Volume Title: Aging in the United States and Japan: Economic Trends

Volume Author/Editor: Yukio Noguchi and David A. Wise, eds.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-59018-6

Volume URL: http://www.nber.org/books/nogu94-1

Conference Date: September 8-9, 1989

Publication Date: January 1994

Chapter Title: Aging and Labor Force Participation: A Review of Trends and Explanations

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Chapter URL: http://www.nber.org/chapters/c8040

Chapter pages in book: (p. 7 - 42)

1 Aging and Labor Force Participation: A Review of Trends and Explanations

Robin L. Lumsdaine and David A. Wise

The American population is aging rapidly. Persons 65 years of age and older, who now constitute about one-fifth of the population, will constitute about two-fifths of the population by 2040. In addition, individuals are living longer. Yet the labor force participation rate of older Americans has fallen dramatically in recent years. This paper discusses this trend and the principal explanations put forth to explain it. The paper is in two parts. The first part reviews trends in labor force participation and associated trends in Social Security (SS) coverage, firm pension plan coverage, and other factors that are likely to be associated with the labor force participation trends. The second part of the paper discusses the incentive effects of SS and retirement plans, with emphasis on firm pension plans. The intent is to summarize the facts and the research that has attempted to explain them. The presentation is primarily graphic. We begin with a simple conceptual framework.

1.1 A Conceptual Framework

To help organize the discussion that follows and to put the ideas in context, a conceptual framework of the retirement decision is outlined in figure 1.1,

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The authors have paraphrased and borrowed freely from papers by Kotlikoff and Wise (1985, 1987, 1989) and Stock and Wise (1990a, 1990b). Data gathered by several other authors have also been used, often in a format different from the original presentation. In all cases, the original sources are cited. Financial support was provided by the National Institute on Aging (grants P01 AG05842 and T32 AG00186) and by the Hoover Institution.

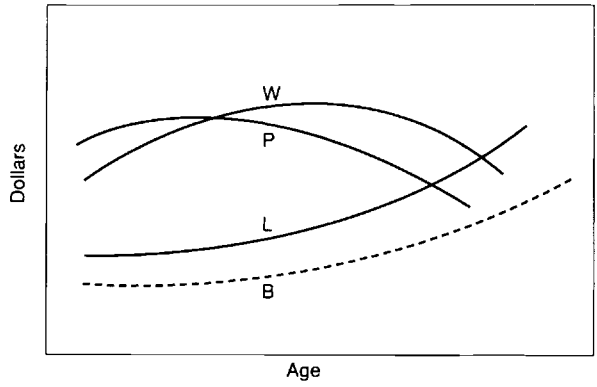

Fig. 1.1 Summary of factors that influence retirement

which summarizes several stylized facts.[1] Several factors have important influences on the retirement decision as workers age. As health and functional ability deteriorate, the disutility of work increases, and the relative desire for leisure increases, indicated by the line labeled *L* in the figure. Real wage earnings typically rise over some portion of the working life but later decline with age, as indicated by *W.* Lower wage earnings and greater hardship associated with working tend to increase the incentive to retire. As employees age, they may also accumulate more personal saving, and their entitlement to SS and firm pension benefits increases. Thus, if the retirement age is postponed, employees are able to support a higher level of consumption after retirement. In addition, any given level of personal saving or SS and pension entitlement can support a higher annual consumption level if retirement is postponed; there are fewer remaining years of life over which support must be provided. This is summarized as *B* in the figure. The larger these benefits, the greater the incentive to retire.

The central theme of the discussion below is the upward shift over time in the relation between benefits and age; given age, SS and pension entitlements have increased. Thus, the incentive to retire has increased. With respect to most of the discussion below, it may be assumed that the relation between real wage earnings and age and the relation between the disutility of work (desire for leisure) and age have not changed over time.

Worker productivity also declines with age. It is often argued that productivity is greater than the wage early in the working life and less than the wage later in the working life. This is the assumption reflected in the relation between worker productivity, *P,* and the wage shown in the figure. This relation is often put forth as an explanation for the structure of private pension plans, which typically encourage early retirement, as discussed below.

1. Our fig. 1.1 is patterned after fig. 10.1 in Nalebuff and Zeckhauser (1985).

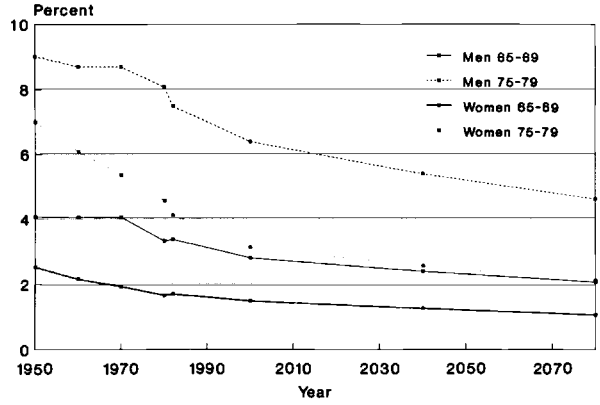

Fig. 1.2 Death rates for men and women, selected ages, by year

1.2 Life Expectancy, Labor Force Participation, and Associated Trends

1.2.1 Life Expectancy and the Age Composition of the U.S. Population

Americans are living longer, and the proportion of the population that is old is increasing rapidly. In 1950, for example, the annual death rate of white men age 75–79 was 90.1 per 1,000; by 1980, it had fallen to 80.7, a 10 percent reduction. Assuming current trends, the projected death rate for the year 2000 is 63.9, a further 21 percent reduction. The reductions for white women are even larger, as shown in figure 1.2.[2]

An implication of the lower death rates is a marked increase in life expectancy, especially for women. Men who were 65 in 1950 could expect to live 12.8 more years; in 1980 they could expect to live 14.2 more years, an 11 percent increase (see fig. 1.3A). Over the same thirty-year period, the life expectancy of women who were 65 increased by over 23 percent, from 15 to 18.5 more years (see fig. 1.3B).

The overall aging of the population probably has more important policy implications than increasing individual life expectancy.[3] The proportion of the population 55 and older has increased from about 15 percent in 1940 to about 21 percent in 1980. By 2020, almost 31 percent of the population will be in this age group (see fig. 1.4A). The elderly (those over 54), who now constitute

2. These data were taken from Poterba and Summers (1987), who obtained their data from the U.S. Department of Health, Education, and Welfare/U.S. Department of Health and Human Services, National Center for Health Statistics, *Vital Statistics of the United States,* vol. 2, *Mortality* (Washington, D.C., 1950, 1960, 1970, 1980).

3. Data for figs. 1.4A and 1.4B are taken from Sandefur and Tuma (1987, table 1) and U.S. Bureau of the Census (1984, table 6).

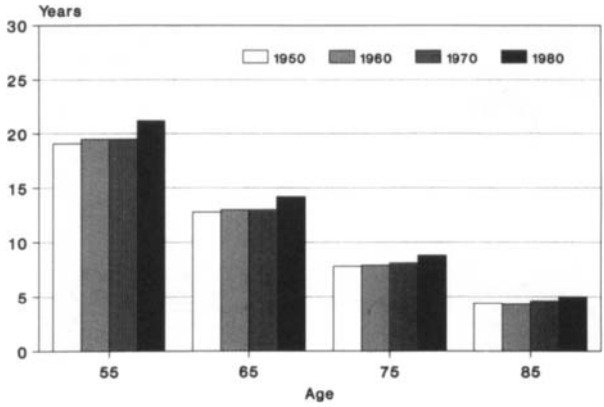

Fig. 1.3A Life expectancy of men at selected ages, by year

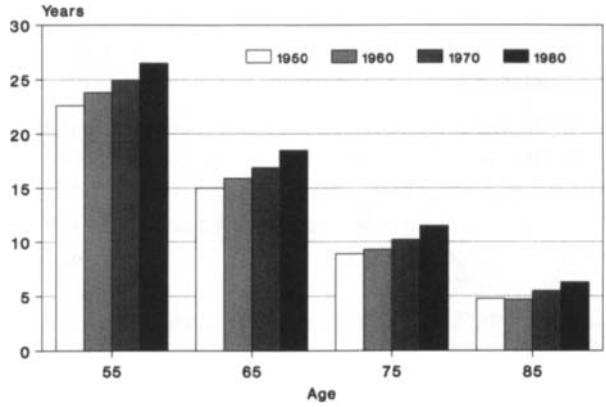

Fig. 1.3B Life Expectancy of women at selected ages, by year

about one-fifth of all adults, will constitute about two-fifths of all adults by 2040.

The oldest age groups are growing the fastest. Only 0.3 percent of the population was over 85 in 1940; the proportion had increased to 1.0 percent by 1980, mostly since 1960 (see fig. 1.4B). The projected proportion is 2.4 in 2020. The proportion between 65 and 74 increased from about 5 percent of the population in 1940 to close to 7 percent in 1980; the 2020 projection is 10 percent. Thus, an increasingly large fraction of the population is older than typical retirement ages. As emphasized below, the dramatic reduction in retirement ages magnifies this effect.

