Assessing the Rationality of Workers' Choice of Retirement Age and Saving Accumulation

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Abstract

This paper asks whether economists' model of fully rational decision makers can explain saving for retirement or the timing of retirement. Many non-economists are skeptical that workers make retirement decisions in the far-sighted and well-informed manner that "rationality" seems to imply. Unlike other economic choices, which are repeated many times over the course of a worker's life, the decision of when to retire is usually made only once. Workers are not given the opportunity to improve on decision making through constant repetition. The evidence on the financial soundness of workers' retirement choices is mixed. When polled about their preparations for retirement, large minorities of Americans acknowledge they have given no thought to the subject, have saved little or nothing in pension and other retirement accounts, and lack confidence they will be able to afford retirement. Many workers near retirement age are ignorant of the rules that will determine their pension benefits. Some economists and financial planners have found evidence that middle-aged and older workers face large saving shortfalls compared with the savings needed to retire at the typical retirement age. Empirical studies show that a substantial minority of workers experiences big drops in consumption after they retire, which appears to violate a basic implication of the life-cycle model.

On the other hand, recent analysis of the best survey evidence on workers' earnings, pension accumulations, public pension entitlements, and non-pension saving reveals that relatively few workers have saving balances that obviously and substantially fall short of what is "optimal" under some conceivably rational plan. This means we cannot rule out rational foresight when workers enter retirement with little savings or when they experience big drops in consumption after they retire. These outcomes may have been fully anticipated – and accepted – in a far-sighted and rational retirement plan.

The latest evidence on worker savings and retiree consumption does not prove retirement and saving decisions are made in a fully rational and far-sighted way. The evidence only shows it is hard to rule out rationality and far-sightedness using available information on households' consumption and savings. What older workers actually tell us about their saving behavior, retirement plans, and knowledge of pension rules suggests that relatively few make big investments in learning or thinking about the financial trade-offs that are relevant to retirement. Many workers probably consider the payoffs from such investments to be uncertain and small.

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WORKERS MAKE THREE CHOICES about retirement. They must choose the age when they will retire, the percentage of their wages to set aside for retirement consumption, and the allocation of their retirement savings across different kinds of investments, such as stocks, bonds, and real estate. The three decisions are connected. Workers who do not expect to retire until late in life do not need to save much for retirement. Those who anticipate retiring before 60 should plan to set aside a sizeable portion of their monthly earnings. Workers who invest in risky assets, like penny stocks or South American gold mines, may obtain outsize rewards for accepting great risk. If they are lucky they can use some of the proceeds to retire young and live sumptuously. If unlucky, they may accumulate too little wealth to stop working.

Most economists assume workers are well informed, farsighted, and rational. Workers with these characteristics will use all the information available to them, including knowledge about their own preferences and long-term interests, to make logical choices that maximize their well-being given the constraints they face. Many observers, including a few economists, are skeptical that workers make retirement decisions in the farsighted and logical manner just described. Unlike other economic choices, which are repeated many times over the course of life, retirement only occurs once for most workers. People are not given the opportunity to improve on their decision making as a result of constant repetition, as is the case when consumers learn how to budget and shop for groceries, clothing, apartments, and visits to theme parks. It is therefore hard to argue that workers can eventually learn from experience about choosing an advantageous retirement age or an optimal rate of saving. When people decide to retire or how much to save for retirement, their choices may be poorly informed, short sighted, and less than rational.

Does it matter whether workers make retirement decisions in a rational way? It matters a great deal if workers' errors produce large deficits in well-being compared with outcomes when workers' choices are fully informed and rational. The deficit could be large, for example, if a worker with modest savings decided to retire young and then faced severe deprivation after exhausting her retirement savings. All rich countries have developed retirement policies to help workers avoid some of the worst consequences of bad planning and poor decision-making. They have established state-sponsored pension and health insurance programs to support consumption

in old age. Workers are automatically enrolled in these programs when they take a job. The programs are quite costly, however, and they will become more burdensome in the future as the ratio of aged to non-aged increases. One way to reduce the long-term cost of state retirement programs is to gradually replace them with individual investment accounts. Under this kind of system, workers may have to decide how much savings to place in their accounts, how to allocate their savings across different asset classes, and when and how fast to make withdrawals from their accounts after they retire. Workers would depend on withdrawals from their accounts to pay for some or all old-age consumption. A few countries, including Japan and Great Britain, have moved toward this kind of policy. Policymakers in other countries, including the United States, urge reforms along the same lines.

Countries that rely on workers to make their own decisions about retirement saving and investment have made a prudent choice if workers make these decisions rationally and competently. The same policies are less appealing when a large fraction of workers bases retirement and saving choices on herd behavior, faulty logic, or incomplete and incorrect information. If workers are forced to assume more responsibility to save for their own retirement, allocate their pension contributions, and withdraw funds during retirement, policymakers should be confident that few workers will make big planning mistakes. A big mistake can lead to serious hardship if state pensions are small. By the time aged workers discover they have retired too early or saved too little, they may have no opportunity to undo this mistake by saving more or returning to work.

This paper considers what we have learned about the rationality and farsightedness of workers' retirement decisions. Do workers retire at a reasonable age? Do they save enough to afford the retirement ages they choose? Do they invest their retirement savings in a rational and prudent way? The literature on these questions is lengthy and growing, and it is open to competing interpretations. When polled about their preparations for retirement, large minorities of workers in some countries acknowledge they have given no thought to the subject, have set aside little or nothing in pension and other saving accounts, and lack confidence they will be able to afford retirement. A number of economists and financial planners have published alarming studies suggesting that middle-aged and older U.S. workers face large saving shortfalls compared with the nest eggs they will need to retire at the typical retirement age (Bernheim, 1992; Moore and Mitchell, 2000). On the other hand, careful analysis of the best survey evidence on workers'

earnings, pension accumulations, state pension entitlements, and non-pension saving reveals that very few workers have nest eggs that obviously and substantially fall short of what is optimal under some conceivably rational plan. To be sure, many workers have little or no retirement saving. However, most low-saving workers can fall back on state pensions or social assistance to support a low level of consumption in old age. While the annual consumption reported by newly retired workers is lower than workers' consumption before they retired, the decline is relatively small, is anticipated by many people approaching retirement, and is not clearly associated with a drop in retirees' well-being.

Recent research findings on worker savings and retiree consumption do not prove that retirement and saving decisions are made in a fully rational and farsighted way (Engen, Gale, and Ucello, 1999; Scholz, Seshadri, and Khitatrakum, 2004). The evidence only shows it is hard to rule out rationality and farsightedness using available information on households' consumption and savings. One problem is that we do not directly observe the underlying preferences of individual workers. This makes it nearly impossible to rule out rational decision making, even when we observe very odd patterns of work, saving, and consumption. When a worker suffers a 50 percent drop in consumption upon retirement, we might interpret this as evidence of bad planning or irrational behavior. Alternatively, it may reflect the unfortunate result of an unexpected early exit from the labor force, possibly because of a factory shutdown or the onset of serious disease. Even if the possibility of a plant closing or poor health were fully reflected in workers' saving plans, they may have rationally intended to accept a big cut in consumption if their careers came to a premature end. This means we cannot rule out rational foresight when workers enter retirement with little savings or when they experience a big drop in consumption over the course of their retirement. Bad outcomes may have been fully anticipated, and accepted, in a farsighted and plausible retirement plan.

Choice of retirement age

When economists think about retirement, they naturally focus on the financial aspects of the decision. Most modern theories of retirement are based directly or indirectly on the life-cycle consumption model. The classic statement of this model is contained in a series of articles written or co-authored by Franco Modigliani (Modigliani and Brumberg, 1954; Ando and Modigliani, 1963). The theory has had wide influence on economists' thinking about the timing of retirement as well as the determination of saving.

Incentives and timing of retirement. Modigliani's basic hypothesis was that farsighted workers will rationally plan their consumption over a full lifetime. In devising their lifetime consumption plans, they take account of the likely path of their labor earnings as they age and then prudently accumulate savings in anticipation of their retirement. The goal of a good consumption plan is to maximize the worker's lifetime well-being, subject to the constraint that lifetime consumption cannot exceed the worker's lifetime wealth. Lifetime wealth consists of the worker's initial assets and the present discounted value of anticipated labor earnings and other kinds of income that are not derived from initial assets or labor earnings. Rational workers will plan to avoid situations in which all of their lifetime wealth has been consumed long before they expect to die.

A worker who successfully solves the consumption planning problem will plot out a desired path of consumption for each future year of life, and will stick with the plan unless there is an unanticipated change in his or her financial outlook. The most advantageous plan will depend on the relationship between the worker's subjective rate of time preference and the interest rate that can be obtained on savings. The rate of time preference is a measure of the worker's impatience in consumption. If the worker's rate of time preference is equal to the market interest rate, the consumption path will be level throughout the worker's life. If instead the rate of time preference is higher than the interest rate, the worker will attempt to shift consumption toward the early part of life, and consumption will fall as the worker grows older. People with a very low rate of time preference, who are very patient in their consumption, will shift consumption to later stages of their life, and will plan to increase their consumption as they get older. Workers may wish to leave bequests to survivors, in which case they will consume all their lifetime wealth except the amount they plan to leave to heirs.

The life-cycle model emphasizes the single most important financial aspect of retirement, namely, the sharp drop or complete cessation of labor earnings when work hours decline. Most worker households rely heavily on labor earnings to pay for consumption. When earnings cease at retirement, workers must find another way to pay for their consumption. The life-cycle model stresses personal saving as an alternative source of support in old age. A crucial implication of the life-cycle theory is that farsighted workers will simultaneously select both a retirement age and a pattern of lifetime consumption. Their choice will be decisively affected by the expected pattern of their wage income, the interest rate they pay on money they borrow, and the

investment earnings they obtain on money they save. Another implication of the theory is that year-to-year changes in consumption should be much smaller than year-to-year changes in earnings, especially around the planned age of retirement. Workers with farsighted plans will smooth consumption using saving and spending out of their savings over the course of their careers.

