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# 11 Social Security and Retirement in the United States

Peter Diamond and Jonathan Gruber

The largest entitlement program in the United States today is the social security program. Social security benefits payments in 1993 amounted to \$267.8 billion, which is over 18 percent of the federal budget and over 4 percent of U.S. GDP in that year; this represents a doubling as share of GDP in the past thirty years. Social security in the United States is also a system in fiscal imbalance. The convergence of three trends in the early twenty-first century will cause problems with the long-run solvency of the program. Two of these trends are the aging of the “baby-boom” cohort and the drop in the fertility rate of U.S. families. As a result, the ratio of persons over age sixty-five to those aged twenty to sixty-four has risen from 0.14 in 1950 to 0.21 today and is projected to rise to 0.36 by 2030 and to 0.41 by 2070. The final trend is the reduction in the rate of growth in real wages in the United States, which has lowered the base of earnings on which social security benefits commitments can be financed. As a result, current estimates imply that, if the structure of the program remains unchanged, payroll taxes to finance this program, currently at 12.4 percent of payroll, would have to rise to over 18 percent (Steuerle and Bakija 1994).

As a result of this fiscal imbalance in the social security program, a number of alternatives for reform have been considered, ranging from benefit reductions or tax increases to the increased taxation of social security benefits, raising the age of normal or early retirement, or even shifting partly or wholly into

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a funded (privatized) system. A critical input into understanding the efficiency implications of each of these alternatives is a model of how social security affects retirement decisions. Social security is a dominant feature of the opportunity set facing older households in the United States. Ranking households where the head is over age sixty-five by the share of their income from social security, social security represents 51 percent of total family income at the median; for 16 percent of such households, social security is the only source of family income.<sup>1</sup> As a result, it seems likely that the structure of the social security program has important effects on the life-cycle savings and labor supply decision making of households and, in particular, on their retirement decisions.

The purpose of our paper is to provide an overview of the interaction between social security and the labor force behavior of older persons in the United States. We do so in four steps. First, in section 11.1, we document the pertinent facts about the labor market behavior of older persons in the United States, both today and over time. Then, in section 11.2, we describe the structure of the social security system in the United States, summarizing the relevant institutional details for thinking about retirement behavior. Finally, in section 11.3, we present the results of a simulation model designed to document the retirement incentives inherent in social security for current cohorts of retirees. We conclude our analysis in section 11.4.

## 11.1 The Labor Market Behavior of Older Persons in the United States

One of the most striking trends in the U.S. labor market over the twentieth century has been the declining attachment to the labor force of older persons. In 1950, almost 60 percent of men aged sixty-five to sixty-nine were participating in the labor force. By 1990, this figure had fallen to 26 percent. This dramatic shift in the lifestyles of older men has prompted a large literature on its proximate causes, and a leading candidate is the growth of the social security program over this same time period. But, before addressing the effects of social security, it is useful to provide some more background on the labor market behavior of older men and women.

The historical and contemporaneous facts presented in this section are drawn from a number of different data sources. These are summarized in appendix A. In that appendix, we also provide a brief overview of the databases that are used by researchers in the United States to study retirement behavior.

### 11.1.1 Historical Trends

Figures 11.1 and 11.2 graph the labor force participation rates of men and women in different age groups since 1960. We focus on four age groups: forty-five to fifty-four; fifty-five to fifty-nine; sixty to sixty-four; and sixty-five and