From the point of view of the individual, increasing life expectancy induces later retirement. If other factors remain the same, longer life expectancy means

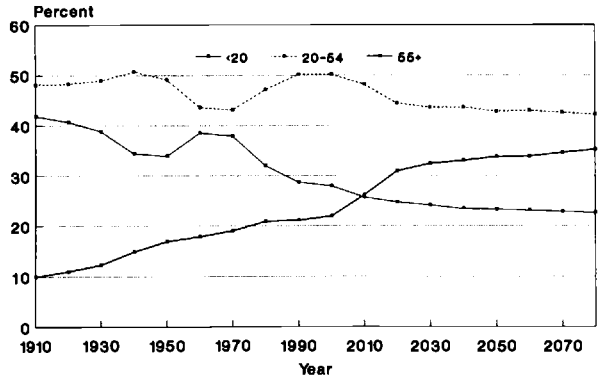

Fig. 1.4A Age composition of the U.S. population (1910–80) and projections (1990–2080), selected age groups

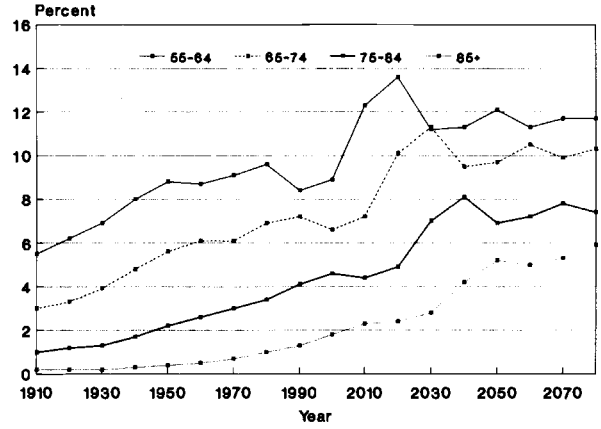

Fig. 1.4B Age composition of the U.S. population over 55 (1910–80) and projections (1990–2080), selected age groups

that any given level of pension and SS entitlement, or of personal saving, must be used to support consumption over more retirement years. From the point of view of society, a larger older population means that a smaller labor force must support a larger number of retirees.

1.2.2 Labor Force Participation

Although a larger and larger fraction of the population is old and individual life expectancy is increasing, workers are leaving the labor force at younger and younger ages. Thus, there are more older people, living longer, working less.

A recent study by Ransom and Sutch (1988) shows that the labor force par-

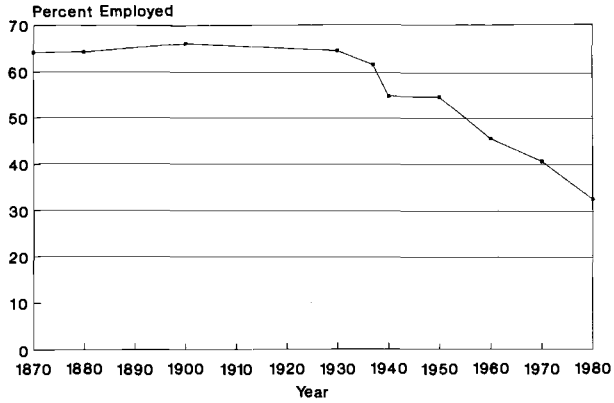

Fig. 1.5A Labor force participation of men over 60, 1870–1980

ticipation rates of men over 60 were essentially constant between 1870 and 1930. Indeed, according to their study, for most older age groups the rates in 1937 were essentially the same as in 1930. Since that time, the labor force participation rates of older men have fallen continuously. Adjusted for the shift away from agricultural employment, the rate increased from a little over 50 percent in 1870 to almost 65 percent in 1930 and then fell to about 30 percent by 1980. Social Security was introduced under the Social Security Act of 1935. Company pensions were spurred by the Revenue Act of 1942, which granted tax incentives to firms to establish pension plans. The Ransom and Sutch data, based on the decennial censuses, are reproduced in figure 1.5A.

These data, as reported in Sandefur and Tuma (1987), have also been used to construct labor force participation rates by age group for men and women at ten-year intervals, beginning in 1940 (figs. 1.5B–D).[4] The rates for men fell in each age group. For example, 61.4 percent of men 55 and older were in the labor force in 1940, by 1970 the proportion had fallen to 52.7, and by 1985 only 39.6 percent of men in this age group were in the labor force. The participation rates of women 55 and older increased until 1970. But, since

4. Labor force participation by gender and age group can be computed from Sandefur and Tuma's (1987) tables 1, 2, 3, and 10. For example, the labor force participation of men in a given age category is equal to the percentage of men in that age group who are employed divided by the percentage of men in that age group (which is given in table 3, panel a). Since the tables are divided by gender and race simultaneously, the percentage of employed men in a given age group is the percentage of white employed men in that age group plus the percentage of nonwhite employed men in that age group. For each race, the percentage of employed men in an age group is the product of the following: the percentage of men of a given race and age that is employed, the percentage of the population of a given race and age that is male, and the percentage of a given age that is a specific race. This information is obtained from tables 10, 3, and 2, respectively. To aggregate age groups, additional information regarding the percentage of the population that is a given age group is required; these data are found in table 1.

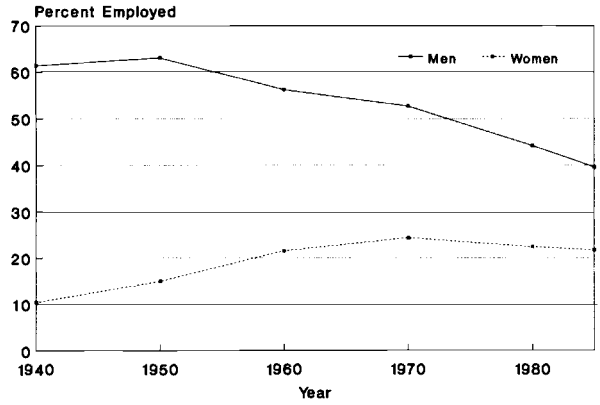

Fig. 1.5B Labor force participation of men and women 55 and older, 1940–85

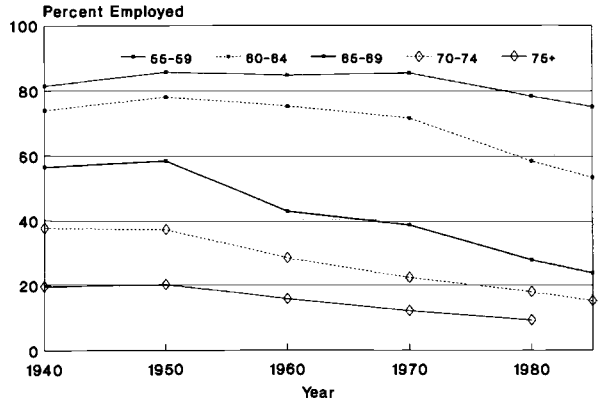

Fig. 1.5C Labor force participation of men 55 and older, by age group, 1940–85

1970, even the rates for women have fallen (see fig. 1.5B). Indeed, for both men and women there was an abrupt change in labor force participation rates in the early 1970s: for men the reduction was accelerated in most age groups, and for women the rates that had been increasing began to decline.

1.2.3 Associated Trends

What has enabled people to leave the labor force at younger and younger ages and still maintain consumption after retirement? It seems evident that this has been made possible by Social Security benefits and by firm pension plans. Before discussing trends in SS and pension coverage, it is useful to establish first that support in old age is typically not financed by personal saving.

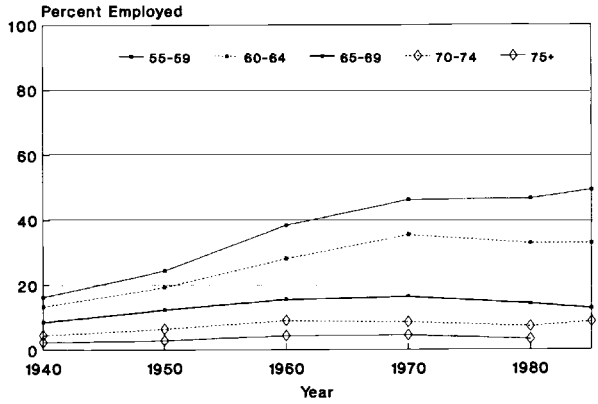

Fig. 1.5D Labor force participation of women 55 and older, by age group, 1940–85

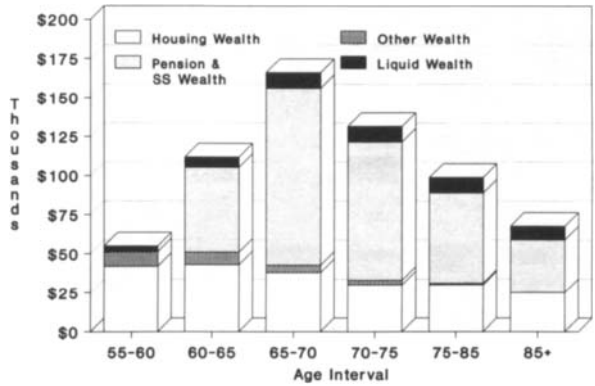

Fig. 1.6A Median wealth by age and asset category, all households

The Composition of Total Wealth

Based on the recent Survey of Income and Program Participation (SIPP), Venti and Wise (1991) have computed the composition of total wealth for all households, for homeowners, and for renters in 1984. The results are summarized in figures 1.6A–C. The amounts reflect median wealth by asset category. It is clear from figure 1.6A that most families approach retirement age with very little personal saving other than housing equity. For example, among households with heads 60–65, the median of liquid wealth is only $6,600; the median of housing equity is $43,000.[5] The majority of families rely heavily on

5. Liquid wealth is broadly defined to include interest-earning assets held in banks and other institutions, mortgages held, money owed from the sale of businesses, U.S. savings bonds, checking accounts, and equity in stocks and mutual fund shares, less unsecured debt.