Setting aside the effects of uncertainty for a moment, the life-cycle model can be used to analyze workers' choice of retirement age. To simplify, assume that workers stop working completely when they retire. If a worker's potential wages at each future age are known with reasonable certainty, the planning problem is to select the most satisfying combination of years at work and lifetime consumption that is available to the worker. Economists usually assume that, other things equal, workers would prefer to work fewer years (holding constant their lifetime consumption) and to consume more goods and services (holding constant their years at work). In other words, additional consumption of goods and services is a good and an additional year at work is a bad. If workers postpone their retirement (accepting more of a bad), they can also consume more over their lifetime (a good). Of course, this characterization of the trade-off is not really accurate for people who enjoy their work and derive great satisfaction from accomplishments and social interactions on the job. The theory is not very helpful in explaining retirement among this kind of worker, but it is useful for explaining retirement among the much greater number of people who dislike or eventually grow tired of their jobs.

One reason workers retire is that their potential earnings decline in old age, so the payoff from accepting a longer work life eventually grows smaller with advances in age. When the payoff falls below the perceived value of the extra goods and services a worker can consume as a result of working longer, the worker will retire. Employer and government pension plans can affect the financial payoff from extra work, which may be another reason work can appear less attractive at older ages. State and occupational pensions affect the lifetime trade-off between consumption and retirement in a complicated way. Their impacts on retirement depend on the contributions workers must make for the pensions they will receive and on the benefit formula and rules that link monthly pensions to a worker's past covered earnings. In the United States, employers and workers currently pay a combined tax equal to 12.4% of wages into the pension fund. The tax thus reduces workers' current wages by about 12% in comparison with the wages they would receive if the program were abolished. On the other hand, contributions allow a

worker to earn credits toward a bigger public pension. The monthly pension goes up as the worker's covered lifetime wages increase. Whether the increase in the pension entitlement is large enough to compensate workers for their extra contributions is an empirical question. The answer varies from one worker to the next and probably also varies at different stages in the same worker's career. Low-wage workers receive favorable treatment under the U.S. public pension system, so they usually receive a generous return on their contributions. High-wage and long-service workers typically receive much lower returns. The same general pattern can be found in other countries' pension systems, though the degree of redistribution between high- and low-lifetime earners differs across countries (OECD 2006, esp. Chapter 4).

Most pay-as-you-go pension systems were historically quite generous to early contributors, allowing those tax payers to collect larger pensions than their taxes could have financed if the contributions had been invested in safe assets. In effect, this generosity raised the lifetime wealth of early contributors to the system. If they consumed all of the state pension benefits they received, they enjoyed higher lifetime consumption than their labor income alone could have financed. (The excess consumption was financed by contributors from later generations, who paid taxes that were higher than the discounted value of the benefits they can expect to receive.) The fortunate generations that received pension windfalls may have retired earlier than would have been the case if state pensions had not been introduced or had been less generous.

On the margin, a pension plan can have another effect on the payoff from extra work. Workers who delay their retirement until after the benefit-claiming age are at least temporarily passing up the opportunity to receive a pension. If a worker is entitled to $800 per month in pension, for example, the worker gives up $800 in retirement income every month he or she delays retirement past the benefit-claiming age. If the worker's regular monthly pay is $10,000, this represents a comparatively small sacrifice. But if the wage is only $800 a month, the sacrifice is equal to 100% of the worker's earnings. The sacrifice is so large the worker's sanity might be questioned if he continued to work after the benefit-claiming age, unless there is an upward adjustment in future pensions to compensate him for giving up a year's pension. This presumes, of course, that the person is only working for financial gain. Many people, including volunteers, are happy to work for no pay at all, which is precisely the situation of a worker who

gives up $800 in pensions every month in exchange for a monthly pay envelope that contains just $800.

Some pension formulas fairly compensate workers for delaying pension acceptance after the benefit-claiming age. For example, the U.S. public pension system offers workers between ages 62 and 64 a fair compensation for giving up a year's pension. Monthly benefits are adjusted upwards about 8% for each year's delay in claiming a pension. For workers who have average life expectancy and a moderate rate of time preference, this adjustment is large enough so that the sacrifice of a year's benefits is compensated by eligibility for a bigger pension in the future. After age 65, however, the U.S. public pension formula was historically much less generous toward delays in retirement. Postponement of retirement after that age was not fairly compensated by increases in the monthly pension. (Because of changes in the benefit formula, that is no longer true. Regardless of when U.S. workers retire between age 62–70, most will receive fair compensation in the form of higher monthly pensions if they delay their retirement by one extra year.) In effect, the historical benefit formula required workers to give up part of the accumulated value of their lifetime pensions if they delayed retirement after age 65. It should not be surprising under these circumstances if a sizeable percentage of U.S. workers stopped working at age 65 and began collecting public pensions.

It is worth emphasizing that very few workers are exactly "average." A benefit calculation rule that is age-neutral (or actuarially fair) on average can still provide a worker who has below-average life expectancy with a strong financial incentives to retire. The worker may not expect to live long enough for the future benefit increase to make up for the benefits he or she gives up by delaying retirement for one more year. Similarly, a worker who applies a high discount factor when evaluating future benefits may not be impressed that the pension adjustment is "fair" for an average worker. For workers who are impatient to consume, an 8% hike in benefits starting one year from today may not be enough to compensate for the loss of 12 pension checks in the next 12 months. Even an actuarially fair pension adjustment might be too small to persuade workers who are tired of their jobs to delay retirement.

Public pension systems often impose an earnings test in calculating the annual pension, forcing many workers to stop working or substantially reduce their hours in order to begin collecting a pension. Workers who earn more than a threshold level of earnings may lose some or all of their monthly pensions. If pensioners are fairly compensated for this loss of benefits

with an increase in future benefits, possibly after the pensioner leaves employment altogether, the temporary loss of pensions should in theory have little impact on pensioners' work effort. In many state pension systems, however, the short-run loss of pensions was not compensated by future pension increases, so the earnings test essentially represented a pure tax on pensioners' earnings. A pension system that combines an earnings test with a pension-adjustment formula that does not fairly compensate workers when they delay claiming a pension offers a strong incentive for workers to cease working and start collecting pensions at the earliest benefit-claiming age.

Evidence. A large number of studies have tried to measure the impact of occupational and public pensions on retirement (good surveys of the literature have been prepared by Quinn et al. 1990, Hurd 1990, Lumsdaine and Mitchell 1999, and Krueger and Meyer 2002). Many of the most widely cited retirement studies examine the impact of the social security system on U.S. retirement patterns. Krueger and Meyer (2002) distinguish between two broad approaches to estimating the effects of social security on retirement. One class of study relies on time series changes in public pension incentives to identify the impact of incentives on some measure of aggregate labor supply. A second relies on differences among workers at a particular point in time to disentangle the influence of detailed program incentives on individual workers. A few studies use the combination of both time-series and cross-section variation to determine the effects, if any, of pension incentives based on longitudinal data for a representative sample of workers. To this list should be added cross-national studies of the effects of different retirement systems on aggregate supply.

Time series data give some indication of the possible influence of the U.S. public pension system on retirement. These data shed light on the relationship between the program's changing retirement incentives and the observed distribution of retirement ages. The U.S. social security program is now the main source of cash income for American households headed by someone 65 or older. Income tabulations of Census data show that public pensions account for slightly more than 40% of the total cash income of the U.S. aged. For almost three-fifths of aged Americans, social security represents half or more of the family's total cash income (Employee Benefit Research Institute 2002, Figure 9.1; Grad 2002, Table 9.6.A2). Until 1941, the social security system provided no income at all to the elderly. Today the program replaces about 40% of the final wage earned by a full career single worker who earns the average wage and claims a

pension at age 65. If the worker has a non-working dependent spouse, the benefit replaces approximately 60% of the worker's final wage. Benefits are clearly high enough so they can be economically significant in influencing the choice of retirement age.

The labor force participation rates of older American men fell substantially over the 20th century. What role did social security incentives play in this trend? The distributions of male retirement ages in selected years between 1940–2000 are plotted in Figure 1. The figure shows the percentage of men leaving the labor force at each age from 55 to 72, computed as a fraction of men in the labor force at age 54. The calculations are based on male labor force participation rates for successive years of age in each of the indicated years. Not surprisingly, the retirement distributions for more recent years are skewed toward the left, reflecting the fact that men have withdrawn from the workforce at younger and younger ages. The tabulations in all of the years show evidence of clustering in retirement at particular ages. There are peaks in the 1940 distribution at ages 60, 65, and 70, indicating that retirement at those ages was more common than at other ages. By 1960, however, there is only one main peak in the retirement distribution– at age 65. In 1970 there is evidence of a secondary peak in the distribution at age 62. By 1980, the percentage of retirements that occurred at age 62 was almost as high as the percentage at age 65. In 1990 and 2000, retirement at age 62 was much more common than retirement at 65.

The retirement incentives in the U.S. public pension system provide an explanation for the clustering of retirements at ages 62 and 65. Between 1941–2000, workers eligible for social security who continued to work beyond age 65 gave up pensions for which they were not fairly compensated. The earnings penalty in the benefit formula encouraged workers to retire at age 65. The clustering of retirements at age 62, which began after 1960, is also easy to explain. Starting in 1961, age 62 became the earliest age at which American men could claim a reduced social security pension. Before 1961 men could not claim a pension until 65, and there was no evidence of clustering in retirements at age 62. By 1970, retirement was more common at 62 than at any other age except 65. By 1990, age 62 was the most popular age of retirement by a wide margin. In principle, the social security formula fairly compensates workers if they delay claiming a pension past age 62. As we have seen, however, a worker with a high rate of time preference or short life expectancy might not regard the compensation as fair. In that case, some workers will prefer retiring at age 62 rather than at a later age.

