0281*	0.0186*
1915–1924	0.0414*	0.0671*	0.0624*	0.0428*	0.0299*
1925–1964	0.0438*	0.0233	0.0668*	0.0195	0.0414*

[a]Including retired and occupation unknown.
*Rate is significantly different from zero with a probability greater than 0.99.

Two aspects of the earnings data confound the interpretation of differences in the experience of the two occupational groups as a pure effect of additional educational training. First, a sizable fraction of the earnings of professional workers come from self-employment. Self-employment requires some investment in physical capital and the return on that investment is included in the earnings figures presented. For physicians that investment may be substantial; for lawyers it may be trivial. In any case return to labor of professionals is somewhat overstated by the actual earning data.

Earnings of semi- and unskilled workers are also overstated, and in all likelihood to a greater extent. The earnings data used in the comparison are mean earnings for individuals who file tax returns. Individuals who do not file a return when they are unemployed for extended periods do not enter the computation of mean earnings. Thus the older unskilled worker is represented only when he is actively earning, not when he is forced out of work by sickness, slack business conditions, layoffs,or automation.[18] Analysis of the experience of the 1885–1894

[16]See also David [9b].

[17]In this classification professionals include doctors, lawyers, clergymen, engineers, teachers, and architects. Technical personnel such as para-medical workers, draftsmen, and laboratory technicians were excluded although they are sometimes included in the professional group as technical and kindred workers.

[18]In theory mean earnings for taxpayers could be adjusted for the rate of non-filing, just as the mean for the birth cohort was adjusted to derived means discussed in Section 2.4. Comparison of the distribution of occupation within birth cohorts against 1950 and 1960 Census data indicate good agreement in those years with the distributions obtained from the tax record sample. (See Appendix A.)

The only obstacle to adjusting the mean earnings of occupation groups is the preparation of suitable estimates of the distribution of the population by birth year and occupation in non-Census years. Because of inter-occupational mobility, differential mortality of different occupation groups, and differential migration in response to economic pressures, such estimates are far more uncertain than the population estimates based on age alone (used in Section 2.4).

birth cohort does not seem appropriate because of this bias. We examine only those cohorts in which a high rate of filing tax returns indicates a high rate of participation in the labor force.

Table 2.6-1 indicates an expected pattern for the semi-skilled and unskilled. The 1915–1924 birth cohort, the maturing workers who have already been in the labor force for a period of years, show a three percent rate of growth of real earnings. That rate is somewhat above the "generalized productivity increase" derived earlier. Older cohorts of semi-skilled and unskilled workers show a rate of growth of earnings slightly lower than the generalized productivity increase. The rate shown for the 1895–1904 birth cohort may be artificially large, as some unskilled workers of that cohort have already dropped out of the labor force because of local unemployment and discrimination against the older worker in the labor market.

The growth of earnings for the professional shows a somewhat different pattern than anticipated, but one which can be explained largely by the time required for many professionals to advance to positions commensurate with their formal training. The 1925–1964 cohort of professional workers shows a rate of growth of earnings less than that of the unskilled. Apprenticeship of physicians as interns, lawyers as salaried novices, and delayed entry into regular employment associated with graduate training may be responsible.

The earnings growth for older professionals exceeds the average during the peak earning decade (1905–1915) but declines radically for the oldest non-retiring cohort, as a result of little earnings growth after 1957. The forces producing this pattern remain an open question.

The evidence of Table 2.6-1 can be interpreted in view of the educational attainment of professional workers and managerial workers:

1. The rate of growth of earnings associated with maturation continues longer for both groups than for the relatively less educated semi- and unskilled workers.

2. Over a period that includes the years of peak earnings and peak labor force participation professional and managerial earnings grow at a rate substantially higher than the semi- and unskilled. The longer working lifetime of these occupational groups adds to this differential. However, semi-skilled and unskilled workers are able to embark on their careers earlier in life so that income growth occurs while many professionals are still in training. If the rates in Table 2.6-1 can be interpreted as functions of age, the 40-year career of a manager shows greatest earnings growth, or a service worker the least earnings growth.

Some perspective on the implications of the rates of growth obtained in Table 2.6-1 can be obtained by comparing the actual experience of workers with age-related experience in a single cross section. In Table 2.6-2 differential earnings of professional and blue collar workers are estimated in two ways:

1. the differential earnings of workers ten years older in year $t-10$ is taken as a forecast of the experience of the birth cohort;
2. actual differentials experienced by the cohort are deflated by changes in the price level to provide a standard for comparison.

If all birth cohorts experienced the same rate of growth of earnings over the ten-year period, the forecast and actual differentials would be identical. Discrepancies imply that estimates of lifetime income streams such as those obtained by Becker [5], Blaug [6] and Morgan and David [29], must be modified to account for changes in the demand for services of one cohort relative to others. Table 2.6-2 shows quite clearly that some structural model of the demand for labor must be formulated if the dynamics of lifetime incomes and wage differentials are to be understood. The differential rates of growth of earnings of the cohorts shown indicate that average productivity increases cannot be applied across-the-board to accurately forecast differentials from an earlier cross section.