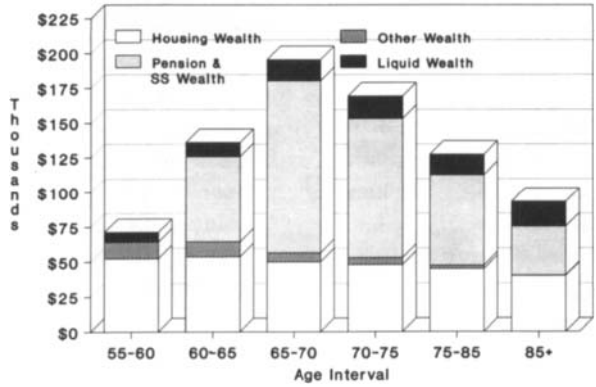

Fig. 1.6B Median wealth by age and asset category, homeowners

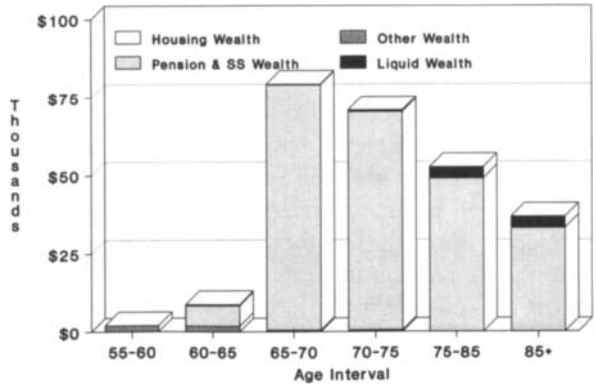

Fig. 1.6C Median wealth by age and asset category, renters

Social Security benefits for support after retirement and, to a more limited extent, on the saving that is done for them by employers, through defined-benefit pension plans. The SIPP data, from which these figures were computed, allow estimation of the value of SS and pension plan benefits only after the payments are received.[6] Thus, wealth in the form of SS and pensions is recorded only for persons who have begun to receive the payments. Most persons have retired by 65 and thereafter are receiving the benefits to which they are entitled. About 59 percent of households with reference persons between 65 and 70 receive pension benefits; 89 percent receive SS benefits. The present value of pension and SS wealth is based on life tables together with the amount of the annual payments. Social Security benefits are indexed to inflation; pri-

6. The SIPP data do not contain SS earnings histories (which determine SS benefits), nor do they contain detailed pension plan provisions.

vate pension benefits typically are not.[7] As can be seen from figure 1.6A, SS and pension wealth is by far the most important component of the wealth of most elderly. Among households with heads age 65–70, for example, the median of SS and pension wealth *combined* is $113,400; the median of housing wealth is $38,000, and the median of liquid financial assets is only $10,000. The decline in SS and pension wealth with age is largely an artifact of declining life expectancy. The lower housing equity of older households is a cohort effect and does not reflect a reduction of housing equity as individual households age; in fact, housing equity increases on average as the elderly age; there is little change in housing equity even among families that move from one home to another.

Comparison of figures 1.6B and 1.6C shows that households who rent have substantially less wealth than homeowners in all asset categories. The median total wealth of homeowners is $170,400; the median for renters is $59,300. Renters, who constitute about 20 percent of all households, have virtually no liquid assets.

In summary, the majority of elderly households live on Social Security and pension benefits.

Social Security Coverage

It is clear from figure 1.5A above that the trend toward earlier retirement began between the passage of the Social Security Act in 1935 and the Revenue Act of 1942. The 1942 Revenue Act granted tax incentives to firms to establish pension plans. Indeed, after adjusting for the reduction in agricultural employment, there was a sharp *reversal* in the prior trend toward later retirement, as shown by Ransom and Sutch (1988).

The percentage of persons 65 and older receiving SS benefits increased from about 20 percent in 1940 to 85 percent in 1960; now about 95 percent receive SS benefits (see fig. 1.7). In addition, the level of benefits has increased sharply. The benefits for a retired male worker increased from about 14 percent of median male income in 1950 to 37.5 percent in 1980 (see Tuma and Sandefur 1988). Thus, not only has coverage been extended to virtually the entire labor force, but the standard of living that the benefits can support has also increased sharply.

Firm Pension Plans

The proportion of the *workforce* covered by a firm (or a federal or state or local government) pension plan increased from 23.8 to 48.6 percent between

7. The present values of pension and SS benefits are the discounted survival weighted streams of income from each source received by the reference person and the spouse if present. Discounting is at 6 percent, and survival probabilities are calculated from mortality tables by sex. Payments from SS, military pensions, federal employee pensions, and the railroad retirement pension are assumed to be indexed at an annual rate of 4 percent. All other sources of pension income are not indexed in the wealth calculations.

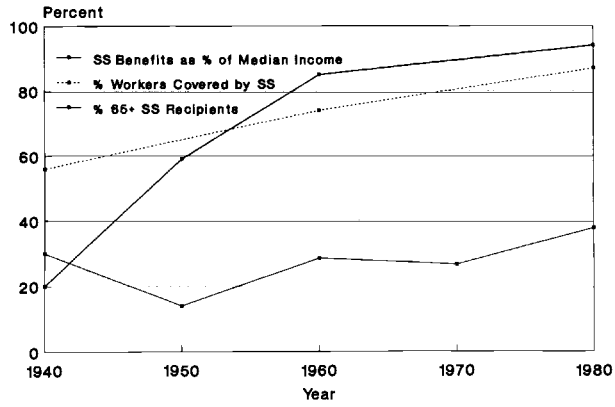

Fig. 1.7 Social Security coverage, recipients, and benefits, 1940–80

1950 and 1979. Now about 50 percent of the workforce is covered by a pension plan. Most of the growth in pension coverage occurred in the 1950s. The proportion of the older *population* (55 and older) collecting pension benefits continues to increase, as shown in figure 1.8.[8] By 1984, 30.8 percent of persons 55 and older and 39.0 percent of persons 65 and older were collecting pension benefits from some sourse, according to the SIPP.

In short, it is evident that the expansion of SS and firm pension plans has allowed and encouraged earlier retirement. In addition to the income incentive created by the entitlement to retirement income, the timing of the accrual of pension entitlements, created by firm pension plan provisions in particular, provides a strong incentive to retire early (as shown in the discussion below). These provisions create large increases and decreases in the *total* compensation from working at particular ages. Thus, the retirement benefit inducement to retire results from both income and price (wage) effects.

The Earnings of Older Employees

Like the earnings of younger employees, the earnings of older workers increased consistently from 1940 to 1970. But, after 1970, the earnings of the oldest employees began to decline, and the earnings of all older workers were declining by 1980 (see fig. 1.9). For example, the average 1985 annual earnings of employees 65–69 were about the same in real terms as they were twenty-five years earlier, in 1960. The earnings of employees 55–59 were lower in 1985 than they were in 1970. These data may be affected by selective retirement of the highest-paid employees and by part-time work, but there is ample evidence of a general decline in real wages across all age groups in the United States since about 1972. Thus, falling real wage earnings may also have contributed to earlier retirement in recent years.

8. Data for fig. 1.8 are taken from Kotlikoff and Smith (1983, tables 3.1.1, 3.1.2, 3.5.1).

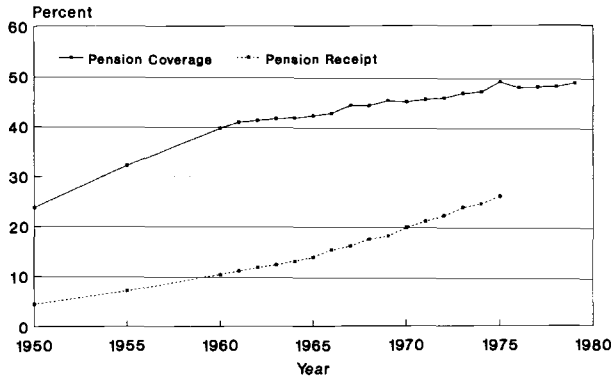

Fig. 1.8 Percentage pension coverage (of all workers 16 and older) and receipt (of population 55 and older), 1950–80

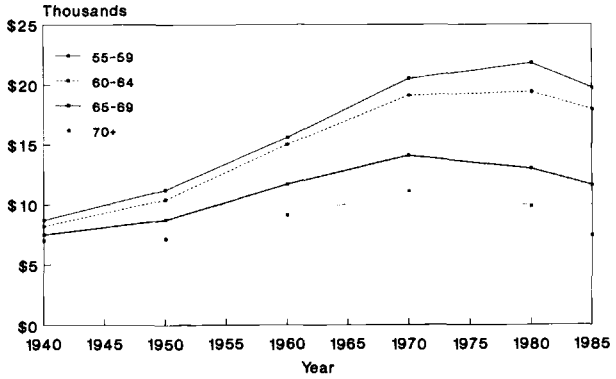

Fig. 1.9 Mean annual earnings of persons 55 and older, with nonzero earnings, by age group (thousands of 1984 dollars)

The Income of the Elderly

Although the labor force participation rates of older Americans have fallen dramatically in recent years, the average income of the elderly has increased sharply. Income data have been tabulated by Hurd and Shoven (1982) for several years between 1963 and 1978 (see figs. 1.10A and B).[9] Between 1960 and 1980, the labor force participation rates of men 65 and older fell by 37.5 percent, from 31.7 to 19.8. Yet the incomes of the elderly increased more than threefold over approximately the same period. The proportion of income from earnings declined, while the proportion from SS, firm pension benefits, and government medical plans increased substantially. The Hurd and Shoven com-

9. The Hurd and Shoven data are based on several U.S. Bureau of the Census, U.S. Department of Health, Education, and Welfare, and Social Security Administration reports and the 1978 Survey of the Elderly.