1. Authors' tabulations from March 1994 and 1995 Current Population Survey.

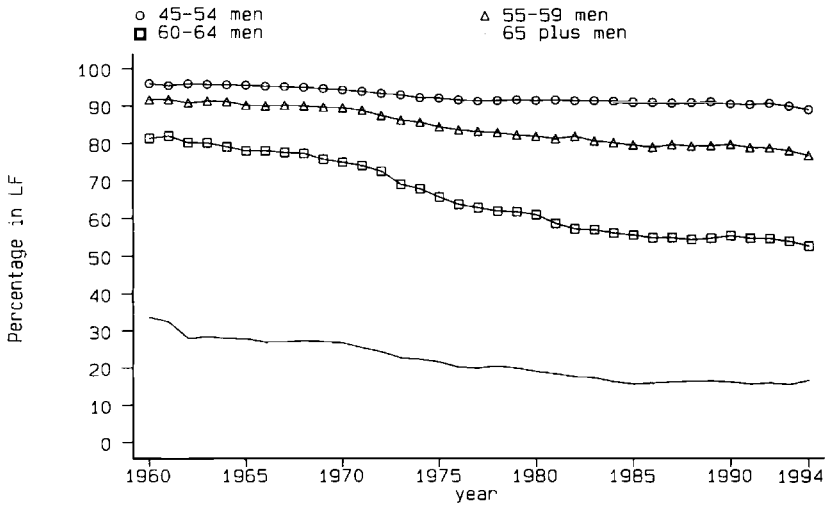


Fig. 11.1 Historical trends in labor force (LF) participation of older men

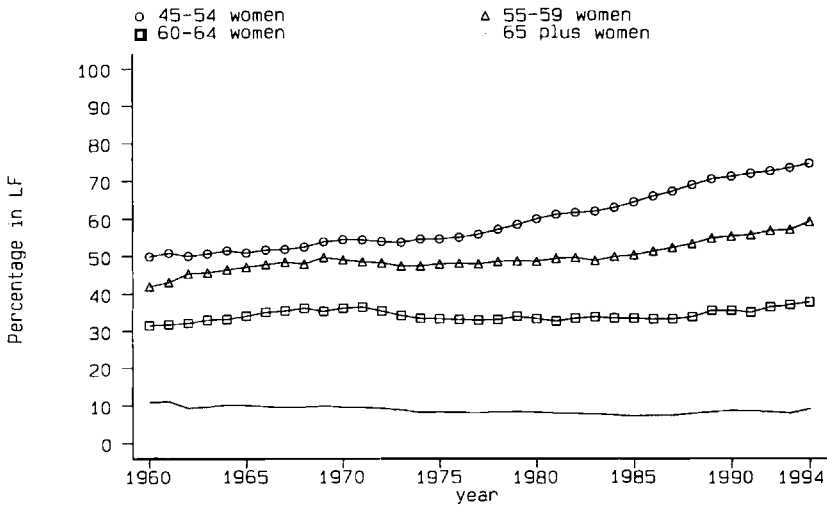
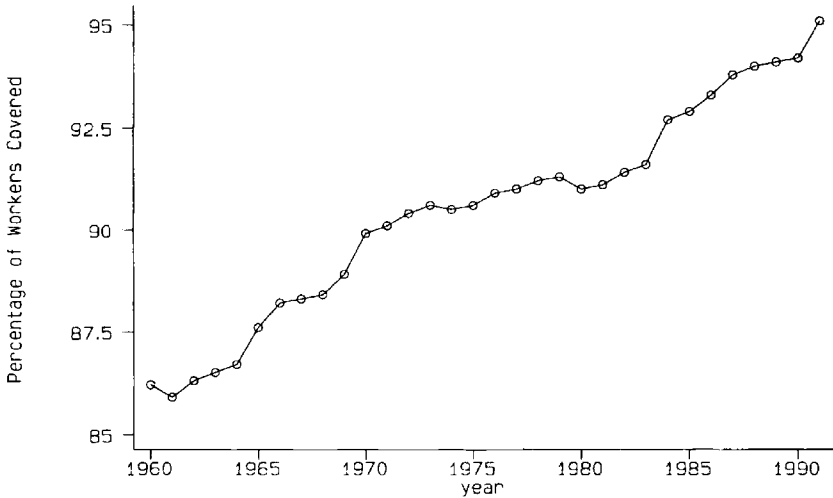


Fig. 11.2 Historical trends in labor force (LF) participation of older women

over. For men, there is a decline in the labor force participation of all these groups. The decline for the youngest group is slight, while the decline for sixty-to sixty-four-year-olds is much more precipitous. There is also a large percentage decline, albeit from a smaller base, for the oldest group.

For women, the pattern is quite different: any trend toward earlier retirement is dominated by increased labor force participation across cohorts. Even for



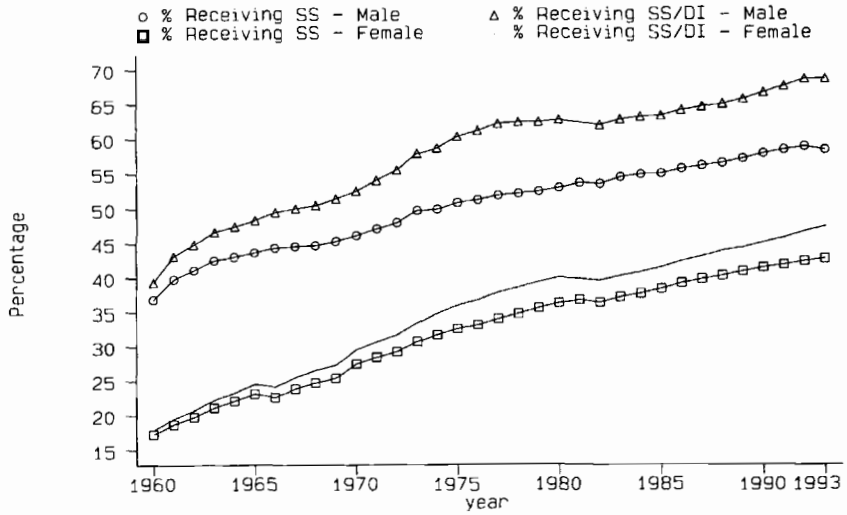
**Fig. 11.3** Percentage of workers covered by the social security system

those aged sixty to sixty-four, participation is rising; for the oldest group, participation declines slightly.