2.7. *The Income Experience of Male Cohorts—Summary*

The data presented relate tax return information to the population of income receivers residing in Wisconsin during the period 1947–1959. Classification of tax returns in successive years by the date of birth of the filer enables us to reconstruct a time series of mean incomes for birth cohorts that represents identical groups of people, identical except for mortality and migration into and out of the state.[19] The time series of mean incomes and components of income obscure many important details—many individuals have no income other than earnings; the majority of workers report either wages or self-employment income but not

TABLE 2.6-2

CROSS-SECTION VERSUS COHORT EARNINGS DIFFERENTIALS OF PROFESSIONAL AND SEMI- AND UNSKILLED WORKERS, 1957–1959
(Wisconsin Taxpayers Only)

Birth Cohort	Year	Differential Forecast from Earnings of Workers 10 years Older in $t-10$	Actual Experience	Difference	
			Constant	Amount	Percent of Actual
		$	$	$	%
1895–1904	1957	4,401	6,296	1,805	28.6
	1958	3,728	6,611	2,883	43.6
	1959	3,970	6,001	2,031	33.8
1905–1914	1957	5,670	5,306	−364	−6.8
	1958	6,271	5,566	−705	−12.6
	1959	7,242	5,440	−1,812	−33.3
1915–1924	1957	3,680	3,182	−498	−15.6
	1958	3,511	3,930	419	10.6
	1959	4,036	4,051	15	0.37

[19]The technique used can be applied to U.S. data from the *Statistics of Income* [18]. Analysis of cohort experience utilizing the quintiles of the income distribution for a limited number of years was already undertaken by Brady [7], on the basis of Current Population Survey data.

both, and so forth. Nevertheless, a measure of the central tendency of the distribution does give some insight into global forces that have impinged on individuals over the period of observation. A model of income determination must be sufficient to explain the dynamics of these means. Individual experiences may be different from the mean, but again a model of individual experience must produce the mean upon aggregation. Since many forces in the market can be expected to affect the individuals with similar characteristics in the same manner the time series of mean income experience becomes a source of hypotheses for testing in a model of individual incomes.

The mean data on earnings indicate widely differing growth rates for the birth cohorts studied. The differentials need to be explained by explicit models of productivity and training. Within occupations (and here the populations compared from year to year will differ because of occupational mobility), the cohorts show different patterns of earnings growth which again need to be explained by models of training and labor force entry (Korbel [21]).

Mean data on non-earned income reveal a growth in wealth, just as earnings data revealed a growth in productivity. Differential rates of accumulation of interest-bearing and dividend-yielding assets occurred for the different cohorts studied. Again such differentials need to be related to rates of growth of earnings, life-cycle, and the perhaps idiosyncratic development of asset prices and yields during the period of observation.

Further insight into the data is required to answer questions raised about the role of education in the dynamics of earnings, possible differential mortality and migration of the rich and the poor, and the contribution of occupational mobility to earnings growth. These questions cannot yet be answered; however, in the next section of the paper we contrast the actual experience of *individuals* with the experience of the *birth cohort* of which he is a member in an effort to describe the heterogeniety of experience that lies buried in the time series of means discussed thus far.

3. Individual Income Experience Relative to the Birth Cohort

Since the sample of tax records was generated in such a way as to provide time series of the *individual* experiences of residents in Wisconsin, it is natural to attempt to describe those experiences. One common tool that has been used in the past is the development of transition probabilities that describe an individual's likelihood of moving from one layer of income distribution to another.[20] Use of the Markov matrix seemed inappropriate because we have every reason to believe from our analysis of the time series of means that the probabilities of transition did not remain fixed. Markov analysis would only be appropriate on the residual influence after structural changes in the market for factors had been adequately removed. Since such a model had not been estimated, we chose an alternative technique.

[20]Actually such matrices can be estimated from marginal distributions if the probabilities can be considered fixed (Lee, Judge, and Takayama [25]). If not, a great deal of information can still be generated if some limited hypothesis can be made about the manner in which transition probabilities have changed (David and Otsuki [11]).

Individual data on adjusted gross income were transformed into an index that describes the position of the individual relative to the experience of his cohort. For each individual a trend was fit through the time series of income relatives. Three types of information resulted:

1. the relative income position of the individual in the base year as estimated from the trend line;
2. the trend of the relative over the period for which tax returns were available; and
3. characteristics of the unexplained variance in income.

The last indicates variability in income that cannot be explained either by general experiences of a cohort or a linear development of adjusted gross income relative to the cohort.[21]

3.1. *Specification of the Sub-sample and Models*

The two models fit to the individual time series are as follows:

Model A

$$y_{it} = \frac{Y_{it}}{Z(B_i)_t} \tag{1}$$

$$y_{it} = \alpha_i^* + \beta_i^*(t-1959) + \eta_{it}^* \tag{2}$$

where Y_{it} is the adjusted gross income of individual i in year t; $Z(B_i)_t$ is the estimated mean income of the birth cohort B_i to which the individual belongs in the year t. We assume $E(\eta_{it}^*) = 0$ and

$$E(\eta_{it}^* \eta_{jt'}^*) = 0 \qquad \text{if } i \neq j \text{ or } t \neq t'$$
$$= \sigma_i^{*2} \qquad i = j \text{ and } t = t'.$$

Model B is identical to Model A except for the specification of an auto-regressive process in the stochastic term:

Model B

$$y_{it} = \alpha_i + \beta_i(t-1959) + \epsilon_{it} \tag{3}$$

$$\epsilon_{it} = \eta_{it} + \mu_i \epsilon_{i,t-1} \tag{4}$$

where η_{it} has the same properties as η_{it}^*. To assure finite variance of ϵ_{it} and avoid a random walk:

$$-1 < \mu_i < +1 \tag{5}$$

In order to estimate (3) with at least one degree of freedom at least four pairs of observations $(y_{i,t}, y_{i,t-1})$ must be available. A subsample of tax records with this minimal amount of data was selected from the main tax record sample. As mobility into or out of the state, death, and periods of non-filing of tax returns associated with low income all operate to reduce the number of tax returns observed for an individual, the time series for individuals in the subsample is no