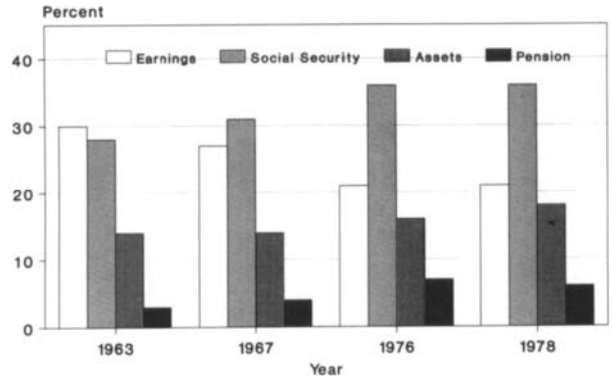

Fig. 1.10A Composition of the income of the elderly 65 and older, selected years, excluding Medicare and Medicaid

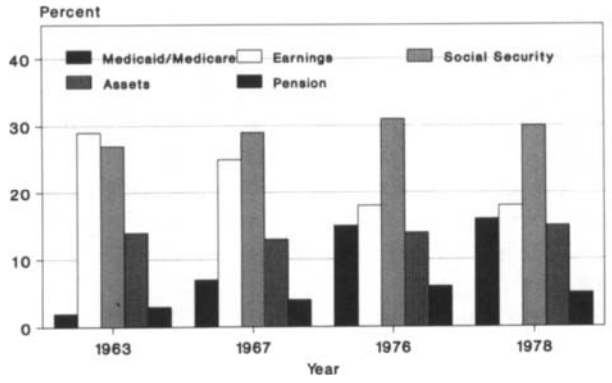

Fig. 1.10B Composition of the income of the elderly, including Medicare and Medicaid

putations include an estimate for the user cost of housing and an estimate for the income equivalent of Medicare and Medicaid insurance (valued at cost). According to their numbers, the proportion of the income of the elderly derived from their own earnings declined from 29 to 18 percent between 1963 and 1978. Over the same period, the proportion from SS, firm pension plans, and government medical insurance increased from 32 to 51 percent. The proportion of income from assets remained roughly constant. The Hurd and Shoven data are based on *mean* income by category. Data from Venti and Wise (1991) based on *median* income by category, make it clear that the vast majority of the income of most elderly families comes from Social Security and pension benefits (see figs. 1.6A–C above).

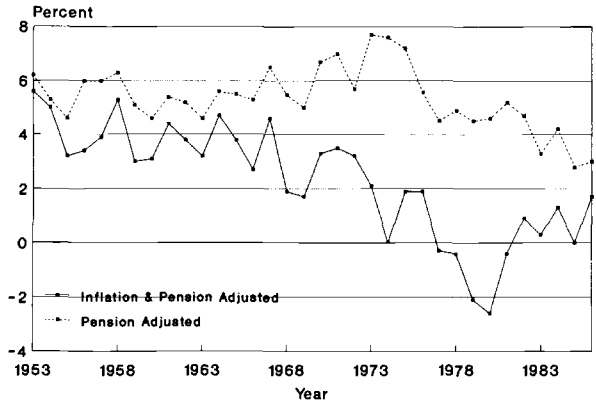

Fig. 1.11 Personal saving as a percentage of disposable private income, 1953–87

Personal Saving

Changes in personal saving may also affect retirement decisions. Personal saving declined from 3 to 6 percent of disposable private income in the 1950s to around 1 percent in the early 1980s, according to computations made by Summers and Carroll (1987) and reproduced in figure 1.11. These numbers are adjusted for inflation and exclude saving by employers through defined-benefit pension plans.[10] Without the inflation adjustment, the downward trend begins only after 1973. It is clear from papers by Venti and Wise (1990, 1991), for example, that there is a very large range in personal saving rates, with a large proportion of the population saving virtually nothing except in the form of housing equity. Thus, the extent to which the aggregate data reflect a reduction in saving that could impinge on the retirement decisions of an important proportion of employees is not clear. In any case, less personal saving, holding other income sources constant, would typically be associated with later retirement, clearly not the dominant force in the current trend.

Summary

The trends discussed above are summarized in figure 1.12. The labor force participation of older Americans has declined dramatically since 1940. Social Security and pension benefits have become the major source of income for the majority of older persons, and the total income of persons over 65 has increased enormously, over threefold between 1963 and 1978 alone. (Real annual earnings of the typical employee are about the same now as they were in

10. The national income accounts include firm contributions to defined-benefit pension plans under *personal saving*. Inflation-adjusted saving is measured saving minus the inflation rate (the GNP deflator) times net interest-bearing assets.

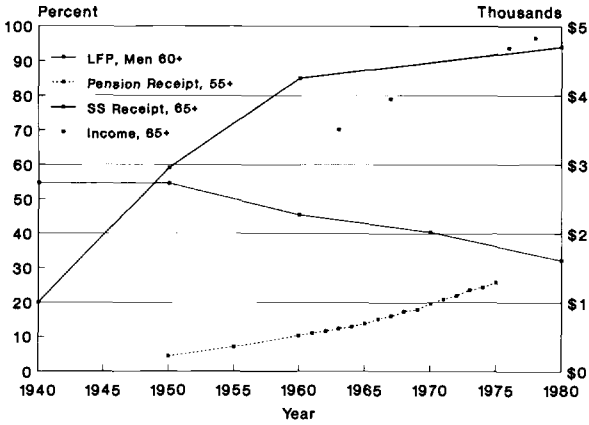

Fig. 1.12 Summary of trends

the early 1960s.) These forces have clearly dominated longer life expectancy and lower personal saving, which would be expected to prolong labor force participation. In addition, a fall in real wages since 1970 may have contributed to earlier retirement in more recent years. Without some change in labor force participation rates of older persons, the prospect is that a smaller segment of working persons will support an increasingly larger group of retirees.

1.3 The Incentive Effects of Public and Private Retirement Plans

The foregoing discussion highlights the correlates of the reduction in the labor force participation rates of older Americans and suggests the conclusion that the reduction was induced by the introduction of SS and firm pension plans. The implication is that the adoption of public and private entitlements to retirement benefits made early retirement possible; it increased the income available to support retirement consumption. The discussion below emphasizes the incentive effects inherent in the provisions of public and private plans, independent of the retirement wealth that they represent.

The 1980s have witnessed a marked shift in government policy toward promoting the labor supply of the elderly. The government has virtually eliminated mandatory retirement, and it has scheduled a gradual increase in the Social Security retirement age from 65 to 67. It has limited somewhat the Social Security earnings test that reduces Social Security benefits for "retired" workers earning more than an "exempt amount," it eliminated the earnings test after age 70, and it is increasing the actuarial incentive to delay the receipt of Social Security benefits beyond age 65.

The change in the government policy is responsive to the major demographic swing that is under way and its important implications for retirement finances in the next century. Given Social Security's pay-as-you-go method of

finance, the projected increase in the ratio of beneficiaries to contributors means either significant cuts in future benefits or significant future increases in the Social Security payroll tax.

Reversing the trend toward early retirement represents an important alternative for addressing the demographic transition. Additional labor supply of the elderly would relieve Social Security's finances as well as offset a potential shortage in the supply of labor relative to that of other productive factors. In addition, it is argued that prolonging labor force participation would mean more fulfilling lives for many elderly.

What has gone largely unrecognized is that, notwithstanding recent changes in Social Security regulations intended to prolong work, private pension plan provisions operate powerfully in the opposite direction. The most prominent theoretical explanations for the firm behavior rest on the proposition that the efficient structure of the age-wage profile is such that older workers are paid more than their worth to the firm and must therefore be encouraged to retire (see, e.g., Lazear 1979). Whether this is in fact the reason has not been demonstrated. Conversations with pension managers reveal that, in some instances, the incentives of the plans are not fully understood and that many plans have been introduced without consideration of their effects on retirement. Some special early retirement incentives (temporary "window" plans) have been introduced to relieve the firm of older workers so that younger workers could be promoted or simply as a means of reducing the size of the firm's workforce.

Many researchers have pointed to the Social Security system's high benefit levels and work disincentives as a major contributor to the continuing trend toward early retirement, and a great deal of research has focused on the effect of Social Security benefits on labor force participation. Recent examples are Blinder, Gordon, and Wise (1980), Burkhauser (1980), Hurd and Boskin (1981), Burkhauser and Quinn (1983), Burtless and Moffitt (1984), Hausman and Wise (1985), Burtless (1986), and Gustman and Steinmeier (1986, 1991). With few exceptions—Hurd and Boskin (1981) and, to some extent, Hausman and Wise (1985)—these studies attribute only a modest portion of the early retirement trend to the effect of Social Security provisions, although the findings may reflect, to some degree, problems of misspecification in accounting for its effects. In contrast, there has been very little work relating retirement behavior to the retirement incentives provided by pension plans.[11] The apparent reason for this neglect has been the difficulty in obtaining data that combine the retirement choices of older workers with information about their past earnings and the specific provisions of their pension plans.[12]

More recent work of Kotlikoff and Wise (1985, 1987, 1989), Stock and Wise (1990a, 1990b), and Lumsdaine, Stock, and Wise (1991) suggests that

11. The most closely related work considers the effect of pension plans on job mobility (Clark and McDermed 1988; Gustman and Steinmeier 1993; Allen, Clark, and McDermed 1988, 1993) but not retirement.

12. Exceptions are Burkhauser (1979), Fields and Mitchell (1982), Lazear (1983), Kotlikoff and Wise (1987), and Hogarth (1988).

the provisions of private pension plans are typically much more important than SS provisions as determinants of the retirement behavior of workers covered by such plans. Their detailed analysis of the provisions of private defined-benefit pension plans, which account for roughly three-quarters of all pension plan recipients, indicates that a large proportion of these plans provide very large incentives to retire early. Virtually all defined-benefit plans incorporate stiff financial penalties for working past the age of 65, and a very sizable fraction have similarly stiff penalties for working past the plan's early retirement age, often as young as 55. Similar evidence is presented by Bulow (1981), Lazear (1983), Clark and McDermed (1986), Fields and Mitchell (1984), and Frant and Leonard (1987). Working an additional year often involves losing, in expected present value of future pension benefits, an amount equivalent to half a year's nonpension earnings, if not more. These retirement incentives in many, if not most, instances are significantly greater than those ascribed to Social Security.