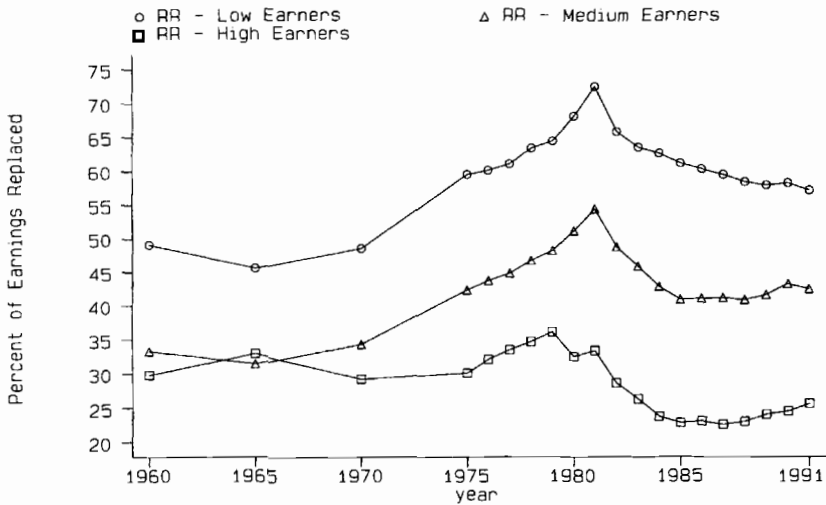
One first-pass approach to considering whether social security is associated with these labor force trends is to examine related trends in social security generosity. We do so in three ways. First, in figure 11.3, we show the share of the workforce covered by the social security system. By 1960, a very high share of the workforce was already covered by social security, although that share grew steadily over the next thirty years. An important break in the series is after 1983, when a major reform brought several new sectors into the social security system; this reform is described further below.

Second, in figure 11.4, we show the share of men and women over age fifty-five receiving social security benefits as well as the share receiving social security or disability insurance benefits.<sup>2</sup> There was a dramatic increase in the share of the older population receiving payments from these public schemes over time. In 1960, fewer than 40 percent of older men and fewer than 20 percent of older women received social security and disability insurance benefits. By 1993, over 55 percent of older men were receiving social security, and over 65 percent were receiving either social security or disability insurance. For women, the percentage growth has been even more dramatic, with the result that by 1993 roughly 40 percent of women are receiving social security or disability insurance; the net contribution of disability insurance is much smaller for women than for men.

2. *Social security benefits receipt* refers to receipt of retired worker benefits only, which is restricted to those age sixty-two and over. *Disability insurance receipt* refers to receipt of disabled worker benefits, which is not age restricted; but we use disability insurance recipients of age fifty-five and over in the numerator of our calculation.