[21] Further discussion of the model appears in David, Miller and Bauman [10].

longer representative of all income receivers nor even of tax-return filers. Non-representativeness is indicated by departure of the mean value of the intercept (α_i, α_i*) over the subsample from a value of unity, or a non-zero mean value for the trend coefficients (β_i, β_i*).[22]

3.2. *Characteristics of Relative Income Change*

The two models give largely parallel results. For the majority of the subsample the autoregressive coefficient μ_i does not appear significant using ordinary least squares estimators.[23] (See Table 3.2-1.) Table 3.2-2 indicates that the auto-regressive parameter shows the greatest variation for those individuals for whom only a few observations are available. This is partly a statistical artifact, since the sampling variation of the estimate will necessarily be larger for the small samples; nevertheless the auto-correlation coefficient is not negligible for sixty percent of the individuals observed for the full 13 years. These values are by and large not significant, but do suggest a problem of non-linearity that we have not adequately specified in our model. We continue to use the auto-regressive specification, recognizing that it may bias estimates of the other parameters. We exclude cases in which $m_i < -0.99$ or $0.95 < m_i$, as inadmissible in view of (5).

Table 3.2-3 shows the high correlation between trend parameters estimated from Models A and B. The trend coefficient is significantly different from zero in four-fifths of the cases in Model B, only one-fifth of the cases in Model A (see Table 3.2-4). Negative trends of -0.01 to -0.09 account for a third of the significant cases; positive trends of 0.01 to 0.10 (but not including 0.01) account for another forty percent of the significant cases (Model B). This finding implies that the mean cohort income experience illustrated in Figure 2.1-1 is an amalgam of relatively heterogeneous experiences of particular individuals in the cohort. A model of the individual time series would contribute substantially more information than the model of aggregate means.

Table 3.2-5 summarizes mean values of parameters estimated from Models A and B for the birth cohorts studied earlier. The expected value of $\bar{a}_i$* within each cohort is unity, if the sample is representative. For the cohorts born prior to 1905 there is clear evidence of the bias in tax return filing individuals towards those with high income. The remainder of the cohorts present a mixed picture, and we are at a loss to explain values of less than unity except by inter-state mobility of relatively high-income persons within each birth cohort.

[22]The model described by (1) and (2) is unquestionably naive. To the extent that $Z(B_i)_t = f(X_t)$ where X_t is some vector of exogenous variables, all is well and good. However, it is likely that some individual characteristics also enter. To the extent that individual characteristics of the members of the cohort have changed systematically over the period of observation, our estimate of the trend coefficient includes the associated change in relative income position. This is an omitted variable problem in our specification (Goldberger [14]).

The subsample is also limited to half of the individuals with sufficient data. Alternate clusters of two individuals were selected from a file in which individuals appear in alphabetical order of name group and household identifier [3].

[23]Unfortunately small sample estimates are biased. Orcutt and Winokur [33] have provided Monte Carlo estimates of the bias when the only other parameter estimated is the intercept. Inclusion of a trend in Model B implies that their results are not directly applicable.

We distinguish estimates by the use of roman letters corresponding to the Greek parameters in (2)–(4).

TABLE 3.2-1

DISTRIBUTION OF m_i BY SIGNIFICANCE LEVELS

(Model B)

Character of the Error term	Distribution of the Sample (percent)	Percent Significance at 1% level	Distribution of Highly Significant Cases	Number of Cases
Unstable oscillations				
Less than −.99	2%	9%	1%	92
Damped oscillations				
−0.99−−0.80	1	13	1	55
−0.79−−0.60	4	24	6	155
−0.59−−0.40	7	25	11	263
−0.39−−0.20	14	26	23	521
−0.19−−0.05	14	22	20	528
Negligible auto-regression				
−0.04–0.05	10	16	10	363
Positive auto-regression				
0.06–0.20	14	15	14	516
0.21–0.40	15	10	10	562
0.41–0.60	9	4	2	343
0.61–0.80	5	2	1	170
0.81–1.00[a]	2	*	*	61
Unstable positive auto-regression				
1.01–1.20	1			28
Greater than 1.20	2	2	*	83
TOTALS, AVERAGE	100%	15.6%	100%	3,740

[a] The value $m_i = 1$ implies a random walk in the stochastic process and makes it impossible to estimate a_i, b_i.

*Less than 0.5%.

Individuals are further classified according to the number of distinct occupational groups reported during the period. Individuals with a unique occupation reported the highest intercept and the largest trend, for cohorts born prior to 1905.[24] Individuals with one occupation change had both the largest intercept and the largest trend in the 1905–1914 and 1930–1934 birth cohorts. Those individuals with more than one occupational change showed the least intercept except for the 1925–1929 cohort. The cohorts prior to 1905 and 1930–34 show the smallest trend. The importance of one occupation change for income growth in the 1930–1934 cohort demonstrates the importance of mobility to establishing a productive career line for a substantial proportion of young men.

[24] In part this is a definitional matter. Retirement from the labor force is considered a change in occupation. As individuals are more likely to file a tax return in the year in which they leave the labor force than the year in which they enter, some negative movement associated with retirement would be expected. As we have already seen persons in the labor force for a period of time are more likely to have non-earned income to report. Thus retirees are more likely to file returns than young persons prior to entering the labor market.