We consider first the incentive effects inherent in the SS rules and then the incentive effects of private pension plans.

1.3.1 Social Security (SS)

The SS benefit amount is based on past individual earnings, although the relation between benefits and earnings is not linear. Benefits are a much larger proportion of the past earnings of low-wage than of high-wage workers. The initial benefit is based on nominal earnings indexed to age-60 dollars using the consumer price index (CPI). After retirement (receipt of benefits), the benefits are indexed to the CPI. The SS normal retirement age is 65. But benefits can be taken as young as 62, with the benefit amount actuarially reduced to reflect the increase in the expected number of retirement years over which benefits will be received. That is, if the benefit entitlement is not changed because of a change in earnings, the expected present value of future benefits is the same irrespective of the age, between 62 and 65, at which benefits are first received. After age 65, however, the increase in benefits is much less than actuarial. It is now 3 percent per year, but it was only 1 percent per year until 1981.[13]

The easiest way to understand the incentive effects of the benefit structure is to consider the relation between the present value of future benefits and the age of retirement. Such relations are shown in figure 1.13A for two representative workers, one a low-wage and the other a high-wage employee. The top part of the graph represents nominal earnings by age (age-50 earnings are in 1980 dollars). The bottom part of the graph represents the accrual (SSA) of SS wealth (SSW). It is the change in the present value of SS benefits between one year and the next. That is,

$$\mathrm{SSA}_t = \mathrm{SSW}_t - \mathrm{SSW}_{t-1}(1 + r),$$

13. Although the change from 1 to 3 percent was the result of a 1977 law, it applied to those who would be 65 in 1981 and later years.

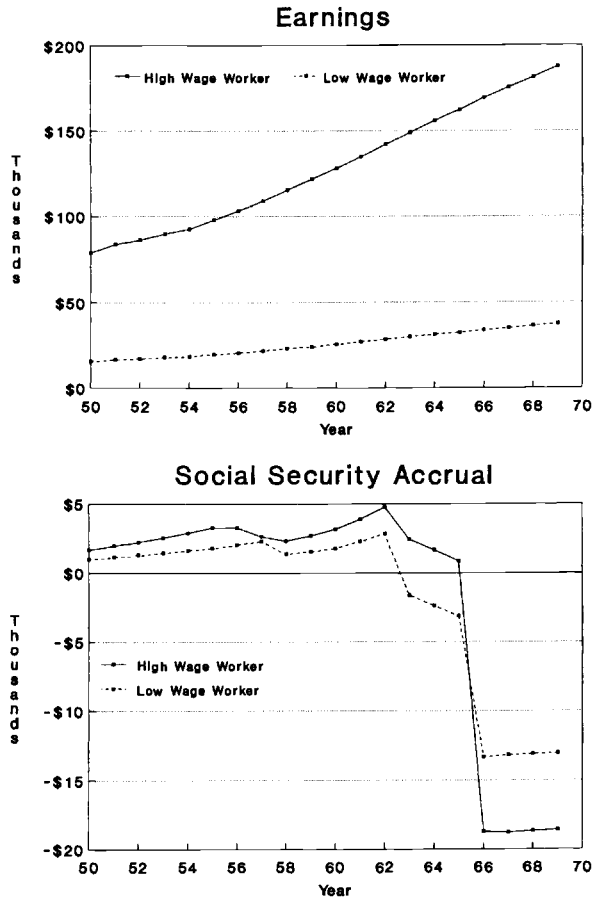

Fig. 1.13A Social Security accrual and earnings, representative low- and high-wage workers

where in this case r is a nominal discount rate taken to be 9 percent. Thus, the figure represents two forms of compensation: one is wage earnings; the other is the increase in the entitlement to future SS benefits.

Social Security accrual is a small proportion of wage earnings for the high-wage worker but can be a significant proportion for the low-wage worker, as shown in figure 1.13B. It is about 6 percent of the wage earnings of the low-wage worker at age 50 and increases to almost 10 percent at age 62. If the low-wage worker continues to work from 62 to 65, the accrual is *negative* (10 percent of the wage at 64). The *loss* in the present value of SS benefits would be about 39 percent of wage earnings if the person continued to work past age 65. Thus, the reduction in total wage and SS compensation between 62 and 66 would be about 50 percent, were the low-wage worker to continue to work.

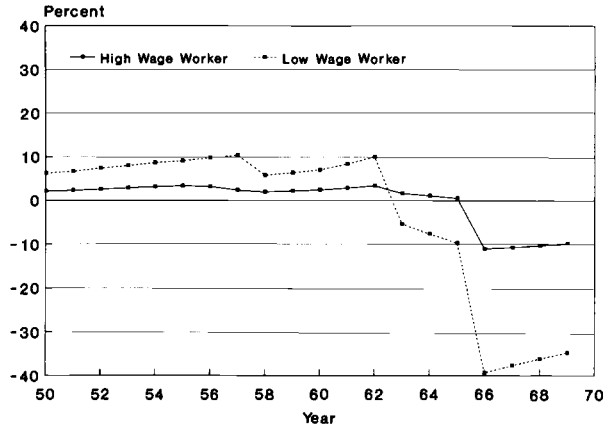

Fig. 1.13B Real Social Security accrual as a percentage of real earnings, low- and high-wage workers

The reduction in total compensation for the high-wage worker would be about 14 percent. Thus, the SS inducement to leave the labor force at age 65 is inversely related to wage earnings.

1.3.2 Firm Pensions

Roughly three-quarters of all persons participating in private pension plans are enrolled in defined-benefit plans where benefits are determined according to a specified formula. The remainder are enrolled in plans where benefits are directly related to contributions made on behalf of the employee and to the performance of the plan's investment portfolio. Because most workers are covered by defined-benefit plans, and because they are likely to have the greatest effects on labor market behavior, the discussion here emphasizes the incentive effects of this type of plan. The evidence is presented in three sections. The first section discusses the "average" incentives of a large number of plans. The second section discusses the incentives of the plan of a single large firm and relates these incentives to departure rates from the firm.

The Incentive Effects of Typical Plans

Kotlikoff and Wise (1985, 1987) considered the retirement incentive effects inherent in typical defined-benefit plans and have analyzed the provisions of a large number of firm plans. As with Social Security, it is easiest to exhibit the potential retirement incentive effects of defined-benefit pension plans by describing the accrual of vested benefits. Figure 1.14 is taken from Kotlikoff and Wise (1987). It shows the average accrual rates (weighted by plan membership) for U.S. defined-benefit plans with selected early and normal retirement ages. The pension accrual in a year is the increase (or decrease) in the expected

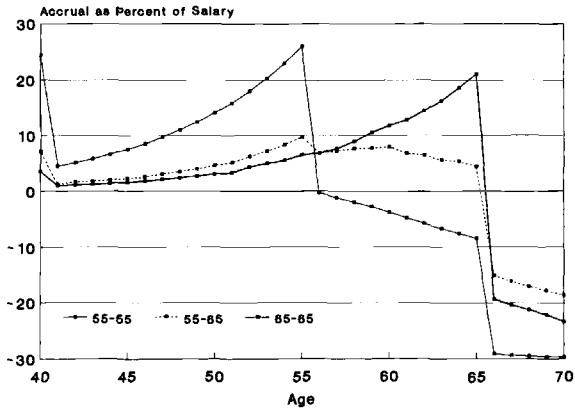

Fig. 1.14 Weighted average pension accrual as percentage of wage earnings for percentage of earnings plans with ten-year cliff vesting, for selected early and normal retirement ages

discounted value of future pension benefits that results from working that year. It is the value of deferred compensation analogous to current wage compensation. Pension accrual is shown as a percentage of wage compensation (the accrual ratio or accrual rate). The data come from a random sample of approximately 2,500 plans from the Bureau of Labor Statistics Level of Benefits Survey.[14] For each plan, accrual rates are calculated assuming average wage-tenure profiles in the industry and occupation to which the plan pertains, based on current population survey data (see Kotlikoff and Wise 1985).

Consider first plans with early and normal retirement at the same age, 55, a plan stipulation that is common in the transportation industry, for example. The average decline in the rate of pension wealth accrual at 55 is equivalent to about 30 percent of wage earnings. If the typical person covered by such a plan were to continue to work through age 65, pension accrual would be negative and equivalent to approximately 30 percent of wage earnings. Whereas at age 54 the pension benefit accrual is equivalent to about 30 percent of wage earnings, after age 65 continued work means a loss in pension wealth equivalent to about 30 percent of wage earnings. Thus, between these two ages, the decline in the rate of pension wealth accrual is equivalent to a 60 percent wage reduction!

The more common plans with early retirement at 55 and normal retirement at 65 typically exhibit an increase in pension wealth accrual to age 55 with a decline thereafter. Again, continued work past age 65 is associated with a substantial loss in pension wealth, with the decline in accrual equivalent to

14. Similar calculations have been made by Lazear (1983) on the basis of the Bankers Trust Survey of large pension plans.

approximately 20 percent of wage earnings. The pension wealth of persons covered by plans with both early and normal retirement at 65 increases continuously until 65 and then declines by approximately 40 percent, from a positive accrual of about 21 percent of salary to a negative accrual of about 19 percent.

Thus, on the basis of industry-wide earnings profiles, continued employment with the plan sponsor after the age of early retirement and, in particular, after the age of normal retirement typically involves a substantial reduction in total annual compensation because of declines in pension wealth accrual.