The retirement age distributions displayed in Figure 1 are based on a crude approximation of workers' behavior in each of the indicated years. If the labor force participation rate of 60-year-old men is five percentage points lower than the participation rate at age 59, and if 90% of 54-year-old men are in the labor force in the same year, the calculation assumes that the retirement rate at age 60 is 5.5% $[(5 \div 90) \times 100]$. A more refined estimate of workers' retirement ages can be obtained by interviewing the same people several times as they approach the end of their careers. The U.S. government mounted two such panel surveys, the Longitudinal Retirement History Survey (LRHS) (Irelan, 1976), conducted between 1969–1979, and the Health and Retirement Survey (HRS), which began in 1992 (Gustman, Mitchell & Steinmeier, 1995). The LRHS was a 10-year panel survey covering about 11,000 families headed by people who were between 58–63 years old when the survey began in 1969. Retirement behavior in these 11,000 families has been analyzed by a number of researchers who applied the life-cycle framework in their studies. Figure 2 displays information on the retirement behavior of men in the LRHS sample who had no disabilities. The top panel shows the distribution of retirement ages among men who were observed to retire by the end of the survey in 1979, when respondents were between 68–73 years old (Burtless and Moffitt, 1985). To determine the exact retirement age, I examined the lifetime pattern of respondents' work effort and selected the point in each worker's life when he made a discontinuous and apparently permanent reduction in labor supply. This definition excludes spells of unemployment that end with the worker's return to a full-time job. However, the definition includes movements from steady full-time work into part-time jobs. The picture misses the retirements of some men who did not retire before their last completed interviews, and this omission will lead to some under-representation of retirements that occur after age 67. Taking account of the different populations included in the tabulations and the differing definitions of retirement, the pattern of retirement in the top panel of Figure 2 is broadly similar to that shown in Figure 1 for 1970. As in Figure 1, there is a clustering of retirements at ages 62 and 65 with a much higher peak at the latter age.

The lower panel displays the pattern of earnings among retired but working men who were age 62 or older in the first LRHS interview after they retired. Approximately one-fifth of retiring men were still working within the first two years after their retirements, and on average they worked a little more than 16 hours a week. The lower panel in Figure 1 shows the distribution of their earnings in relation to the earnings exempt amount in the social security

benefit formula. Earnings below the exempt amount had no effect on a worker's pension; earnings above the exempt amount caused benefits to be reduced by 50% of the amount of excess wages over the exempt amount. (The tax rate on excess earnings was subsequently reduced for retirees age 65 and older. The retirement earnings test for American workers older than the normal retirement age was eliminated altogether in 2000.)

Casual observation of the top and bottom panels of Figure 2 suggests social security had a powerful effect on both retirement ages and postretirement earnings. Note that the age distribution of retirements had two peaks, a lower one at age 62, when social security benefits could first be claimed, and a much higher one at age 65, when the social security formula stopped making generous adjustments for further delays in claiming a pension. The distribution of postretirement work effort shows an even larger effect of social security. Workers appear acutely sensitive to the high implicit tax on their earnings when annual wages exceed the exempt amount. Over a quarter of working retirees earn within 10% and over half earn within 30% of the exempt amount. While retirees may under-report their true earnings to social security to avoid paying the high implicit tax, the earnings estimates displayed in Figure 2 are based on workers' responses to a Census interviewer, not their earnings reports to the Social Security Administration.

The evidence in Figures 1 and 2 strongly suggests that some fraction of men are quite sensitive to social security incentives when they retire. It is less obvious whether this shows most of them are choosing their retirement age on the basis of a farsighted and rational plan. Workers following a simple rule of thumb may retire as soon as available retirement income replaces a target percentage of their monthly pay. It does not require long-term planning to recognize this target is more likely to be met when the worker can first claim a social security pension. To be sure, the shifts in the peak of male retirement ages shown in Figure 1 conform broadly with the shifting incentives provided by the U.S. social security program. Still, it seems surprising that men were so slow to respond to the availability of early pensions, which began in 1961. The percentage of men retiring at age 62 approximately doubled between 1970 and 1980, yet it is hard to see how the incentives for retirement at that particular age changed appreciably over the decade. The innovation in pension rules occurred in 1961 when early retirement benefits were first made available.

Axtell and Epstein (1999) argue that the slow evolution of retirement ages after the 1961 rule change actually provides powerful evidence against the view that workers are fully rational in their choice of retirement age. They suggest instead that ". . . imitative behavior and social interactions—factors absent from traditional economic models—may be fundamental in explaining the sluggish response to policy" (p. 162). They argue that only a small percentage of workers may have the capacity or willingness to understand program rules and interpret their meaning for the choice of an optimal retirement age. They suggest most workers imitate the behavior of their "neighbors," that is, older relatives, colleagues at work, or actual neighbors whose retirement behavior can be directly observed. If an imitator's "neighborhood" happens to include one or more farsighted planners, it is more likely the imitator will respond to new incentives in a farsighted way because the behavior imitated is more likely to be optimal. Axtell and Epstein show how rational behavior can cascade through a social network, even though very few members of the network may be farsighted or plan rationally for their retirements. Eventually, retirement patterns attain a new equilibrium in which the rational behavior predominates. It is not obvious, however, whether the optimal, farsighted behavior of a neighbor offers a good guide to one's own behavior. A neighbor who has accumulated greater wealth or who expects a shorter life span can comfortably retire at a younger age. Axtell and Epstein's (1999) model works best in explaining imitative behavior when agents face a common change in incentives. The change in availability of U.S. public pensions at age 62 is one example of such a change.

There is also some question whether the pattern of retirement ages and postretirement work effort reflects a sensible response to social security incentives. Many Americans retire just before or just after their 62nd birthdays, apparently because they can immediately claim a social security pension. As noted earlier, however, the social security benefit formula compensates workers who delay claiming a pension after 62 by increasing their monthly pension in later years. For workers who have average or above-average life expectancy and who have a savings account that earns less than 5% a year, it should make sense to delay claiming social security for two or three years after age 62. The rate of return that these workers can obtain through delaying a benefit claim compares favorably to the return they obtain on their savings. For workers in these circumstances, there is no more reason to stop working at age 62 than there is at age 61. Only workers who have no liquid savings, who have a short life expectancy, or who apply a high

rate of discount when evaluating future income gains have any special reason to retire at 62 years of age. Of course, men in those circumstances could account for all the extra retirements observed at age 62.

The postretirement work pattern shown in the lower panel of Figure 1 seems to reflect a powerful influence of the old social security earnings test on behavior. Pensioners avoid earning more than the social security exempt amount in order to avoid facing a 50% marginal tax rate on their earnings. On the other hand, the distribution of postretirement pay may also reflect considerable misunderstanding of the earnings test. Under the rules of social security, workers whose benefits are penalized because of application of the earnings test eventually have their monthly pensions recalculated to reflect this benefit reduction. Suppose a 64 year old worker earns enough wages above the earnings exempt amount to lose three months of benefit payments when he is 64. According to the rules of the program, the basic monthly pension at age 65 and later years is supposed to be increased to reflect the fact that no benefits were received for three months between ages 62–64. The adjustment is exactly the same as the one the worker would have received if claiming benefits had been postponed for three months. Since this delay in claiming pensions is compensated with an actuarially fair adjustment in monthly pensions, in effect the worker does not lose any lifetime benefits at all when benefits are reduced because of application of the retirement earnings test. For pensioners who are between 62 years of age and the normal retirement age, the earnings test results in the rearrangement of benefits over time. The worker receives smaller monthly benefits at the time he earns more than the annual exempt amount, but he receives permanently higher monthly benefits starting at a later age. In theory, the later benefit adjustment fairly compensates workers for the temporary reduction in benefits. If workers fully understood these rules, it is a little hard to understand why their postretirement earnings are so sensitive to the "tax" on earnings above the exempt amount and to changes in the annual exempt amount (Vroman 1985).

A simple explanation is that workers misunderstand the program rules. Many interpret the rules to mean they face a simple benefit cut whenever their earnings exceed the exempt amount. The clustering of annual earnings around the exempt amount certainly seems consistent with this interpretation. It shows pensioners are responsive to social security incentives, but it does not show whether workers are knowledgeable about the true financial implications of the program rules. If they are knowledgeable about the program rules, the clustering of

postretirement earnings at the exempt amount may ironically provide evidence that workers are shortsighted in their response to the earnings test.

Some economists have directly posed the question of whether the retirement behavior they observe is guided by simple-minded or farsighted planning. Lumsdaine, Stock, and Wise (1992) believe they found evidence suggesting that retirement age choice is often the result of a sophisticated decision-making rule. They examined the retirement choices of workers in a handful of company pension plans. They assessed these choices using three different decision-making rules, one an application of a simple rule, and the other two based on more sophisticated decision-making approaches. The analysts estimated their models using information from one period, and then they tried to predict retirement patterns in a later period under each of the three models. Perhaps surprisingly, they found that the models based on more complex and farsighted decision rules were more successful in predicting future retirement patterns. This evidence suggests at least some workers use information in a sophisticated way to decide when to retire. Of course, within a long-established occupational plan that covers many workers in the same workplace, information helpful in choosing an optimal retirement age that is discovered by one worker can easily be shared with coworkers. Where information sharing is more difficult, workers might rely on simpler decision-making rules, and some workers may end up retiring at an age that is less than optimal. Lumsdaine et al. (1992) analyzed the retirement decision in isolation. They did not assume workers were making farsighted and fully consistent plans for both work and consumption over a multi-year time horizon. Even the most sophisticated decision rule they consider is simpler than the planning methods needed to simultaneously select a retirement age and an optimal path for saving and consumption.

Other data are less supportive of the idea that workers use good information and farsighted plans to select their retirement age. The availability of longitudinal surveys of older workers allows researchers to ask people whether they have made retirement plans and selected an expected age of retirement. Information from later interviews can be used to determine whether respondents follow through on their plans. Abraham and Hausman (2004) analyzed information from the 1992–2000 Health and Retirement Survey (HRS) to determine how frequently older workers reported a retirement plan and how often they stuck to those plans. Workers in the HRS were in their 50s and early 60s when the question on retirement plans was first posed. This seems like a point in life when long-term planners would have formulated some

kind of retirement strategy. Abraham and Hausman report that ". . .the most common answer (38% of responses) was that the respondent had not given much thought to future work and retirement plans, or had no plans" (p. 9). Among workers who reported an expected retirement age or retirement strategy, a large percentage failed to follow through on their plans, even when the planned retirement was within two years of the time they described their plans. Among respondents reporting they would stop working altogether within two years of an interview, slightly more than one-third were still at work in the next biannual interview. Among workers who claimed they would never stop working, about one in seven had actually ceased working within two years. Of course, unexpected events may have intervened between the two surveys, disrupting the best laid plans of rational workers.