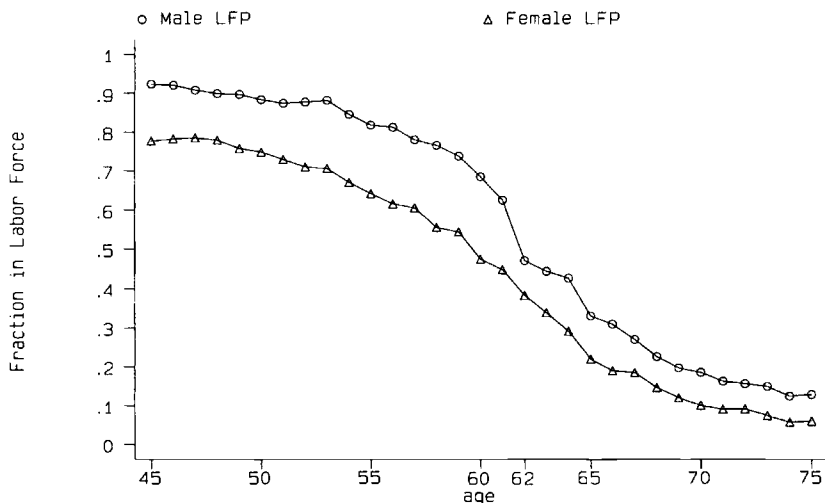


**Fig. 11.4 Social security (SS) and disability insurance (DI) benefits receipt—age 55 and over**



**Fig. 11.5 Social security replacement rates (RRs) over time**

Third, we show the change in generosity of benefits payments over time in figure 11.5. We show the replacement rate from 1960 to 1991 for low-earnings, medium-earnings, and high-earnings workers. These replacement rates are computed for a sixty-five-year-old single worker. In fact, social security replacement rates were roughly constant until 1970 for all three groups. Replacement rates then grew dramatically from 1970 to 1980, for reasons that are



**Fig. 11.6** Labor force participation (LFP) rates by age and sex

described below; this growth was especially dramatic for low earners, who saw their replacement rates rise by 50 percent, to 75 percent of their previous earnings level. Replacement rates then fell fairly precipitously beginning in 1981. For high earners, replacement rates are now actually lower than they were in 1970, while, for average earners and low earners, they remain somewhat higher.

These time-series patterns yield a mixed picture of the influence of social security. Clearly, there is a strong correlation between the size of the program and the labor force participation rate of older men. But the decline in participation of older men has continued unabated in the 1980s and 1990s, even as program generosity has declined. For women, any effects of social security are swamped by secular trends in time-series behavior.

### 11.1.2 Labor Market Behavior in 1995

For a more detailed understanding of the time pattern of labor force participation in recent times, we turn to the March 1994 and 1995 Current Population Survey (CPS). The CPS is a large, nationally representative survey that asks individuals about their labor force attachment at both the point of the survey and the previous year as well as about income in the previous year. We pool two years of the CPS for added precision in our estimates of labor force participation by age.

The age pattern of nonparticipation for men and women is depicted in figure 11.6. At age forty-five, the participation of men is significantly higher, although almost 80 percent of forty-five-year-old women are working in 1994–95. There is then a gradual parallel decline for men and women until age fifty-five, at

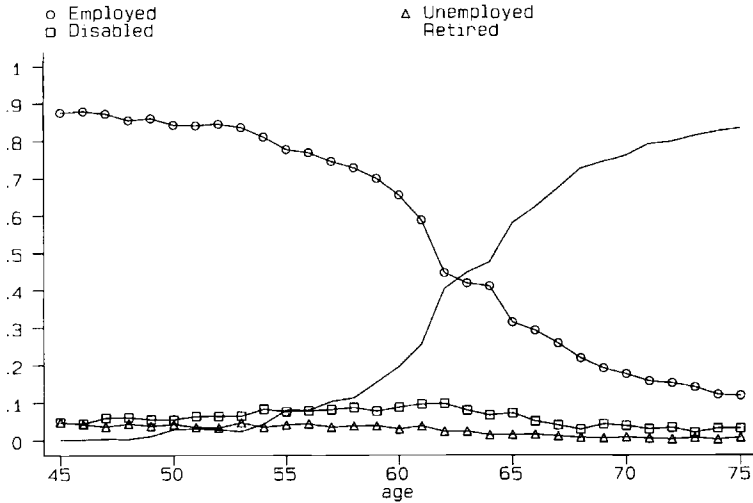


Fig. 11.7 Distribution of activities of men by age

which point the age pace steepens; this is particularly true for men, with the result that the participation gap closes substantially by age sixty-two. By age seventy-five, participation has dropped quite low, with fewer than 20 percent of men and 10 percent of women participating in the labor force.

Figure 11.7 considers in more detail the allocation of time among men as they age, by dividing activities at each age into employment, unemployment, disability, and retirement. The top line, showing the share of men employed, mirrors the age trend in figure 11.6 above. There is very little age trend in either unemployment or disability, although both categories do shrink over time. The dominating trend here is increased retirement with age. This same exercise is repeated for women in figure 11.8; the patterns are very similar to those for men, although a much larger share of women is in “other” activities that are not captured by these four metrics (as can be seen by taking one minus the sum of the four values).

### 11.1.3 Income Sources of Older Persons

Figures 11.9 and 11.10 examine the incidence of public and private retirement income for older persons. Figure 11.9 graphs three series for men only: the rate of social security receipt; the rate of receipt of disability insurance and supplemental security income; and the rate of receipt of income from other public assistance programs.<sup>3</sup> Before age sixty-two, there is relatively little receipt of public assistance income among men. There is a declining pattern of

3. Supplemental security income is cash welfare for low-income elders; the other categories represented here are unemployment insurance, workers’ compensation, and cash welfare (through the AFDC program or state welfare programs).