TABLE 3.2-2

DISTRIBUTION OF THE AUTOREGRESSIVE COEFFICIENT m_i GIVEN THE DEGREES OF FREEDOM AVAILABLE FOR EACH INDIVIDUAL

(Model B)

	Degrees of Freedom				
m_i	1–3	4–6	7–8	9	All
Unstable oscillations					
Less than −0.99	8%	1%	1%	1%	2%
Stable oscillations					
−0.99–−0.80	3	2	1	1	1
−0.79–−0.60	10	4	2	1	4
−0.59–−0.40	12	8	4	4	7
−0.39–−0.20	13	15	14	14	14
−0.19–−0.05	11	15	16	15	14
Negligible auto-regression					
−0.04–0.05	8	10	12	10	10
Positive auto-regression					
0.06–0.20	9	14	13	16	14
0.21–0.40	8	14	17	19	15
0.41–0.60	4	8	14	12	9
0.61–0.80	3	4	4	6	5
0.81–1.00	2	1	2	1	2
Unstable positive auto-regression					
1.01–1.20	1	1	1	1	1
Greater than 1.20	6	2	1	1	2
TOTALS	100%	100%	100%	100%	100%
Number of cases	938	838	446	1,518	3,740

The negative mean values for the trend coefficient $\bar{b}^*$ were not anticipated, but can be explained for the youngest and oldest cohorts shown in Table 3.2-5. The oldest cohort reporting a change in occupation is likely to have retired. The resulting drop in income (which may only be reflected in one tax return in the year of retirement) far exceeds the fall in average income for the cohort. The latter is derived from individuals born in ten years and represents an average of the experience of some individuals who have already retired, some currently retiring, and some experiencing income growth from market changes in earnings.

The negative trend of tax return filers in the 1925–1934 birth cohort results from the high levels of starting salaries received by college graduates. As observed in Table 2.4-1, growth of earnings of the cohort reflects the entry of new workers. As we do not observe a large proportion of students filing tax returns prior to their entry into full-time work, individuals filing returns constitute a sample of early entrants to the labor force who experienced earnings growth from the process of maturation described earlier. That rate of growth is necessarily less than the growth of mean incomes of the cohort.

TABLE 3.2-3

COMPARISON OF b_i AND b_i^*
(Cases for which m is between -0.99 and 0.95)

Upper Limit to Value of b_i^*	Upper Limit to Value of b_i														
	−0.50	−0.25	−0.10	−0.05	−0.02	−0.01	0.00	0.01	0.02	0.05	0.10	0.25	0.50	99.00	TOTAL
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
−0.50	0.72	0.08													0.8
−0.25	0.25	1.44	0.28										0.02	0.02	2.0
−0.10	0.14	0.45	5.67	0.74	0.08	0.02						0.02	0.02	0.02	7.4
−0.05	0.08	0.08	1.39	7.38	1.13	0.08	0.08	0.02		0.05					10.3
−0.02	0.08	0.11	0.56	1.53	12.40	1.02	0.28	0.17	0.02	0.08	0.05				16.4
−0.01			0.19	0.11	1.05	4.79	0.99	0.08	0.11	0.14		0.05			7.6
0.00			0.11	0.28	0.39	0.90	6.01	1.05	0.19	0.05	0.02	0.02			9.1
0.01			0.11	0.14	0.11	0.22	1.19	5.99	0.76	0.45	0.08		0.05		9.1
0.02			0.02	0.14	0.14	0.02	0.19	0.96	5.05	1.19	0.11	0.05	0.02		8.0
0.05			0.17	0.08	0.08	0.14	0.11	0.14	1.05	11.64	0.99	0.17	0.02		14.6
0.10			0.02	0.02	0.08	0.08	0.02		0.17	0.74	6.87	0.65	0.11	0.02	8.9
0.25			0.02		0.05				0.02	0.08	0.08	3.74	0.25	0.11	4.4
0.50	0.02											0.14	0.90	0.05	1.1
99.00	0.02													0.36	0.4
TOTAL	1.3%	2.3%	8.6%	10.4%	15.6%	7.3%	8.9%	8.4%	7.4%	14.5%	8.3%	4.9%	1.4%	0.6%	100.0%

TABLE 3.2-4

SIGNIFICANCE OF TREND COEFFICIENTS AND DISTRIBUTION OF HIGHLY SIGNIFICANT COEFFICIENTS WHEN m_i IS BETWEEN 0.99 AND 0.95

	Model A		Model B	
Upper limit to b_i	Percent of b_i* Significant at 0.01 level	Distribution of highly Significant b_i*	Percent of b_i Significant at 0.01 level	Distribution of highly Significant b_i
Decreasing Trend				
−0.50	0%	0%	12.8%	0.3%
−0.25	0	0	7.5	0.3
−0.10	4.2	1.1	19.5	2.5
−0.05	36.9	35.2	40.2	6.4
−0.02	26.0	61.4	63.7	15.1
−0.01	0.5	2.3	76.3	8.5
0	0	0	81.2	11.4
Increasing Trend				
0.01	0	0	84.8	11.0
0.02	0	0	85.8	9.7
0.05	0	0	85.7	18.9
0.10	0	0	80.1	10.1
0.25	0	0	64.0	4.8
0.50	0	0	45.1	2.9
99.00	0	0	45.5	0.4
TOTAL	22.1%	100.0%	79.2%	100.0%

The foregoing interpretations are supported by the fact that members of the cohort born prior to 1895 with a unique occupation have the highest trend, equal to 0.0233, while members of the 1930–1934 cohort with a unique occupation have the lowest trend, equal to −0.1029, within the cohort.[25]

Table 3.2-6 shows the results of Model A classified by occupation and occupational mobility. Findings for individuals with a unique occupation are reported together with findings for persons who held no more than two occupations in different categories. The latter group was also limited to persons who reported the second occupational category more than 20 per cent of the period for which tax returns were filed. The comparison thus attempts to measure the impact of mobility after the individual has become somewhat established in his new position; the 20 percent limitation assures that at least two observations on the second occupation are available for those individuals who filed eight or more tax returns.