If workers wish to formulate a rational retirement strategy, a minimum requirement is to become familiar with the rules and benefit formulas governing the pension plans in which they are enrolled. The HRS provides a good source of information about older workers' knowledge of their pension plans. Workers were asked to describe some important features of their company plans, and their descriptions were compared to the descriptions of the same plan supplied by employers. Because of the method used to collect and verify the data, we should expect that employers provided more accurate plan descriptions than their employees. Gustman and Steinmeier (2004) offer a sobering comparison of the pension descriptions supplied by workers and employers in the HRS. Only about one-half of workers covered by a defined-contribution plan correctly identified the type of pension plan in which they were enrolled. Approximately the same percentage of workers enrolled in a defined-benefit plan correctly reported that their employer offered that form of pension.

A defined-benefit plan provides vested workers with a pension that is determined by the worker's years of service and final salary while enrolled in the plan. These plans ordinarily have an early entitlement age (when workers can first receive reduced benefits) and a full entitlement age (when workers can claim an unreduced benefit). In this kind of plan, the monthly pension is guaranteed by the employer. In contrast, a defined-contribution pension is essentially an individual investment account maintained on behalf of individual workers. The employer deposits annual contributions (usually a fixed percentage of a worker's pay), and the ultimate value of the investment account depends on the success of the worker's or employer's investment strategy. The worker bears the risk of poor investment outcomes, but the

accumulation in the pension account is the property of the worker even if he leaves the employer long before the standard retirement age. If workers do not know whether they are enrolled in a defined-benefit or a defined-contribution pension plan, it is unlikely they are familiar with the retirement incentives in their plan. Indeed, Gustman and Steinmeier (2004) show startling discrepancies between workers' understanding and employers' descriptions of retirement incentives. Even among workers who correctly stated they were covered by a defined-benefit plan, only a minority accurately reported the youngest age at which they could claim pensions. For example, among workers in plans where the early eligibility age was 55, only 40% of workers correctly reported this age. Slightly more than 20% believed the early entitlement age was 62, and 7% reported it was 65 or higher. Gustman and Steinmeier show that workers are more accurate in describing their Social Security entitlements, although workers with very low entitlements often have an exaggerated estimate of their potential monthly benefits

How does misinformation affect retirement decisions? Chan and Stevens (2003) offer some fascinating evidence. They focused their analysis on HRS respondents who worked in 1992 and were covered by a company pension plan according to the reports of their employers. Using the employer's description of the worker's pension entitlement, Chan and Stevens could reliably calculate the value of a pension if the worker retired immediately and compare that to the pension value if the worker retired at a future age. The average worker underestimated the value of the pension by about 55% of the amount reported by employers. Moreover, many workers offered wildly inaccurate estimates of the improvement in their pension if they delayed retirement to a later age. Using information from follow-up HRS interviews, Chan and Stevens found that workers' retirement choices were based on their (possibly inaccurate) interpretation of pension rules. For people with accurate information, retirement choices were closely aligned with the financial incentives in their plan. If a worker's understanding of the plan rules was in error, the retirement decision was often based on serious misunderstanding.

One of the most important financial determinants of an optimal retirement age is the increase or decline in the value of a pension if a worker postpones retirement for one or more years. Under some retirement plans, workers can actually lose lifetime pension wealth if they delay their retirement after attaining the plan's early or normal retirement age. Chan and Stevens (2003) found that workers who accurately reported the amount of pension gain from delaying retirement were several times more responsive than average workers to the true financial

incentives in their pension plan. Most economists, including Gustman and Steinmeier (1986), Burtless and Moffitt (1985), and Burtless (1986), estimate life-cycle retirement models under the presumption that workers are responding to the true financial incentives in the pension plans in which they are enrolled. On the whole, they find aggregate responses to pension incentives that seem consistent with the basic life-cycle model. Chan and Stevens' findings suggest the pattern of aggregate response may reflect farsighted responses on the part of some well-informed workers and poorly informed or irrational choices for a sizeable minority or even a majority of workers.

In recent years the evidence from single-country studies has been supplemented by evidence based on cross-national comparisons of retirement behavior. Gruber and Wise (1999) have performed one of the best known studies of this type. Gruber and Wise and their expert collaborators examined pension systems and retirement incentives in 11 industrialized countries. Some of these countries allow workers to begin drawing public pensions at age 60 or even earlier, while others do not make old-age benefits available until later. There is also wide variation in the treatment of labor earnings once workers reach the pensionable age. Some countries, like the United States, do not penalize workers for delaying their retirement beyond the early and normal pensionable ages. Other countries, like France and Belgium, impose heavy financial penalties on workers who remain employed after the pensionable age. Gruber and Wise find a strong correlation between national retirement patterns and the labor supply incentives that are embodied in national pension systems. Countries with modest pensions and generous treatment of earned income after the pensionable age have high rates of participation among people between 55 and 70 years old. Countries that offer generous pensions and impose heavy penalties on earnings after the pensionable age have lower participation rates at older ages.

These findings imply that the trends in labor force participation at older ages have been decisively influenced by incentives in national retirement systems. While all the rich countries have seen major declines in older males' activity rates, the extent of decline has been affected by the details of the national pension system. The Gruber and Wise (1999) analysis implies the incentives in a public pension system have a major impact on the timing of retirement as well as overall employment rates at older ages. The same conclusion was reached by Blöndal and Scarpetta (1999) who assessed retirement incentives in 20 OECD countries and provided a statistical analysis of the impacts on old-age labor supply.

Although the international evidence conforms with national-level evidence in showing a link between the timing of retirement and pension plan retirement incentives, it is not obvious what percentage of workers actually uses optimal planning rules to decide when to retire. The statistical results obtained by Gruber and Wise (1999) and Blöndal and Scarpetta (1999) show that cross-national differences in retirement patterns are broadly consistent differences in pension generosity and pension incentives in different national pension systems. But the same kind of statistical relationship would be uncovered if 20%, 50%, or 95% of workers were fully informed of pension incentives and were both far-sighted and fully rational in response to them.

Saving for retirement

The life-cycle model provides some clear predictions about how wealth is accumulated over a career and how workers should respond to unexpected events. The theory implies that workers should build up significant savings in anticipation of retirement and then draw down their wealth after they retire. It makes a clear distinction between (unanticipated) changes in flows of income that can be expected to last and changes that are only temporary. An unexpected income improvement that is permanent, such as an earnings gain that accompanies a promotion, will have a much bigger impact on a worker's consumption than an improvement that is only temporary, such as a one-time bonus for outstanding job performance. By the logic of the life-cycle model, a person who wins a lottery that pays $10,000 a year for 30 years will plan to make a much bigger change in consumption than the person who wins a one-time prize of $10,000. By the same reasoning, the lottery winner who obtains a prize paying a modest annual amount (say, $750 a year) that has a present discounted value of $10,000 will alter consumption by roughly the same amount as the winner of a one-time prize equal to $10,000. A fully anticipated drop in income, such as the one that accompanies a planned retirement, should have almost no effect on consumption.

Some evidence supports this theory (Lusardi and Browning, 1996). Most empirical research suggests that the life-cycle model is correct in emphasizing that households discount short-run fluctuations in their income when determining current consumption, and that retirement is one important motive for saving. There is competing evidence, however, that consumption is more volatile and closely related to current income changes than would be the case if there were complete smoothing of consumption over full lifetime resources. As the theory predicts, we observe a tendency among many workers to steadily, but gradually, build up their wealth,

increasing their rates of saving in peak earning years and as they approach retirement. The life-cycle theory's implication that consumers have a target wealth-income ratio that increases with age up to retirement also seems to be valid for many households.

Nonetheless, some economists are skeptical of the theory because simple versions of it are not very successful in accounting for important aspects of personal saving. For example, many workers enter retirement without any assets. A large percentage of workers who do have assets apparently continue to add to them after they retire. Neither fact is easy to reconcile with simple versions of the life-cycle model. Theorists have made modifications in the basic theory to account for obvious empirical contradictions. Different theorists have proposed different modifications to rescue the basic model. Whatever their criticisms of the model, however, few economists have strayed far from it in trying to explain the connection between saving and retirement behavior.

Saving before retirement. Recent empirical research has focused on two questions about saving and retirement. First, do workers typically accumulate enough savings so that they can live comfortably during retirement? And second, is there evidence to support the prediction of the life-cycle model that consumption changes little when retirement occurs?

The first question has aroused controversy because of disagreement over what constitutes adequate saving for retirement. Almost from the beginning of systematic analysis of the wealth distribution, economists have had to confront the fact that many workers reach old age with very little savings (Diamond and Hausman, 1984). This finding has been confirmed in many studies over the years. Lusardi (2001) recently tabulated the wealth holdings of HRS respondents who were not retired at the time of their first interview in 1992. Since these workers were between 50 and 61 years old, it is reasonable to assume most of them were within a decade of retirement. Active workers in the bottom one-tenth of the HRS wealth distribution had no wealth at all except their public pension entitlement. Even workers at the 25th percentile had essentially no financial market wealth. Subtracting their short-term debt from the sum of their bank deposits, stocks, and bonds, workers at this rank of the wealth distribution had no liquid savings. These workers' total wealth holdings, including equity in a home or business, defined-contribution pension plans, and vehicles, amounted to less than $28,000 (in 1992 U.S. dollars). Lusardi calculates that if all of this wealth were sold and converted into a lifetime annuity, it would provide workers with an income of less than $200 a month. One-quarter of 50–61-year-old

workers in the HRS had even less wealth than this. One reason for low savings may be that workers have given little or no thought to retirement. Lusardi reports that the median wealth holdings of workers who have thought "hardly at all" about their retirement is less than one-half the median wealth of workers who have thought "some" or "a lot" about retirement.