While figure 1.14 highlights the average characteristics of plans, it is important to understand that there is a very wide range in plan provisions, even among plans with the same early and normal retirement ages. This is demonstrated in figure 1.15, also taken from Kotlikoff and Wise (1987). The figure shows average accrual rates for the 513 plans of figure 1.14 with early retirement at 55 and normal retirement at 65, together with upper and lower 5 percentile levels. The lower 5 percentile level for any age group is that accrual rate below which 5 percent of plans fall. The upper 5 percentile level is defined analogously. Consider the accrual ratio at vesting. While the average vesting ratio for this sample is .071, the median is .021, the maximum is .383, and the minimum is 0. The ratio at the lowest 5 percentile point is 0, while it is .201 at the largest 5 percentile level. A similarly large dispersion in annual accrual ratios is indicated for each of the ages 40–70. The average accrual rates between ages 55 and 65 are positive, but for many plans the rates by 65 are very negative.

Thus, while the average plan may provide positive pension accrual at a particular age, the accrual rate may be substantially negative for some plans. Even a small proportion of plans that provide a strong incentive to leave the labor

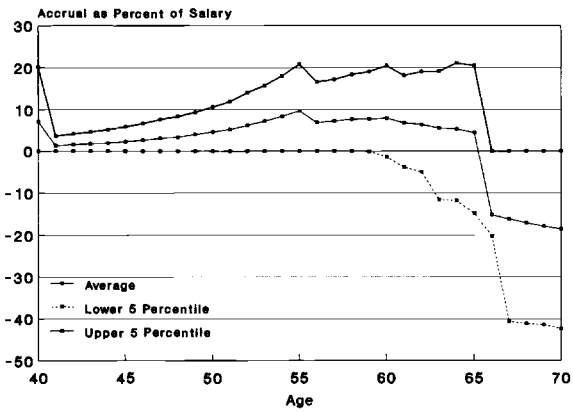

Fig. 1.15 Weighted average accrual rates and upper and lower 5 percentile levels for percentage of earnings plans with ten-year cliff vesting, early retirement at 55 and normal retirement at 65

force could have a very substantial effect on observed average labor force participation rates. Thus, it is important to base judgments about the labor force participation incentive effects of pension plans on more than average accrual rates.

The Plan of a Large Firm

Whether incentive effects like those described above have an effect on retirement decisions is a second question. Kotlikoff and Wise (1985, 1989) have addressed this question by considering the relation between pension plan provisions and retirement rates in a large Fortune 500 firm, referred to as Firm I. That work is summarized in this section. The analysis of the firm data shows a very strong relation between the plan provisions and departure rates from the firm.

The plan. The plan normal retirement age is 65; the early retirement age is 55. Vesting occurs after ten years of service. The plan is integrated with Social Security, with benefits being reduced (offset) by some proportion of SS benefits. Figure 1.16A summarizes the incentive effects inherent in the plan provisions. The figure shows the pension accrual between ages 50 and 70 of male managers hired by the firm in 1960, at age 30. By 1980, they were 50 and had twenty years of service with the firm. The accrual of Social Security benefits and predicted wage earnings for each year are also shown. The wage predictions are based on actual average earnings of firm employees. All the numbers are in real 1985 dollars.

At age 50, the typical male manager has wage earnings of about $48,446 per year. Compensation in the form of pension accrual is $2,646, or about 6 percent of wage earnings. If the manager were to retire at this age, he would be entitled to benefits at 65, based on his earnings in the seven or eight preceding years. The benefits would not be available until age 65 and thus have a relatively low present value at age 50. Normal retirement benefits could be taken earlier, as early as age 55, but they would be reduced actuarially in such a way that the present discounted value of the benefits remains unchanged. The reduction in the benefit would be just enough to offset the fact that benefits would be received for more years.[15]

If the person remains in the firm until age 55 and then retires, however, benefits are available immediately, and the reduction in benefits for early retirement is less than the actuarial reduction. In addition, the worker who remains until age 55 and then retires is eligible to receive a supplemental benefit until age 65 equal to his Social Security offset. Thus, there is a very large increase in pension wealth at age 55, $72,527, corresponding to the large spike in the graph. In effect, there is a bonus of $72,527 for remaining in the firm from age 54 to age 55.

15. Not accounting for any real rate of time preference.

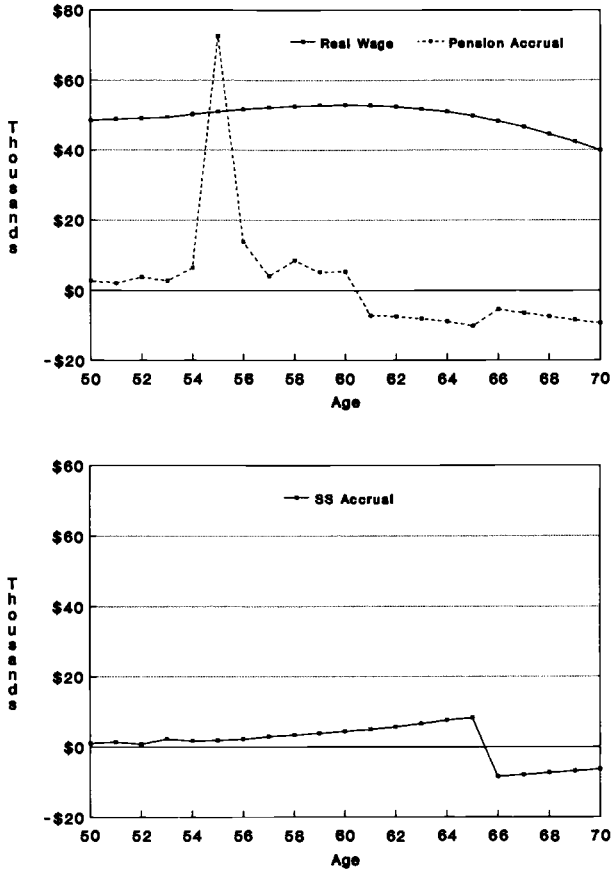

Fig. 1.16A Wage earnings, pension accrual, and Social Security accrual, representative person in Firm I

After age 55, pension accrual falls, to about 10 percent of the wage at age 60.[16] Pension accrual is in fact negative beginning at age 61. The loss in compensation between age 60 and age 61 is equivalent to a wage cut of about 14 percent. Between age 61 and age 65, the loss in pension benefits is equivalent to about 20 percent of annual wage compensation. Workers who have thirty or more years of service at age 60 are eligible for full retirement benefits; the early retirement reduction factors no longer apply.[17]

16. The plan provisions stipulate that an additional year of service adds 2 percent to normal retirement benefits per year of service before age 55 but only 1 percent per year of service after age 55.

17. Thus, no increase in benefits will result for working another year from the application of one less year of early retirement reduction, as was the case before thirty years of service. In addi-

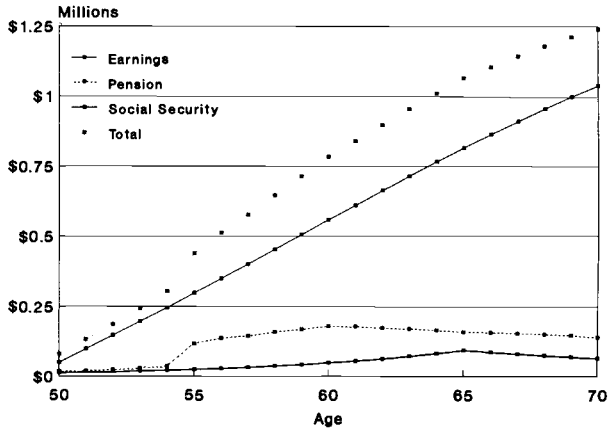

Fig. 1.16B Cumulative earnings, pension wealth, and Social Security wealth, representative person in Firm I

Social Security accruals range from about $1,000 to $8,000 between age 50 and age 65. After 65, Social Security accrual becomes negative, about −$8,500 at age 66. At 66, the loss in private pension benefits and Social Security benefits together amounts to about 32 percent of wage earnings at that age. (For some groups of employees in the firm, the loss in pension and Social Security wealth together after age 65 is equivalent to 95 percent of wage earnings: if these employees continue to work, it is essentially without compensation.)

The data in figure 1.16A are shown in the standard budget constraint form in figure 1.16B. Total compensation, including wage earnings, Social Security wealth, and pension wealth, is graphed against age, beginning at age 50. There is a discontinuous jump in the graph at age 55, the age at which early retirement benefits are available on an advantageous basis.

The firm departure rates. Departure rates by age and years of service suggest the effect of pension plan provisions on retirement. They are shown for salesmen by age and years of service in table 1.1. The yearly departure rate is the proportion of those employed at the beginning of the year that retires—more strictly speaking, leaves the firm—during the forthcoming year. Several as-

tion, for each year that benefits are not taken between ages 55 and 65, the receipt of benefits for a year without the Social Security offset (reduction) is forgone. This advantage is lost at age 65. Thereafter, the loss in benefits from working an additional year is smaller because this opportunity is no longer available; it was available only until age 65. The accruals also depend to a small extent on the updating of the years used in the calculation of "final" earnings. "Final" earnings are used to determine the pension benefit.