The results in Table 3.2-6 are described by the mean of Y_{it} for each category and the mean trend coefficient. The results supplement the data presented in Section 2.6. Semi-skilled and unskilled workers show a negative rate of increase, −0.0214, in income relative to the cohort while managers show the largest rate of increase, 0.0582. The trend in the third column of Table 3.2-6 includes

[25]Because of non-filing by retired persons a small fraction of the individuals born prior to 1895 reported that their unique occupation was rentier, not in the labor force. Obviously the sample is biased.

TABLE 3.2-5

VALUES OF THE MEAN INTERCEPT $\bar{a}^*$ AND MEAN TREND COEFFICIENT $\bar{b}^*$ WITHIN BIRTH COHORTS: MODEL A

$-0.99 \leqslant m_i \leqslant +0.95$

Occupational Mobility	Prior to 1885	1885–1894	1895–1904	1905–1914	1915–1924	1925–1929	1930–1934	Age Unknown	All[a]
Entire Sample									
No. of observations	120	376	632	765	745	359	209	235	3,522
$\bar{a}^*$	1.22	1.08	1.18	1.02	1.01	0.73	0.91	1.22	1.06
$\bar{b}^*$	−0.0257	−0.0047	0.0067	0.0043	−0.0047	−0.0242	−0.0879	0.0168	−0.0127
Unique Occupation									
No. of observations	58	174	401	466	383	144	72		1,698
$\bar{a}^*$	1.40	1.33	1.27	1.03	1.01	0.90	0.86		1.11
$\bar{b}^*$	−0.0124	0.0233	0.0105	0.0005	−0.0089	−0.0269	−0.1029		−0.0042
One Occupation Change									
No. of observations	52	152	167	208	242	132	86		1,039
$\bar{a}^*$	1.40	0.94	1.12	1.05	1.01	0.95	1.03		1.04
$\bar{b}^*$	−0.0362	−0.0238	0.0012	0.0136	−0.0057	−0.0292	−0.0594		−0.0123
Two or More Occupation Changes									
No. of observations	10	50	64	91	120	83	51		469
$\bar{a}^*$	0.72	0.66	0.76	0.86	1.00	0.97	0.77		0.84
$\bar{b}^*$	−0.0488	−0.0412	−0.0026	0.0018	0.0104	−0.0116	−0.1148		−1.73

[a] Includes 81 individuals born after 1934, not shown separately in the table.

growth in non-earned income and omits the income experience of persons who changed jobs; the trend in Table 2.6-1 excludes non-earned income and includes all workers with a given current occupation.

The data for those who change occupations are rather thin. Nevertheless they tell a reasonable story. Persons who left self-employed businesses, farming, and clerical jobs averaged more income and a higher rate of income growth than non-movers. Paradoxically, persons entering self-employment were likely to experience greater and more rapidly growing incomes than those already so-employed. Entering any other occupation was likely to leave the entrant in a worse economic position than those established except for semi-professional and the semi-unskilled where indications of mean income and trend conflict.

These kinds of findings clearly deserve explanation in terms of the relative demands for workers in different occupational groups and some theory of entry into self-employed occupations. Having explored the determinate part of income variation relative to the birth cohort, we now present some results on the nature of the stochastic term.

Table 3.2-7 exhibits mean values of the autoregressive coefficient and the error variance for Model B. The latter is adjusted for the available degrees of freedom, so there is no problem in specifying autoregression when none is actually present. In the table each individual is classified according to the occupation reported most frequently. Professionals, managerial workers, and self-employed businessmen show a relatively high standard error of estimate; semi-skilled, sales workers, and clerical workers show a standard error of estimate less than the average for the sample.

The great difference between self-employed and non self-employed occupations lies in the corresponding estimates of the autoregressive coefficient, $\bar{m}_s$. Self-employed workers show negative auto-regression. Year-to-year variations in income are correspondingly magnified. Sales and semi-professional workers exhibit moderate positive autocorrelations; relative income instability for that group is therefore smaller than is suggested by the value of $\bar{s}_s$. Positive autocorrelation may well reflect a failure to provide for non-linear movements in relative income; inclusion of variables describing occupational mobility, for example, might provide a more adequate explanation of the relative income pattern. The difference in $\bar{m}_s$ estimated for the non-mobile sales workers and the high value estimated for sales workers as a whole suggests the need for some such variable in the model.

The right hand portion of Table 3.2-7 shows characteristics of the stochastic element for workers who did not change major occupational categories. The autoregressive coefficient should be smaller for nonmovers than for the sample as a whole. Individuals who change occupations probably move from one relative income level to another; that shift would be reflected in runs of errors of the same sign from the trend line fitted for Model B. Movers would be more likely to show positive autocorrelation than nonmovers as a consequence.

In fact, for workers with a unique occupation (or continuously out of the labor force) the autoregressive coefficient is more than one hundredth smaller for five of the eleven occupational categories than for all workers in the category. The converse holds only for those continuously out of the labor force.