Although the fraction of older workers who lack wealth may seem shockingly high, is it high enough to cause us to reject the hypothesis that workers save rationally for retirement? In some cases we can show that the optimal rate of pre-retirement saving is zero or very near zero. Many workers who earn low or erratic wages throughout their careers will qualify for a U.S. social security pension or social assistance benefits. The amount of monthly benefits may equal or exceed the average net pay they received during their career. Since some of these workers may not be eligible for social assistance unless their liquid savings are low, it may not make sense to accumulate much wealth before retirement. The availability of social security, social assistance, and company-provided defined-benefit pensions means that the optimal amount of savings depends critically on individual circumstances. Workers who can expect pensions or assistance payments that replace a large percentage of their net earnings have much less need for savings than workers who do not anticipate pensions or assistance payments.

Bernheim (1992, 1995) published two widely cited studies showing that many Americans nearing retirement, including high-wage workers, face large shortfalls in retirement saving. He calculated workers' optimal saving levels, taking into account the number of their current and anticipated dependents, earnings, expected social security and occupational pension benefits, and other factors. He then compared workers' actual saving with the optimal saving amount and determined whether workers faced a surplus or deficit in their saving. His calculations implied that Americans in the baby boom generation were saving at just one-third the rate needed to cover the costs of their retirement.

Other researchers have reached similar conclusions, sometimes using much better survey data. Moore and Mitchell (2000) examined the 1992 wealth holdings of HRS respondents and calculated the additional saving they would need to retire without any loss of consumption at retirement. This calculation takes into account the social security and pension benefits that workers could obtain if they continued working. The calculations are repeated for two potential retirement ages, 62 and 65, the two ages that are most common (see Figure 1). Moore and Mitchell show that the median HRS household would have to increase its saving rate by 16% of

earnings to maintain constant consumption after retirement at age 62. If retirement were delayed for three additional years to 65, the required extra savings for the median worker would represent 7% of earnings. When Moore and Mitchell compared required savings rates to actual savings rates among households approaching retirement, they found that actual saving rates typically fall far short of the required rate. A similar conclusion about the adequacy of household saving was reached by Warshawsky and Ameriks (2001).

In a new analysis of retirement wealth adequacy, Munnell, Webb, and Dunmore (2006) calculated the percentage of Americans who will have enough retirement income to substantially replace their pre-retirement income if they retire at age 65. As the authors note, their assumption regarding the retirement age is optimistic, since about half of American workers retire before age 63. Using comprehensive pension and wealth data from the Survey of Consumer Finances and an optimistic forecast of future saving, the analysts project that 35% of Americans born between 1946-1954 and 44% of those born in 1955-1964 will experience sizeable declines in spendable income after retirement. Interestingly, the predicted percentage of workers facing a shortfall is considerably higher among workers enrolled in defined-contribution (DC) occupational pension plans than it is among workers in defined-benefit (DB) plans. In the latter type of pension plan, U.S. employers are mainly responsible for setting aside and investing retirement savings in behalf of their employees. In the first kind of plan, workers usually chose the total percentage of wages to set aside in a pension plan and the portfolio allocation of the investment funds. Equally important, U.S. workers enrolled in occupational DC plans often have to right the borrow against their fund balances while they are employed with the sponsoring employer and to liquidate their retirement savings (with a tax penalty) when they change employers. The finding that workers in DB plans face less risk of inadequate retirement incomes than workers in DC plans suggests that strong pre-commitment devices may be needed to force workers to save for long-term goals like retirement. If workers apply time-inconsistent hyperbolic discount rates when dividing current income between immediate consumption and retirement saving, the constraints in a DB plan may be more effective than those in a DC plan in enforcing a disciplined saving strategy (Laibson, Repetto, and Tobacman, 1998).

Some recent analyses of wealth surveys have produced a more reassuring picture of wealth adequacy. A number show that comparatively few workers have clearly under-saved, and the typical amount of under-saving is quite small. One reason for the conclusion is that these

studies explicitly account for the income uncertainty workers face in the years before they retire. Earnings uncertainty is very important for an obvious reason. If workers cannot borrow much money, they must save a very large percentage of their earnings in high income years to ensure that their families do not have to reduce their consumption in low earnings years. In the simplest version of the life-cycle model, economists assume that annual earnings will rise and fall over a worker's career in a completely predictable way. In the real world, earnings are not predictable. Every year many workers lose their jobs, and some must accept big pay cuts in order to get reemployed. Other workers receive unexpected promotions or take new jobs with higher salaries. If workers want to accumulate enough savings to smooth consumption completely, they must save a very large percentage of their pay to accumulate a large buffer stock of savings. Rational planners will save less than the full amount needed to completely smooth consumption, and this will mean that large, unexpected income reductions will sometimes cause workers to deplete their savings before they retire. As noted by Engen, Gale, and Uccello (1999), it is wrong to argue that there is a single optimal path of saving for all workers who expect to earn the same lifetime wages. Even among workers who share the same preferences, there is a range of optimal saving paths where each path depends on the exact sequence of earnings "surprises" received by the worker. Workers and retirees also face uncertainty about when they will die. If workers die at an unexpectedly early age, their savings will go unused and will not contribute much to their lifetime happiness. If they die in advanced old age, they may deplete all their savings and face many years of very low consumption. Rational workers will make a savings choice that balances these risks, but for many farsighted workers, the balance will mean their consumption falls as they live longer and longer beyond their retirement age.

In light of earnings and lifespan uncertainty, Engen et al. (1999) ask a different question about wealth holdings from the one posed by other analysts. They ask whether the observed distribution of wealth holdings seems consistent with the distribution that would be observed if each household responded to unexpected earnings changes and life-span uncertainty in an optimal way. Other analysts implicitly posed a different question: If the profile of lifetime earnings and date of death were known in advance, how much wealth would an optimizing worker have set aside by the time he reached the age when his wealth holdings were reported to the interviewer? If a worker's wealth falls short of this threshold, the worker is judged to have inadequate savings. Engen et al. do not actually observe the past sequence of earnings for any

member of their sample, but they can use information from other sources to derive reasonable estimates of typical year-to-year variability in earnings. Combining this information with data about the worker's current earnings and survival probabilities in future years, they simulate the range of wealth holdings that would be observed if workers responded optimally to a simulated sequence earnings fluctuations and the known probabilities of future death. Their simulations unsurprisingly reveal that many prudent and rational savers will have little or no savings if they experience a big, unpleasant earnings surprise. Although Engen et al. conclude that there is probably some under-saving in a few population groups, the shortfall in saving seems quite modest compared with earlier estimates. This conclusion was confirmed in a recent study by Scholz, Seshadri, and Khitatrakun (2004), which used HRS data to calculate optimal saving accumulations based on workers' actual lifetime sequence of Social Security covered earnings. The optimal accumulations were then compared with wealth holdings reported by the same workers. Scholz et al. conclude that less than one-fifth of HRS households have lower saving than their optimal targets, and the saving shortfall of those households is typically quite small.

Post-retirement consumption. The findings by Engen et al. (1999) and Scholz et al. (2004) do not prove that the saving behavior of American workers is farsighted and rational. They demonstrate instead that it is difficult to rule out the hypothesis that saving choices are farsighted and rational for an overwhelming majority of workers. Many policymakers would find this conclusion more reassuring if analysts could point to clear evidence that retirees enjoy adequate income or consumption in old age. It is hard to define a reliable benchmark for assessing consumption "adequacy," however.

A common way to measure income adequacy in cross-national studies is to compare a household's income to one-half the median income in a country. A household with equivalent (or family-size adjusted) income that is less than one-half the national median equivalent income is classified as "poor." Smeeding and Williamson (2001, Tables 1 and 5) have estimated poverty rates among the aged and non-aged in 19 industrial countries. The average poverty rate in these countries was 9.5 percent in the early 1990s. Among people who were at least 65 years old the average poverty rate was somewhat higher, 11.7 percent of the aged population. The old-age poverty rate was higher than the overall poverty rate in 10 of the countries, but it was lower than the overall poverty rate in 4 countries and was within one percentage point of the overall poverty rate in 5 countries. Thus, in about half the industrialized countries poverty in old age was roughly

equal to or less common than poverty at younger ages. In the other half of countries poverty was somewhat more common among the elderly than the non-elderly. Extreme poverty—income below 40 percent of national median income—was no more common among the aged than it was among the non-aged. These statistics apparently provide reassuring evidence about the adequacy of retirement preparations among the aged.

The fact that old-age poverty rates are low does not prove they would be low if workers had to decide for themselves how much to save for retirement, however. In a number of the countries in their analysis, Smeeding and Williamson (2001) examined the impacts of public pensions and other income sources on poverty rates. In particular, they calculated the percentage of elderly households that would be poor under different definitions of income. When the income definition included only private sources of income, such as earnings, income from property and investment, and occupational pensions, an average of 72 percent of elderly households were found to be poor. When public pensions were also included in the income definition, the household poverty rate dropped by 51 percentage points to just 21 percent. The measured poverty rate dropped still further when means-tested government benefits were included in the income definition. Clearly, publicly provided benefits—including compulsory pensions—are overwhelmingly important in keeping aged households out of poverty. When public benefits for the aged were smaller, a larger percentage of the elderly was poor. In the United States, the Census Bureau has tracked poverty rates since 1959. In that year the social security system was not yet mature and many aged households did not receive social security pensions or collected very small pensions. Under the official U.S. poverty definition, 35.2% of America's population 65 and older was poor compared with just 17.0% of adults between 18 and 64. As the social security system matured and public retirement benefits rose, the poverty rate of the aged population fell much faster than it did among the non-aged. Since 1993 the old-age poverty rate has been almost indistinguishable from the poverty rate of 18-64-year-old Americans. This evidence on poverty in the absence of compulsory saving is far from reassuring.

To the cross-national and historical evidence must added direct evidence on old-age consumption. Analysts have found reliable and consistent evidence suggesting that consumption falls after workers retire, although the implications of this decline are disputed. Hamermesh (1985) found that couples' consumption early in retirement is 14% higher than their retirement income can support, forcing them to reduce their consumption in later old age. Hausman and

Paquette (1987) uncovered even more compelling evidence of a drop in consumption following retirement. Looking solely at food consumption among families represented in the LRHS, Hausman and Paquette found that retirement led to a decline in expenditures on food of about 14% of pre-retirement consumption. For the workers who were forced to leave their jobs because of a layoff or deterioration in health, the drop in consumption was even bigger—an additional 9% of pre-retirement food consumption. For workers who had accumulated below-average wealth, the drop in food expenditures was larger still. Banks, Blundell, and Tanner (1998) used many years of detailed household consumption data for British families to document the fall in consumption that occurs immediately after workers retire. Part of this decline can be explained by lower spending requirements for people who no longer need to go to work, but much of the falloff in consumption cannot be rationalized. Banks, Blundell, and Tanner conclude that for many households, retirement must have been accompanied by an unwelcome surprise that reduced the families' ability to consume.