Table 1.1 **Departure Rates for Salesmen by Age and Years of Service**

	Years of Service						
Age	< 10	11–15	16–20	21–25	26–30	31–35	36+
< 50	19	9	5	4	3	...	...
50–54	14	7	4	3	3	2	0
55	11	14	9	11	12	15	...
56–59	14	13	9	11	11	14	...
60	11	12	14	19	14	29	35
61	13	12	13	13	19	32	28
62	12	27	32	38	36	52	35
63	20	28	33	36	47	48	56
64	0	37	36	30	36	38	28
65	34	56	51	50	49	47	43
66	17	28	10	34	18	16	12
67	20	16	25	21	8	5	18

pects of the data stand out. (1) Before 55, departure rates are typically around 3 percent for vested employees; they are substantially larger for those with fewer than ten years of service, who are not vested. At 55, the early retirement age, they jump to 10 percent or more, but only for vested employees, those with at least ten years of service. It is important to notice that the departure rates stay at that level until age 60, when there is another jump in the rate of departure. (2) At age 60, the departure rates increase very precipitously, especially for persons with over thirty years of service. For this group, full benefits are available because there is no longer an early retirement reduction according to the plan's rules. For this group, subsequent pension accrual is negative. (3) When Social Security benefits become available at 62, the departure rates again increase very sharply, but only for those who are vested in the firm plan. (4) Finally, there is a large increase in departure rates at 65, the SS normal retirement age. Both pension and SS accruals are negative if the employee continues to work beyond age 65.

To understand the potential importance of the early retirement benefits, suppose that, if it were not for this inducement, the departure rates would remain at 3 percent until age 60 instead of the 10 or 12 percent rates that are observed. Departure at 3 percent per year means that 14 percent of those who were employed at 55 would have left before age 60; at 11 percent per year, 44 percent would leave between 55 and 59.

Cumulative departure rates for all employees are shown in table 1.2 for three years, together with the rates by age. The cumulative rates are one minus the percentage who have departed. Given employment at age 50, the cumulative rates show the percentage still employed at older ages. On the basis of the 1981 and 1983 departure rates, only 48 percent of those employed at 50 would still

Table 1.2 **Cumulative and Yearly Departure Rates by Calendar Year, Years of Service (YOS), and Age**

	Yearly				Cumulative, 11+ YOS		
		11+ YOS					
Age	8–10 YOS, 1980	1981	1982	1983	1981	1982	1983
50	7	3			97	97	97
51	9	3			94	94	94
52	3	5	5	5	89	89	89
53	0	4	4	4	85	86	86
54	4	3	4	2	83	83	84
55	5	11	12	10	74	73	75
56	4	12	14	10	66	63	68
57	2	9	12	11	60	56	61
58	5	10	14	12	54	48	54
59	2	11	20	10	48	38	48
60	4	17	29	17	40	27	40
61	0	17	32	18	33	18	33
62	8	36	48	31	21	10	23
63	14	37	54	37	13	5	14
64	11	29	49	26	10	2	11
65	25	53	58	45	5	1	6

be employed at 60, and then 17 percent of these would leave. Only 10 percent would remain until age 65, and then about 50 percent of these would leave.

These data also show the effect of a special early retirement incentive (a "window plan") that was in effect in 1982 only. For employees who were eligible for early retirement in 1982, the incentive program provided a bonus of up to one year's salary. It is clear that the effect of the incentive was large: while the departure rates for 1981 and for 1983 are virtually identical, the 1982 rates were much higher. For example, the departure rate for 60-year-olds was 17 percent in 1981 and 1983 but 29 percent in 1982. Of those employed at age 50, 40 percent would still have been employed after age 60, based on the 1981 and 1983 departure rates. Only 27 percent would remain after age 60, based on the 1982 rates. Even under the normal plan, only 10 percent of those employed at age 50 would still be employed at 65. Only 2 percent would remain until 65 with the special incentive.

1.4 An Option Value Model of Retirement

The previous section demonstrates the large incentive effects inherent in the provisions of defined-benefit pension plans and shows that these incentives have very substantial effects on firm retirement (and other departure) rates. An

additional goal of research in this area is to predict the effect on retirement rates of changes in firm pension plan and SS provisions. This section discusses an econometric model of retirement and simulations based on this model.

1.4.1 The Model

Two basic approaches, in addition to least squares regression, have been used in recent years to analyze retirement behavior. The first is the method of estimation developed to analyze the choices of individuals who face discontinuous or kinked budget constraints. The central feature of this method is a lifetime budget constraint analogous to the standard labor-leisure budget constraint, but with annual hours of work replaced by years of labor force participation and annual earnings replaced by cumulative lifetime compensation. The optimal age of retirement is determined by a utility function defined over years of work (postretirement years of leisure) and cumulative compensation. A careful application of this approach to retirement is by Burtless (1986), who analyzed the effects of changes in Social Security benefits on retirement.[18] While appealing in many respects, this procedure has an important drawback. It implicitly assumes that individuals know with certainty the opportunities—like wage rates—that will be available to them in the distant future. The hazard model is the second approach. As implemented to date, it is essentially a reduced-form technique designed to capture the effects on retirement of movements in variables such as Social Security wealth. Implementations of the hazard model have not been as "forward looking" as the nonlinear budget constraint specifications.[19] On the other hand, unexpected shocks, like sudden changes in earnings, enter the analysis very naturally.

The option value model as specified by Stock and Wise (1990b) incorporates the advantages of both of the approaches described above. It allows updating of information, as does the traditional hazard model, but also considers potential compensation many years in the future, as does the nonlinear budget constraint approach.[20] The key ideas of the model can be summarized briefly. It is in-

18. An analogous model was used by Venti and Wise (1984) to describe the rent paid by low-income families faced with discontinuous budget constraints. Earlier papers that develop these techniques are Hausman and Wise (1980) and Burtless and Hausman (1978).

19. Thus, in Hausman and Wise (1985), e.g., changes from the current period to the next, in earnings, pension wealth, and the increment to pension wealth, are allowed to affect the decision to retire in the next period, but expectations of these values several years hence are not.

20. Antecedents of the Stock and Wise model begin with Lazear and Moore (1988), who argue that the option value of postponing retirement is the appropriate variable to enter in a regression equation explaining retirement. Indeed, it was their work and the analysis of military retirement rates by Phillips and Wise (1987) that motivated Stock and Wise to pursue this approach. The Stock and Wise model is close in spirit to the stochastic dynamic programming model of Rust (1989), which poses substantially greater numerical complexity than the Stock and Wise model and has not yet been estimated for retirement. In principle, Rust observes not only the individual's retirement age but subsequent consumption decisions as well. Thus, Rust's model allows the individual to optimize over age of retirement and future consumption jointly. The individual's decision is modeled as the solution to a stochastic dynamic programming problem. As in the Stock and Wise case, the individual's expectations are conditioned on current known variables such as in-

tended to capture an important empirical regularity, the irreversibility of the retirement decision. Although it is not uncommon to work—at least part-time—after "retirement," it is rare to return to the job from which one has retired. The model focuses on the opportunity cost of retiring or, equivalently, on the value of retaining the option to retire at a later date. It has two key aspects. The first is that a person will continue to work at any age if the option value of continuing work is greater than the value of immediate retirement. In effect, the person compares the best of expected future possibilities—the option value of continuing to work—with the value of retiring now. The second is that the individual reevaluates this retirement decision as more information about future earnings—and thus future retirement benefits—becomes available with age. For example, a decline in the wage between age 56 and age 57 will cause the individual to reassess future wage earnings and thus future pension benefits and Social Security accrual as well. Thus, retirement may seem more advantageous on reaching 57 than it was expected to be at age 56. Retirement occurs when the value of continuing work falls below the value of retiring.

come. The idea is to recover the parameters of a utility function specified in terms of these choice variables. In practice, however, Rust uses income to describe consumption (Rust 1988), with a value function similar to that of Stock and Wise, specified in terms of income. To simplify the solution to the dynamic programming problem in his model, Rust assumes that random unobserved individual components are independent over time, whereas Stock and Wise allow such terms (representing differences among individuals in health status, desire for leisure, and the like) to be correlated. In short, Rust has described a solution to a more complicated choice than Stock and Wise, but with uncorrelated errors, whereas the Stock and Wise model is a solution to a less complex problem, but with correlated errors. A "dynamic programming" model of employment behavior has also been proposed by Berkovec and Stern (1991). Berkovec and Stern's analysis is also in progress. They consider transitions among three employment states over time. To simplify the solution to their optimization problem, they assume that disturbance terms are uncorrelated over time, except for an individual-specific random effect. Their analysis is in terms of individual attributes like education, race, health status, and age. Government benefits like Social Security are not explicitly modeled, whereas these benefits, as well as firm pension benefits, play the central role in the Stock and Wise analysis. Stock and Wise estimate a discount or weighting factor, whereas they obtain estimates of other parameters conditional on an assumed discount rate. Age itself is used explicitly to estimate retirement. Age is not a direct determinant of retirement in the standard version of the Stock and Wise model. This has important implications if the model is to be used to predict the effect of changes in firm pension plan or Social Security provisions on retirement. Neither Rust nor Berkovec and Stern, however, have information on private pension plan provisions, the focus of the Stock and Wise analysis. The retirement decision rule proposed by Stock and Wise as an approximation to individual behavior is much simpler than the dynamic programming rule. A concomitant of this assumption is also much simpler econometric implementation than the burdensome calculations imposed by the dynamic programming rule. These simplifications reduce the computational requirements substantially while retaining the key forward-looking features of the dynamic programming approach. Of course, both of these models are theoretical abstractions. The important consideration is which decision rule is the better approximation to the calculations that govern actual individual behavior. The answer to this question will have to await further analysis. Stock and Wise show that the rule that they assume predicts individual choices well, but the predictive validities of the alternative decision rules have not been compared.