TABLE 3.2-6

MEAN RELATIVE INCOME POSITION AND MEAN TREND COEFFICIENT: MODEL A
(Cases for which $-0.99 \leqslant m_i \leqslant 0.95$ only)

Occupation Reported on Tax Return	Individuals with a Unique Occupation				Individuals with One Major Change in Occupation[a]						
					Occupation of Origin			Terminal Occupation			
	No.	$\bar{Y}$	$\bar{b}^*$	Average Number of Years Filed	No.	$\bar{Y}$	$\bar{b}^*$	No.	$\bar{Y}$	$\bar{b}^*$	Average Number of Years Filed
		$				$			$		
Professional	127	8,404	0.0574	6.9	20	4,059	−0.0559	22	4,581	0.0548	5.7
Semi-professional	46	7,611	0.0147	7.0	10	4,619	0.0165	14	3,427	0.0284	6.5
Managerial	106	8,865	0.0582	7.9	32	5,364	−0.0125	63	5,669	−0.0034	3.1
Self-employed											
Business	152	3,876	−0.0460	7.6	36	3,912	0.0045	54	4,043	−0.0354	8.0
Farmers	312	2,304	−0.0272	7.5	62	2,519	0.0138	32	2,614	−0.0191	7.8
Clerical	52	3,909	−0.0115	6.6	37	3,943	0.0003	24	3,626	0.0021	7.5
Sales	83	5,586	−0.0131	7.6	33	4,697	−0.0297	22	4,762	−0.0312	6.7
Service	60	3,435	0.0052	7.0	23	2,983	−0.0353	34	2,500	−0.0214	5.8
Skilled	304	4,544	−0.0095	7.8	85	4,005	−0.0222	115	4,106	−0.0094	7.4
Semi-unskilled	650	3,502	−0.0214	7.0	249	3,404	−0.0236	144	3,096	−0.0062	7.7
Not in labour force	20	715	0.0361	7.2	15	3,154	0.0715	76	2,315	−0.0773	7.4
All	1,912	4,292	−0.0096	7.4	602	3,666	−0.0171	611	3,656	−0.0171	7.3

[a]More than 20% of time spent in second job.

TABLE 3.2-7

CHARACTERISTICS OF THE DISTURBANCES WITHIN GROUPS BASED ON OCCUPATION HELD LONGEST DURING THE SAMPLE PERIOD—FOR ALL WORKERS AND FOR WORKERS WITH NO CHANGE IN OCCUPATION

$-0.99 < m_i < +0.95$
(Model B)

Occupation held Longest During Sample Period	All Workers			Workers with No Change in Occupation		
	$\bar{m}_s$	$\bar{s}_s^2$	Number of Observations	$\bar{m}_{ss}$	$\bar{s}_{ss}^2$	Number of Observations
Professional	0.010	0.44	177	−0.0004	0.45	169
Semi-professional	0.076	0.27	76	0.085	0.27	65
Managerial	0.053	0.69	215	0.061	0.69	173
Self Employed						
Business	−0.015	0.61	269	−0.016	0.61	223
Farm	−0.024	0.56	416	−0.023	0.56	400
Clerical	0.035	0.04	136	0.022	0.04	106
Sales	0.056	0.15	168	0.022	0.15	128
Service	0.011	0.20	139	−0.0003	0.20	107
Skilled	0.042	0.21	591	0.031	0.21	492
Semi-skilled and unskilled	0.011	0.04	1,168	0.007	0.04	1,018
Not in labor force	−0.018	0.76	99	0.005	0.76	67
Not ascertained	−0.038	0.29	68	−0.051	0.29	36
All	0.015	0.28	3,522	0.010	0.28	2.984

If workers who change occupations are either engaging in pursuits in which they have had little experience or have made the change as a result of some economic windfall or loss, one would expect the standard error of estimate for the stabile groups to be less than for the sample as a whole. This hypothesis does not hold; in fact the identity between s_s^2 and s_{ss}^2 is uncanny.

Available evidence, while incomplete, verifies the statistical relevance of classifications based on both occupation held longest and on birth year. Table 3.2-8 shows the distribution of the standard error of estimate within groups based on occupation reported most frequently. The null hypothesis that all underlying frequencies come from the same distribution must be rejected as $\chi^2 = 591.0$ for the table. Similarly distributions of m_i within birth cohorts cannot be considered as samplings from a global population with common variance; the null hypothesis was rejected here with a value of $\chi^2 = 1299$ for a table with 108 degrees of freedom, summarized in Table 3.2-9.

4. CONCLUSIONS—INDIVIDUAL VERSUS COHORT EXPERIENCE

A wide dispersion of actual experiences affected tax return filing individuals during the period 1947–1959. Simple classification of individuals by occupational group or birth cohort indicates both the differential experiences that we observed in Section 2 in time series of mean incomes and differing stochastic terms.