Recent studies suggest that the drop in consumption following retirement is at least partly anticipated. Hurd and Rohwedder (2004) used interview responses in the HRS to compare respondents' pre-retirement expectations of consumption after retirement with the actual experiences of workers who had already retired. HRS respondents who were not yet retired were asked whether they expected consumption to fall after retirement and by how much. The responses of people who had not yet retired could be compared with the reported consumption changes of HRS respondents who had retired and already experienced the fall in income that accompanies retirement. Hurd and Rohwedder confirm that consumption falls at retirement, with an average decline of about 15–20% of pre-retirement consumption. They also show, however, that this fall in consumption is largely anticipated by workers. In fact, the reported decline in consumption among workers who had already retired is a bit smaller than the average decline predicted by workers who had not yet retired. These findings confirm earlier findings by Ameriks, Caplin, and Leahy (2002). Using survey responses obtained from participants enrolled in the TIAA-CREF pension program, Ameriks et al. discovered that a majority of active workers expect their consumption spending to fall after retirement. (TIAA-CREF is a defined-contribution pension plan that covers many U.S. college, university, and academic workers.) Among TIAA-CREF participants who had already retired, only about one-third report that their consumption has actually declined. Forty-four percent report their spending has remained

unchanged, and 20% say consumption has risen. Thus, many older workers anticipate their spending will decline after retirement, but the actual experience of recent retirees suggests the drop in saving may be smaller than anticipated.

Even granting that consumption falls after retirement, the drop in spending may not reduce retirees' welfare. For example, retirees may spend less on food because they do not need to eat as many meals away from home or because they have more time to shop for bargains. Necessary spending on taxes, clothing, and transportation may also decline. Retirees have the time to produce some goods and services in the home that full-time workers may have to purchase in the market. Thus, even if it is true that consumption expenditures fall in retirement, it is not clear that the decline is associated with a drop in well-being. The evidence on the reported happiness (or subjective well-being) of retirees versus older active workers provides little evidence that the retired are systematically less happy than active workers. Retirees on average have more health problems than active workers, but among people who have the same marital status and similar health problems, the retired are about as happy as active workers. Some evidence on subjective well-being among the retired is summarized in Loewenstein, Prelec, and Weber (1999).

In a handful of cases, it is possible to document the short-sightedness or irrationality of workers' saving behavior. In some occupational DC pension plans, workers only receive an employer contribution to their accounts if they make a voluntary contribution to the plan out of their own wages. For example, workers may be required to contribute at least 3% of their salaries before their employers will make a 3% contribution to their DC accounts. Workers who are liquidity constrained may nonetheless refrain from contributing to the DC plan, because the value of receiving income today outweighs the value of collecting a larger future pension. Choi, Laibson, and Madrian (2005) analyzed DC plans in which some workers were allowed to make immediate, penalty-free withdrawals from their pension accounts after employers made matching contributions to the accounts. In this case, workers could elect to make 3% salary contributions which were matched by 3% contributions from their employers, and workers were immediately allowed to withdraw their employers' contributions. In other words, workers could make voluntary contributions without sacrificing any immediate consumption sacrifice. In spite of the obvious advantage of making voluntary contributions up to the employer's contribution limit, the researchers found that about half of eligible workers failed to do so. They calculate that under-

saving workers sacrificed an average of 1.3% of their annual salaries by failing to take maximum advantage of the employer's contribution.

There is overwhelming evidence that many households have little or no savings as they approach retirement. In most cases this does not help us decide whether workers' saving decisions were based on short-sighted or irrational decision making, however. Given the uncertainty of pre-retirement earnings and the availability of means-tested retirement benefits for low-income retirees, many forward-looking, rational workers will enter retirement with little savings. There is also pervasive evidence that workers experience significant reductions in consumption after they retire, possibly indicating that they were shortsighted in their saving or unpleasantly surprised by the drop in income that followed retirement. Many workers anticipate a fall in consumption after they retire, however, and so another explanation for the fall in consumption is that workers have lower spending needs when they stop working. The drop in consumption spending may not be connected with a decline in welfare. Although many observers see overwhelming evidence that workers systematically under-save for retirement, the distribution of retirement saving may in fact be consistent with rational, far-sighted planning under uncertainty. The most compelling evidence of under-saving may come from workers' own assessments of their saving behavior. Laibson, Repetto, and Tobacman (1998) cite polling evidence showing that 76% of U.S. respondents believe they should be saving more for retirement. In another survey, sponsored by Merrill Lynch, a polling firm found self-reported shortfalls in retirement saving among workers between 29 and 47 years old. Compared with their target saving rate, more than three-quarters of respondents reported saving too little of their income. The median reported gap between respondents' target saving rate and their actual saving amounted to 10% of household income (Laibson, Repetto, and Tobacman, 1998, p. 94). Unfortunately, workers' assessments of their retirement saving needs are not very precise. Only about four in ten U.S. workers have performed any calculation of the wealth accumulation needed to sustain their living standards after they retire (Helman, Copeland, and VanDerhei, 2006, p.1) .

Allocation of retirement saving

Workers who elect to set aside part of their wages in retirement savings accounts must ordinarily decide how to invest their savings. How good a job do they do? To answer this question analysts must first establish what a good retirement portfolio would look like. Many

economists believe modern finance theory offers a simple solution to the worker's asset allocation problem. Canner, Mankiw, and Weil (1997) point out that the mutual-fund separation theorem has a straightforward implication for savers: "… more risk-averse investors should hold more of their portfolios in the riskless asset. The composition of risky assets, however, should be the same for all investors." (p. 181) According to the theorem, investors should hold a portfolio that consists of a riskless or very safe short-term security (Treasury bills) and a mutual fund that holds all risky assets in proportion to their weight in the market. The investor's only important investment decision is the allocation of the overall portfolio between the safe asset and the composite risky asset. This allocation depends on the investor's risk aversion, but it does not depend on the investor's age or retirement status. As Canner, Mankiw, and Weil recognize, however, very few professional investment advisors recommend a saving strategy based on this insight (see also Jagannathan and Kocherlakota, 1996; and Ameriks and Zeldes, 2004). Instead, almost all advisors suggest savers should invest more heavily in equities if they are less risk averse and young and gradually shift their asset allocation towards bonds if they are more risk averse or closer to retirement.

The disagreement between finance economists and professional investment advisors makes it hazardous to assess workers' investment choices against ideal portfolios appropriate for savers at different ages. Both financial economists and professional advisors agree that the optimal investment portfolio will vary depending on workers' attitude toward risk, so there is no single portfolio that will be ideal for all workers at the same stage of their career. The two kinds of experts do not agree on how workers should vary their portfolio to reduce risk, and they differ on whether the allocation to riskier assets should decline as workers age. Economists who have analyzed workers' investment choices find not surprisingly that portfolio allocations differ widely from one worker to the next. Many U.S. workers allocate a high percentage of their retirement savings to equities, as professional investment advisors recommend, but a large fraction invests little or nothing in risky assets, contrary to the recommendations of most investment advisors. It is unclear whether American workers allocate a declining percentage of their portfolios to riskier assets as they age (Ameriks and Zeldes, 2004). Many analysts claim that the allocation to equities declines as workers grow older, but Ameriks and Zeldes (2004) show that this finding may be a spurious result of the complicated interaction among time, cohort, and aging effects in the data. Unfortunately, there is no completely persuasive way to

separately identify these effects and determine the true impact of age on the risk of workers' portfolios.

If it is hard to assess the optimality of individual workers' portfolios at a given point in time, it is easier to evaluate some other aspects of their investment behavior. All analyses of investor behavior in employer-sponsored DC pension plans show that American workers are infrequent traders. Few of them exchange one kind of asset for another, and it is uncommon for workers to reallocate their new contributions among the investment alternatives available to them (Agnew, Balduzzi, and Sunden, 2003; and Ameriks and Zeldes, 2004). In a 10-year panel of observations in a large DC pension fund, Ameriks and Zeldes found that only 53% of workers made any change in their allocation of new contributions and only 27% made a change to the allocation of assets already held in their accounts. By implication, most workers' portfolio allocations change over time in response to realized returns on the different assets held in their portfolios. For example, workers who consistently allocate 50% of their new contributions to a diversified equity fund and 50% to a bond fund will see the stock-bond allocation of their portfolio vary widely over time if the relative returns on stocks and bonds differs. Many investment advisors recommend that savers rebalance their portfolios about once a year in order to maintain the risk profile of their holdings, but very few retirement savers follow this advice. On the other hand, the infrequency of trades reduces the transactions costs that workers impose on their pension funds. A number of studies of investment behavior outside of pension plans suggest that excessive trading substantially worsens investors' realized returns (Odean, 1999; Barber and Odean, 2000). This does not appear to be a important problem for most retirement savers. A more serious problem, at least for a large minority of worker investors, is lack of financial knowledge. A 1995 survey of U.S. mutual fund purchasers found that more than one-quarter were unaware that it is possible to lose money on investments in a bond mutual fund. Only a minority of investors reported knowing the cost of owning the mutual funds in their portfolio. An even smaller percentage knew that higher fund expenses were likely to reduce investors' net returns. About one investor in five thought higher fund expenses would actually boost their net returns (Alexander, Jones, and Nigro, 1998).

Analysts have uncovered several aspects of worker investment behavior that raise questions about their capacity to align their portfolios with their long-term goals. Many workers allocate too much of their retirement savings to a single stock, and to a particularly risky one.