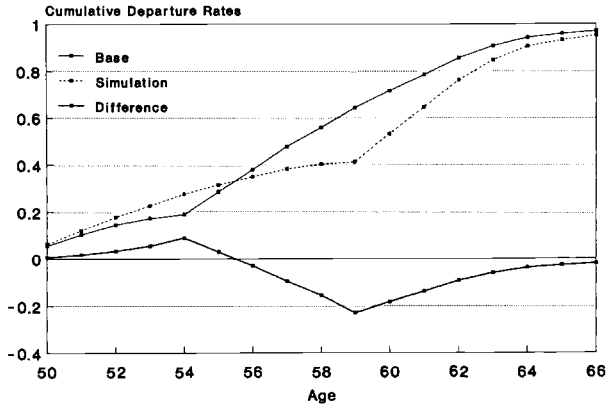

Fig. 1.17 Simulation: Increase firm early retirement age from 55 to 60

1.4.2 Simulations of the Effect of Changes in Pension and SS Provisions

To illustrate the potential to affect retirement behavior through changes in pension and SS provisions, three simulations from Stock and Wise (1990a) and one from Lumsdaine, Stock, and Wise (1991) are discussed here.

Increase the Firm Early Retirement Age from 55 to 60

The effect of increasing the firm's early retirement age from 55 to 60, leaving other provisions as they were, is shown in figure 1.17. Under the current plan, 65 percent of those employed at 50 have left before age 60. Only 42 percent would have left before age 60 if early retirement had been at 60 instead of at 55. Only 13.6 percent of employees leave between 55 and 59 if early retirement is at 60, whereas 45.5 percent leave between these ages under the current system. On the other hand, because the early retirement "bonus" is now farther in the future, more employees leave the firm between 50 and 54. This is the result of the greater weight given to current versus future income. In short, many more workers would be employed between the ages of 57 and 65 if the early retirement age were 60 instead of 55.

Increase the SS Early Retirement Reduction Factor

Social Security benefits can be taken beginning at age 62, but the current Social Security rules include a benefit reduction of 5/9 percent per month of retirement before age 65.[21] The simulated effect of increasing the reduction factor to 1 percent per month is shown in figure 1.18. It is clear that the effect of this change is small relative to the effect of the change in the firm early retirement age. This is primarily because only a small fraction of firm employees are still working at age 62—only 21 percent in the base case. The retire-

21. This reduction is intended to be actuarially fair.

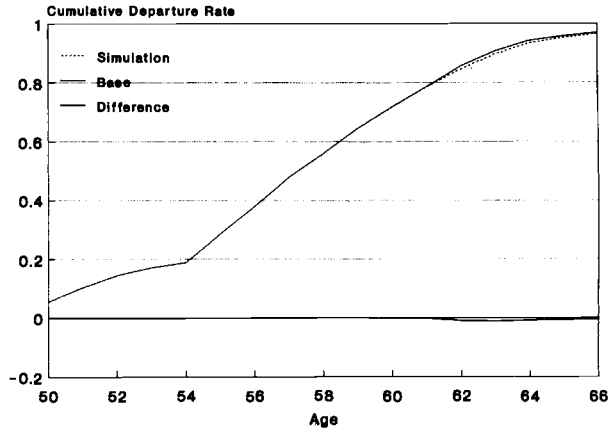

Fig. 1.18 Simulation: Increase Social Security early retirement reduction factor

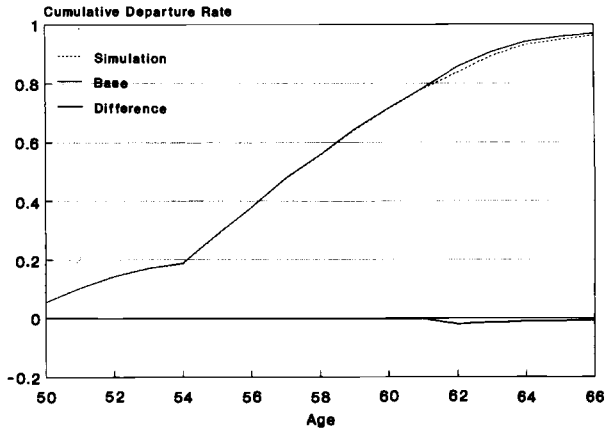

Fig. 1.19 Simulation: Increase Social Security retirement ages by one year

ment rates of those still employed at age 62, however, are considerably lower—about 14 percent—with the higher reduction factor. They are also lower at 63. Still, the net result on the employment of persons covered by the firm's pension plan is negligible.

Increase the SS Retirement Ages by One Year

Current plans are to increase the Social Security retirement age from 65 to 67 by 2027. To judge the effect of such a change on workers with pension plans like the one in this firm, Stock and Wise (1990a) simulated the effect of increasing the normal retirement age from 65 to 66 and the early retirement age from 62 to 63. The results are shown in figure 1.19. Again, the effect on

the retirement rates of persons in this firm is small. This is true even though the effect on the annual retirement rates of 62- and 65-year-olds is substantial. The retirement rate of 62-year-olds is reduced from 33.9 to 25.2 percent. The rate at 65 is reduced from 28.6 to 25.1. But only a few workers remain in the firm to be affected by these changes.

The Effect of a Special Window Plan

During 1982, the firm had a special retirement incentive program (a "window" plan) that provided up to one year's salary, in addition to regular retirement benefits, for employees who retired in that year. The effects of this plan on the retirement behavior of nonmanagerial office workers were simulated by Lumsdaine, Stock, and Wise (1991) and are shown in figure 1.20. For comparison, the figure shows retirement rates in 1981 and then actual and simulated retirement rates in 1982. (Evidence on the effects of this plan is also shown in table 1.2 above.) It is clear that the plan had a very large effect. Annual departure rates were more than doubled for many age groups. In addition, the figure indicates the extent to which the option value model was able to predict the effect of this exogenous change in "retirement benefits."

1.5 Summary

The labor force participation of older Americans has declined dramatically since the inception of Social Security and the tax inducement to develop firm pension plans. Between 1937 and 1980, the participation rate of men over 60 fell from about 62 to about 32 percent, and it continues to decline. Even the rate for older women has declined since 1970. It seems evident that the decline has resulted from the retirement income made possible by these programs. The vast majority of the income of most retirees now comes from pension and Social Security benefits. Most retirement-age families have almost no personal saving other than housing wealth. Yet the average income of older families has increased dramatically in the past three decades, possibly threefold between 1963 and 1978 alone. With reference to figure 1.1 above, the retirement benefits curve has been raised. From the point of view of the individual, the wealth associated with SS and firm pension benefits encourages earlier retirement.

But it is not only the amount of the SS and pension wealth that matters. How it accumulates is also important. For example, if no benefits were available until age 70, few employees would retire at age 55. If retirement wealth accumulates rapidly between 55 and 60 and then starts to decline, employees have an incentive to retire soon after age 60. In effect, the reduction in the accumulation of retirement wealth is like a reduction in the wage; both reduce the incentive for labor force participation. In fact, the formulas determining firm pension benefits in particular tend to encourage continued employment with the firm until some age—often between 55 and 60—and provide an incentive to leave the firm thereafter—the annual addition to retirement wealth is reduced

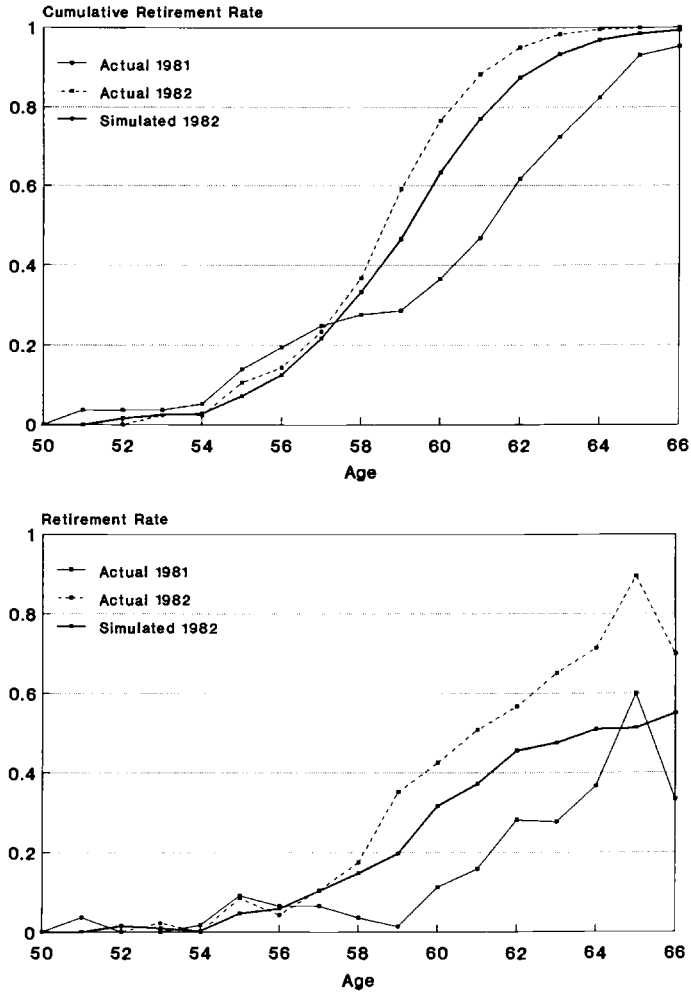

Fig. 1.20 Actual retirement rates in 1981 and 1982 vs. simulated 1982 retirement rates under the window plan, based on 1980 parameter estimates

or even negative. The addition to retirement wealth after age 65 is almost always negative. The amount of the retirement benefit is not increased enough for a person who retires one year later to offset the fact that the benefit is received for one year less.

Thus, even though individuals are living longer, *and* even though a larger fraction of the population is old, workers are leaving the labor force at younger and younger ages. The retired portion of the population is increasing; the employed portion is declining. Whether by intent or by happenstance, firm pension plan and Social Security provisions continue to encourage this trend.

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