TABLE 3.2-8

DISTRIBUTION OF s_i^2 WITHIN OCCUPATION CLASSES
$-0.99 \leq m_i \leq +0.95$

Occupation held Longest During the sample Period	0–0.0025	0.0026–0.0050	0.0051–0.0075	0.0076–0.0100	0.0101–0.0150	0.0151–0.0200	0.0201–0.0250	0.0251–0.0400	0.0401–0.0900	0.0901–0.1600	0.1601–0.2500	0.2501–0.9999	1.0–10.0	10.0–99.0	Total
Professional	7.3	8.5	6.8	6.2	8.5	6.8	4.5	6.8	14.1	7.3	6.8	9.0	6.8	0.6	100.0%
Semi-professional	10.5	14.5	9.2	4.0	2.6	5.3	7.9	5.3	17.1	5.3	4.0	9.2	5.3	0.0	100.0%
Managerial	5.6	8.4	5.6	5.6	8.4	5.6	3.7	9.3	15.8	7.9	5.6	8.8	8.4	1.4	100.0%
Self-employed															
Business	4.1	2.6	2.2	3.0	5.6	5.6	1.5	9.7	21.6	11.9	8.2	17.8	6.0	0.4	100.0%
Farm	3.1	6.8	2.6	2.2	10.1	8.4	5.8	13.7	21.4	10.6	4.8	8.2	1.4	0.7	100.0%
Clerical	12.5	16.2	10.3	13.2	8.8	7.4	2.9	6.6	11.8	4.4	2.9	2.9	0.0	0.0	100.0%
Sales	8.9	10.1	4.8	4.2	10.7	3.6	6.6	11.9	17.3	9.5	3.6	6.6	2.4	0.0	100.0%
Service	14.4	9.4	12.2	5.0	8.6	8.6	7.9	6.5	15.1	3.6	0.7	6.5	0.0	1.4	100.0%
Skilled	6.1	7.1	8.0	7.8	8.6	11.7	5.1	13.2	14.9	9.6	3.6	3.6	0.5	0.3	100.0%
Semi- and unskilled	8.6	11.9	8.3	7.7	10.4	8.1	6.8	10.4	14.3	7.4	2.5	3.1	0.3	0.0	100.0%
Not in labor force	7.1	3.0	4.0	5.0	5.0	6.1	3.0	8.1	14.1	15.2	8.1	20.2	0.0	1.0	100.0%
Not ascertained	10.3	7.4	7.4	5.9	4.4	2.9	5.9	14.7	16.2	10.3	1.5	7.4	5.9	0.0	100.0%
All	7.4	9.1	6.8	6.2	9.0	7.9	5.5	10.6	16.0	8.6	4.0	6.5	2.0	0.4	100.0%

TABLE 3.2-9

DISTRIBUTION OF m_i WITHIN BIRTH YEAR COHORTS
(Cases for which $-0.99 \leqslant m_i \leqq 0.95$ only)

Values of m_i	1860–1884	1885–1894	1895–1904	1905–1914	1915–1924	1925–1929	1930–1934	Age Unknown	Total*
	%	%	%	%	%	%	%	%	%
−0.99−−0.80	3.5	3.1	0.6	0.3	0.5	0.6	0.4	1.1	0.9
−0.79−−0.60	4.4	4.2	2.4	2.0	1.8	1.9	4.2	4.3	2.5
−0.59−−0.40	7.7	5.4	5.8	6.2	3.2	5.9	10.7	5.6	5.5
−0.39−−0.20	15.3	10.9	16.7	14.4	13.6	14.0	15.3	15.8	14.5
−0.19−−0.05	11.0	9.7	17.6	16.0	16.0	15.6	16.7	10.3	15.1
−0.04− 0.05	7.1	9.4	9.3	11.6	10.9	13.6	7.2	8.9	10.5
0.06− 0.20	11.8	10.6	16.1	17.7	17.0	12.8	14.6	17.1	15.6
0.21− 0.40	15.3	17.6	16.4	16.3	20.4	18.8	14.4	21.0	17.8
0.41− 0.60	15.1	12.8	11.0	9.7	11.0	10.8	14.1	11.6	11.1
0.61− 0.80	6.9	13.1	2.6	4.8	4.9	4.8	2.3	2.9	5.1
0.81− 1.00	1.7	3.5	1.4	1.0	0.8	1.2	0.0	1.5	1.4
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0 %

*Also includes those individuals born after 1934.

Exactly how these observed details can be captured in an analytical model of income determination is not clear. A theory of the impact of job change on earnings is sorely needed to explain why some shifts lead to relative improvement in economic position, while others lead to decline.

The study of individual time series in Section 3 shows forcefully that information on micro-units, the actors in the economy, reveals a great deal that cannot be seen in aggregates. At the same time results presented in Section 3 pertain to a limited population that is not representative of all income receiving individuals in the State of Wisconsin. As a consequence a serious problem remains to be solved—how can limited amounts of data on specialized samples over a long period of time be used to yield information on complex processes that determine income in the population at large.

This naive description was presented as a stimulus to other workers to help exploit our rich sample of information on State of Wisconsin taxpayers.*

APPENDIX

The data used in this paper were obtained from a sample of tax returns filed in the State of Wisconsin between 1947 and 1959. The returns were drawn randomly according to the name of the individual filing the return; they were drawn in such a manner that the *same* individual would be sampled in every year given that his name appeared in a single year. Income distributions obtained from the sample and a full description of methodology are available in Moyer [30]. Relationship of this sample to other data collected for this individual and the processing of the data are fully described in Bauman, David, and Miller [3].

As the sample yields only information for tax-filing individuals a number of persons in each birth cohort are excluded from the sample universe. To extend the sample data to the adult income receiving population, some estimates of the income of the non-filing population and the rate of filing tax returns were required. (As indicated in the footnote table in note 7, the rate of filing has varied over birth cohorts and over time). As no information is available to give income estimates for the non-filing population, they were assumed to have $200.00 of adjusted gross income; that amount was not allocated to components of income. Effectively we assumed that non-filers had no income from wages, self-employment, interest, or dividends in our analyses of income components. Table A.1 indicates the implications of these assumptions for the two years of our sample period for which Census income data are available. Column 1 indicates the amount of mean adjusted gross income obtained when it is assumed that non-filing individuals have no income subject to reporting on tax returns; column 2 indicates the mean of adjusted gross income when individuals that do not file have $200.00 that would be reported on tax returns, if the individual were required to file. For comparison the mean income reported to the Census is recorded in column 3.