An investment option open to many U.S. retirement savers is stock in the company where they work. According to Schlomo Benartzi (2001), about a quarter of American workers' discretionary retirement savings is invested in the stock of their employers. Many individual workers invest all or nearly all of their pension savings in their employer's stock. From the point of view of risk management, this is a dubious savings strategy. First, the risk of owning a single stock is much greater than that of holding a diversified portfolio, such as that offered by an equity mutual fund. Second, the future performance of an employer's stock and the worker's wage earnings are likely to be positively correlated. If a worker is laid off because his employer falls on hard times, the employer's share price will probably decline at the same time. It is hard to understand why financially savvy workers would want to compound the misfortune of job loss by losing most of their retirement savings at the same time.

Many workers show little evidence they have carefully weighed their investment options or made a knowledgeable decision about their saving allocation. Many workers leave their contributions in the default investment option under their employer retirement plan (Choi, Laibson, and Madrian, 2004). It is hard to believe the funds are left untouched because the default allocation corresponds to the worker's considered choice. Workers remain in the default option investment plan, regardless of whether it is a low-risk money market fund or a moderate-risk stock-bond hybrid fund. The risk / expected return characteristics of the two investment options are very different, so workers' persistence in remaining in the default option is explained by inertia or lack of knowledge rather than by the happy coincidence of worker preferences and the risk characteristics of the default option.

Finally, many investors are excessively swayed by the packaging of the investment choices offered to them. In principle, well-informed investors should select a portfolio of assets because its risk and expected return characteristics correspond closely to those they desire. In practice, some investors will prefer to invest in option B if it is presented as an intermediate alternative between options A and C, but will instead choose option C when it is presented as the intermediate alternative between options B and D. If options B and C are both available on different menus of investment alternatives, investors should always prefer B over C or C over B, regardless of the risk and return characteristics of the other investment options on the menu. Careful experiments by Benartzi and Thaler (2002) show, however, that some workers' preferences are decisively affected by extreme and intermediate alternatives that are offered on

the menu. Workers who know little about investment are apparently guided in their portfolio allocation by factors that should be irrelevant to their decision.

Implications

If they look carefully at retirement and saving, economists can find evidence for rational, farsighted responses to financial incentives. American retirement patterns at different ages have gradually evolved to reflect the retirement incentives embodied in the nation's most important pension program. Evidence from other industrialized countries and cross-national comparisons of retirement behavior reinforce the findings based on U.S. evidence. The evidence on aggregate retirement patterns seems to dovetail with other recent evidence showing that only a very small proportion of workers enters retirement with wealth that is too low to be consistent with some rational, farsighted rule for planning lifetime consumption and retirement. Even the evidence that workers reduce their consumption after retirement, which violates a basic implication of the life-cycle model, can be explained by the lower consumption commitments of retirees and by rational saving and consumption responses to unexpected events that trigger retirement. Many workers know little about how to invest their retirement savings, but on the whole their investment portfolios seem plausible.

Economists' standard explanations for behavior are a little harder to square with workers' responses when they are asked directly about their retirement plans and saving habits. A large percentage of workers say they have given no thought to retirement, have saved too little for old age, and do not know whether they will be able to afford to retire. Few can accurately describe the risks or costs of the investments they have elected to hold in their retirement savings accounts. When asked to describe future benefits under their occupational or public pension plans, a majority of workers shows astonishing ignorance of the most basic provisions determining their future retirement income. If workers do not take the trouble to learn how their pensions are calculated, it is a little hard to believe they use information sensibly to choose an optimal retirement or saving strategy.

There are two ways to reconcile the apparent contradiction between workers' responses to questions about their retirement planning and saving and the aggregate evidence showing that, on the whole, retirement trends and retirement saving seem consistent with the predictions of rational-actor models. One explanation is that it does not require a large number of farsighted workers for the aggregate evidence to be consistent with the predictions of a rational-actor

model. So long as a modest percentage of workers bases retirement and saving behavior on rational and farsighted decision-making rules, it will be hard using aggregate evidence to statistically reject the hypothesis that the distribution and trend of retirement ages are determined by some version of the life-cycle model. Even if only a small percentage of workers bases retirement decisions on the farsighted model, we might still observe the work and retirement patterns shown in Figures 1 and 2. A second explanation is that many workers follow simple and possibly shortsighted decision-making rules that produce retirement and saving choices that are correlated with choices that emerge from the application of farsighted, rational rules. If workers decide to retire at the earliest age their pensions replace 65% of pre-retirement net earnings, the trend and distribution of retirement ages would look very much like those displayed in Figure 1. The empirical evidence on worker savings and retiree consumption neither proves nor disproves the hypothesis that retirement, saving, and investment allocation decisions are made in a fully rational and farsighted way. The evidence only shows it is hard to rule out rationality and farsightedness using available information on households' consumption and savings.

One explanation for workers' ignorance about retirement incentives and for their lack of retirement planning may be that many people use simple rules of thumb to choose their retirement age. This kind of decision rule may not be farsighted, but it could be rational if workers do not expect to derive much benefit from a big investment in information gathering and planning. The same reasoning applies to workers' acquisition of knowledge about financial assets and their risk and return characteristics. The range of uncertainty about workers' future health and employment prospects and about future financial market returns is so wide that many people may believe well-informed, deliberative planning is a waste of effort. The process will need to be repeated every time a worker receives fresh news about her health and potential earnings or is offered a new investment option for her retirement savings. This prospect is clearly unattractive for people who do not enjoy planning or who are unskilled at performing it. A simpler and more attractive option for deciding when to retire is to imitate the behavior of friends who may be better informed about the actual consequences of selecting one retirement age rather than another.

What difference does it make if workers select their investment portfolio or choose a retirement age using imitation, simple rules of thumb, or other decision rules that require little effort? How much is a worker's welfare harmed by use of a second- or tenth-best decision rule?

In individual cases, the consequence of a poor choice of retirement age or saving allocation can be very poor old age. On the whole, however, only a small percentage of career workers in rich countries faces severe material hardship after retirement. Serious deprivation is currently no more common among the elderly than it is among younger adults. Workers who use shortsighted decision rules probably enjoy less comfortable material circumstances in old age than they could enjoy if they had based their decisions on good information and farsighted planning. But the shortfall in their retirement consumption might be relatively small. Survey evidence on subjective well-being suggests that most people make accommodations to modest changes in income. People who experience income gains often report temporary increases in subjective well-being, and people who experience economic losses report declines in well-being. In neither case, however, does the change in well-being appear to persist very long (Easterlin, 2003). Thus, compared with the happiness that the retired could have obtained under a rational and farsighted plan, the loss in happiness they actually experience using a less costly decision-making process may be small.

One reason retired workers nowadays enjoy reasonable incomes, regardless of their pre-retirement preparations, is the safety net provided by public pensions and social assistance. If this safety net is scaled back to make room for bigger private pension accounts, policymakers should make rules for the accounts that reflect what we have learned about worker decision-making. Many workers will accumulate more retirement savings when retirement contributions are automatically deducted from their wages. Workers' retirement savings will obtain better risk-adjusted returns when they are automatically invested in a prudent and diversified portfolio and when the portfolio is automatically rebalanced to ensure its risk characteristics remain appropriate for retirement investors. Because many workers are myopic and invest little effort in understanding their long-term income needs, strong signals should be provided by the retirement plan to indicate a reasonable saving rate, a prudent retirement investment allocation, a sensible age for claiming benefits, and a prudent rule for withdrawing funds after retirement.

Beshars et al. (2005) suggest that pension plans should have sensible default rules, that is, rules that automatically determine outcomes unless overridden by a worker's instructions. If a prudent retirement saving plan requires a combined employee-employer contribution equal to 8% of wages, the default contribution rate in a plan should be 8%. Workers wishing to contribute more or less should be required to submit instructions to override this default. Recent

research shows that automatic enrollment in a voluntary pension plan can significantly increase participation rates, and high default contribution rates can significantly boost retirement saving. The same approach can be used to steer less informed workers into appropriate investment portfolios, toward reasonable retirement ages, and into annuities after they retire. The Beshars et al. recommendation is reasonable if individual-account pensions will supplement a basic state pension that is large enough to remove full-career workers from poverty after they retire. If state pensions are too small to achieve that goal, something stronger than good default rules will be needed. So long as the state maintains a means-tested program to prop up the incomes of the indigent elderly, active workers will have an incentive to avoid contributing to voluntary pensions. Among workers who do contribute, the availability of means-tested old-age benefits may induce some workers to invest their contributions in high-risk, high-expected-return assets. To protect taxpayers from the effects of these adverse incentives, workers may have to be required to make minimum contributions to the private retirement system, allocate a minimum percentage of their contributions to low- or moderate-risk assets, and convert some portion of their retirement assets into a life annuity.

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**Figure 1. U.S. Male Retirement Rate by Age, 1940 - 2000**