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TABLE A.1

COMPARISON OF MEAN CENSUS INCOME AND ADJUSTED TAX SAMPLE MEANS BY BIRTH COHORT AND YEAR

Census Year and Birth Cohort	Adjusted Gross Income: Assuming Non-filers have no such Income (1)	Adjusted Gross Income: Assuming Non-filers have $200 or such Income (2)	Census Mean Income (3)	Ratio (1) ÷ (3) (4)	Ratio (2) ÷ (3) (5)
1949					
Prior to 1885	1,107	1,187	1,996	0.555	0.594
1885–1894	2,353	2,424	3,270	0.720	0.741
1895–1904	3,388	3,424	3,735	0.907	0.916
1905–1914	2,968	3,006	3,552	0.835	0.846
1915–1924	2,330	2,390	2,951	0.790	0.809
1925–1929	1,404	1,483	1,904	0.737	0.778
1959					
Prior to 1885	722	1,127	1,985	0.364	0.567
1885–1894	1,970	2,052	3,119	0.632	0.657
1895–1904	5,212	5,224	5,201	1.002	1.004
1905–1914	5,346	5,359	5,844	0.915	0.917
1915–1924	5,156	5,251	6,124	0.842	0.857
1925–1929	4,765	4,789	5,634	0.846	0.850
1930–1934	3,652	3,693	4,704	0.776	0.785

Some justification for the $200.00 of income for non-filing individuals can be found in the detailed reporting of income sources by the aged in the 1963 Social Security Survey of the Aged. There retirement-related benefits and public assistance accounted for about two-fifths of the income of the aged. Table A.1

TABLE A.2

PERCENT OF TAX RETURNS REPORTING CAPITAL GAIN OR LOSS

Year	Wisconsin returns (Wisconsin only)	Federal returns (entire U.S.)
1947	5.7	4.49
1948	6.2	4.38
1949	5.9	4.12
1950	6.6	4.83
1951	6.1	4.89
1952	5.5	4.78
1953	5.4	4.80
1954	6.0	5.42
1955	6.3	6.10
1956	6.5	6.64
1957	5.1	6.64
1958	5.4	7.43
1959	6.8	8.14

TABLE A.3

ESTIMATED VALUES OF WISCONSIN MEAN BIRTH YEAR COHORT INCOMES, $Z_t(B_i)$, 1947–1959

Birth Years

From Through	Before 1885	1885–1894	1895–1904	1905–1914	1915–1924	1925–1929	1930–1934	1935–1939	1940–1945	1946–After	All Cohorts
Year											
1947	2,100	3,446	3,783	3,574	2,647	1,316	489	250	100	100	2,842
1948	2,100	3,534	4,428	4,278	2,958	1,737	559	300	125	100	2,970
1949	1,996	3,270	3,735	3,552	2,951	1,904	698	350	150	100	2,894
1950	1,995	3,565	4,107	4,100	3,322	2,240	802	350	150	100	3,216
1951	1,994	3,767	4,172	4,439	3,889	2,901	1,244	350	150	100	3,501
1952	1,993	4,083	4,538	4,529	4,044	3,274	1,626	350	150	100	3,658
1953	1,992	3,936	4,488	4,753	4,351	3,541	1,968	500	200	100	3,764
1954	1,990	3,594	4,469	4,766	4,351	3,650	2,303	784	200	100	3,765
1955	1,989	3,787	4,791	5,066	4,632	3,982	2,752	1,175	200	100	3,949
1956	1,988	3,589	4,711	5,496	5,279	4,590	3,401	1,473	300	150	4,201
1957	1,987	3,478	4,356	5,581	5,403	4,881	3,837	1,864	300	150	4,252
1958	1,986	3,283	4,708	5,644	5,584	5,177	4,069	2,442	400	150	4,323
1959	1,985	3,119	5,201	5,844	6,124	5,634	4,704	3,226	1,069	150	4,646

shows that a third to two-fifths of income of males 65 or over is not recorded in the adjusted gross income figures (see columns 4 and 5). Increasing the amount of unreported income subject to filing beyond $200.00 would tend to increase the share of such income beyond the level indicated in that survey (which is unfortunately three years later than the period in which we are interested).

For nine out of the thirteen years covered by our sample capital gains were reported at a higher rate than in the United States as a whole. As Wisconsin is not marked by being a financial center, and as the rate of reporting increased more in the U.S. as a whole than in Wisconsin, we take this to be an indication that standards of reporting were at least a good as those on the Federal income tax returns. (See Table A.2.)

Evidence of shareholding also corroborates other evidence validating the sample. For an alternative sample of Wisconsin taxpayers Atkinson [16] obtained 8.5 percent of the sample reporting dividends in 1949; we obtained 8.4 percent. For 1955 our estimate of dividend recipients of 10.2 percent compares with *Survey of Consumer Finances* estimates of 10 percent owning corporate shares in the United States as a whole. For 1959 our estimate is 12.1 percent; the Survey of Consumer Finances estimate is 14 percent.

Thus while it is known that reporting of dividends on tax returns shows a downward bias, the few comparisons that are possible indicate rough correspondence between the sample studied here and other work in the field, including the results of personal interview surveys (which are subject to other types of biases).

Finally for the sake of completeness we include a table of the values of $Z(B_i)_t$, Table A.3.

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