1940 and 1960

1970 and 1980

1990 and 2000
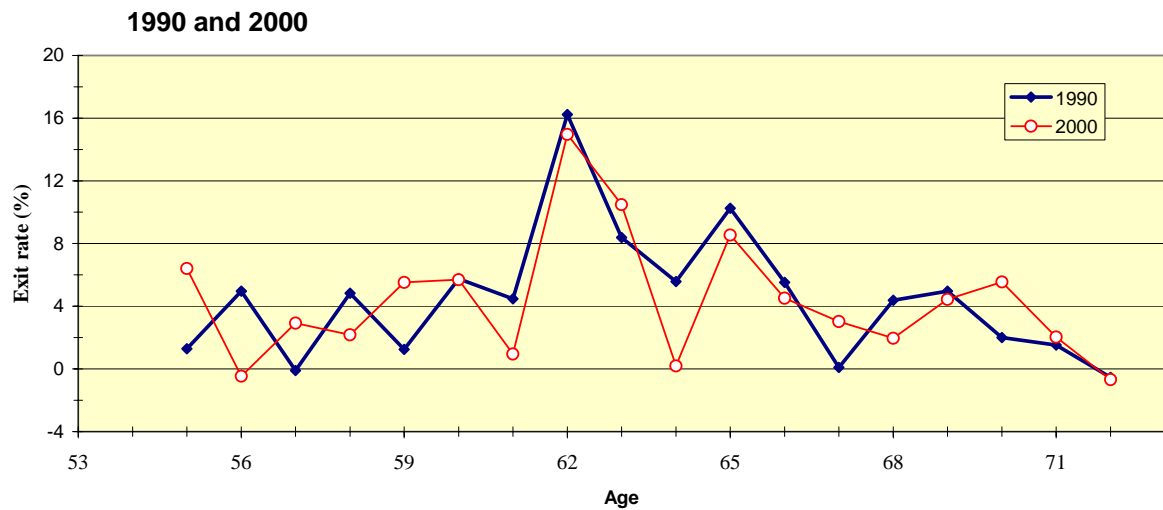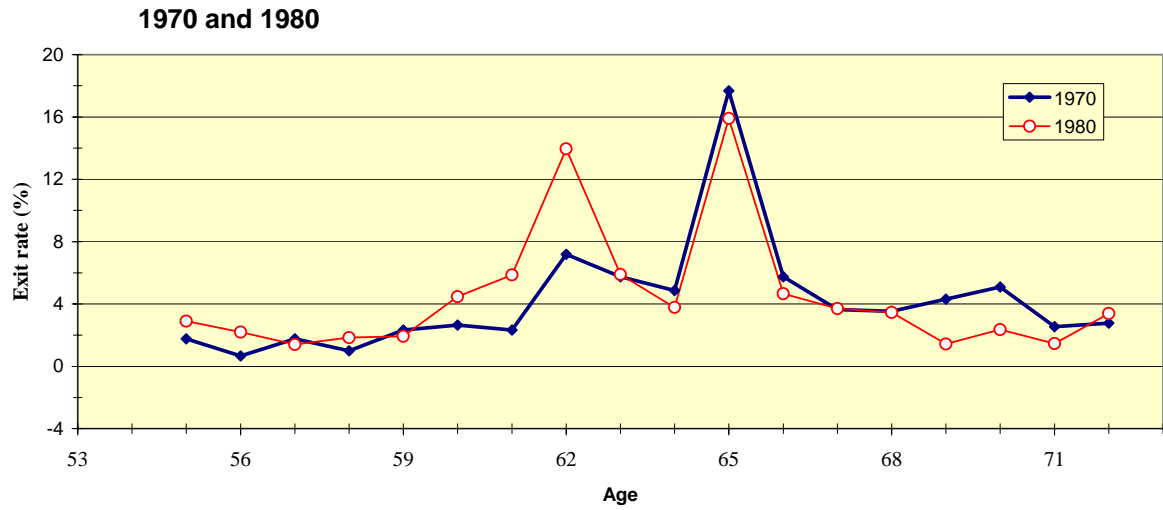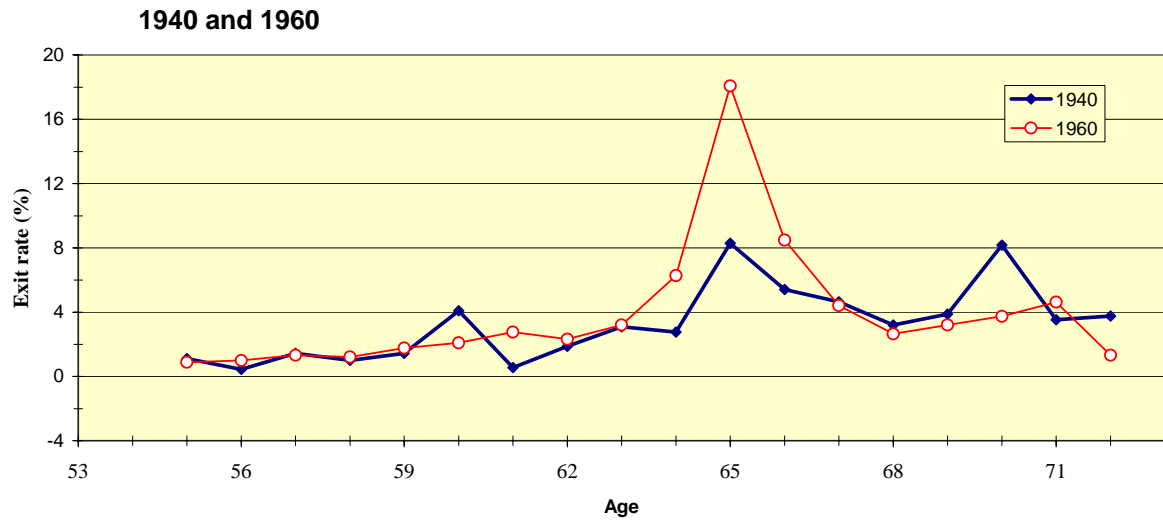
Notes on Figure 1:

Note: Percent retiring each year is a constructed number reflecting the fraction of men leaving the workforce at the designated age, measured as a percent of men in the labor force at age 54.

Source: Author's tabulations of participation rates reported by U.S. Census Bureau for 1940, 1960, and 1970 decennial censuses and tabulations of 12 monthly public-use Current Population Survey files for 1980, 1990, and 2000 calendar years.

Figure 2. U.S. Male Retirement Age and Post-Retirement Earnings Distributions in the Longitudinal Retirement History Survey, 1969-1979

Distribution of Retirement Ages among Men without Disabilities

Distribution of Post-Retirement Earnings among Men Age 62 and Older
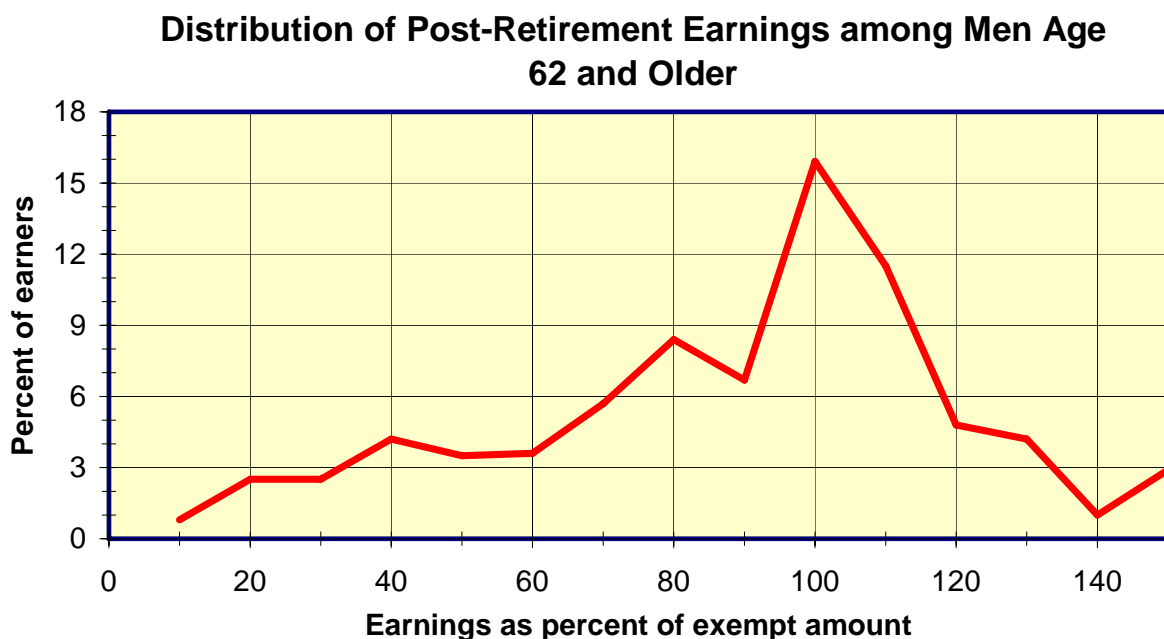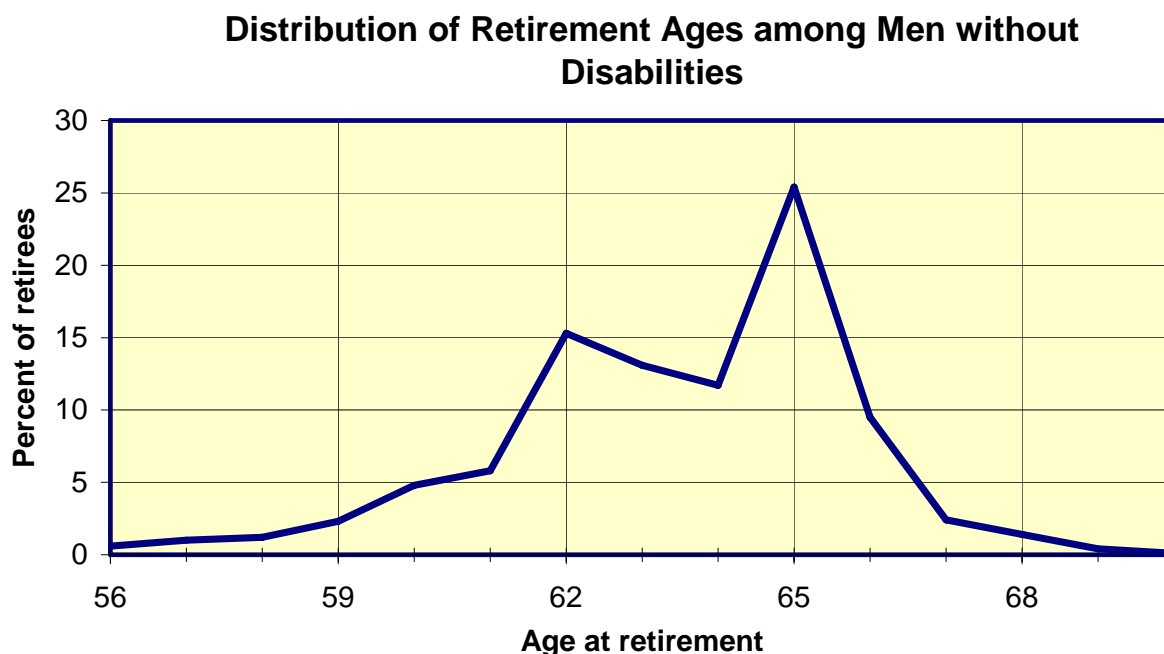
Source: Burtless and Moffitt (1985), p. 225.