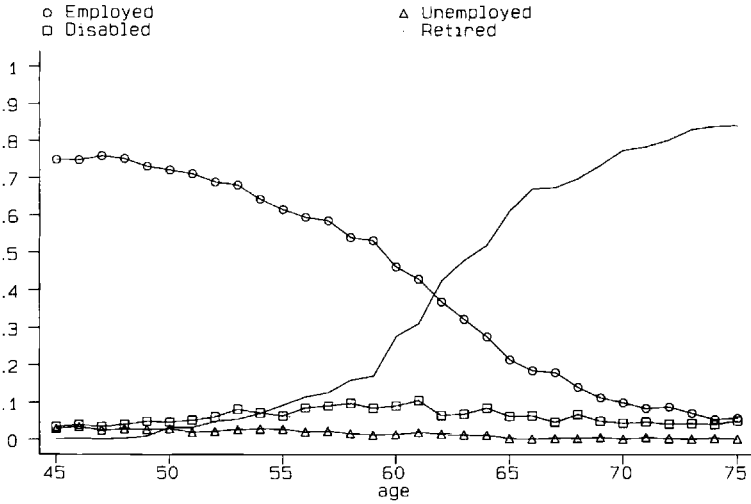


Fig. 11.8 Distribution of activities of women by age

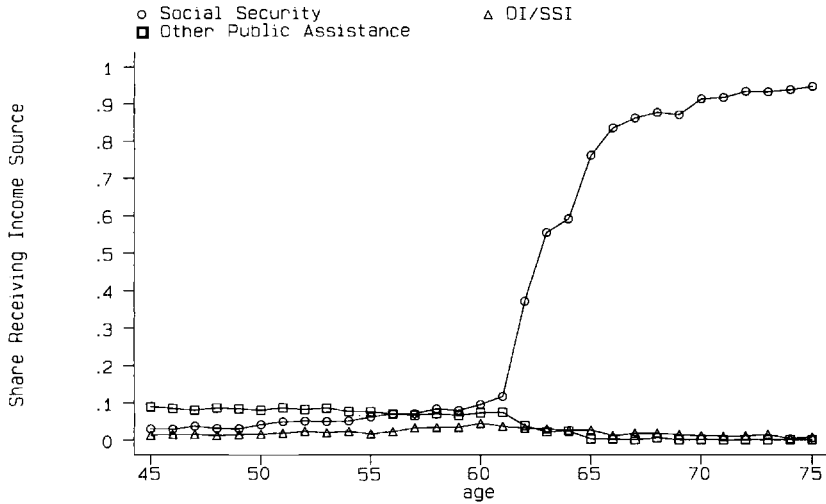
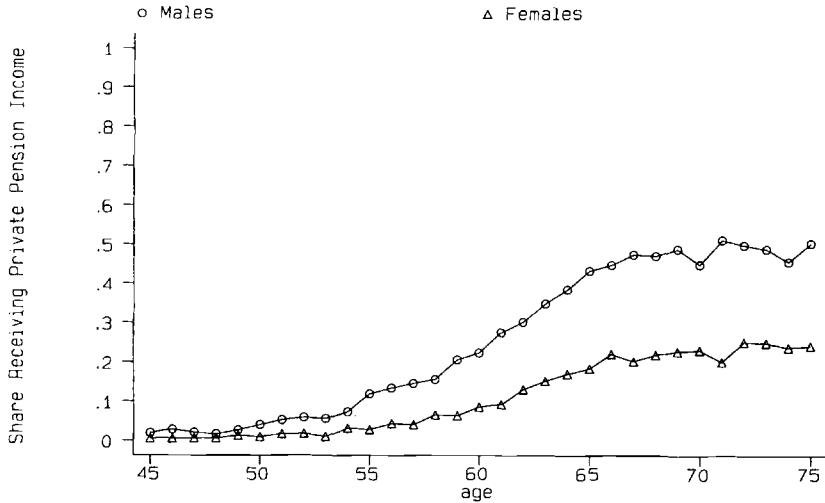


Fig. 11.9 Public income receipt for men (DI = disability insurance; SSI = supplemental security income)

other public assistance receipt, which is offset by a rising pattern of disability insurance/supplemental security income receipt. It is somewhat surprising that, under age sixty-two, a large number of men actually report receiving social security benefits. Some of this may be due to miscoding of disability insurance or supplemental security income; indeed, the reported number of age sixty recipients of disability insurance in the CPS data is only about two-thirds of



**Fig. 11.10** Private pension receipt by sex

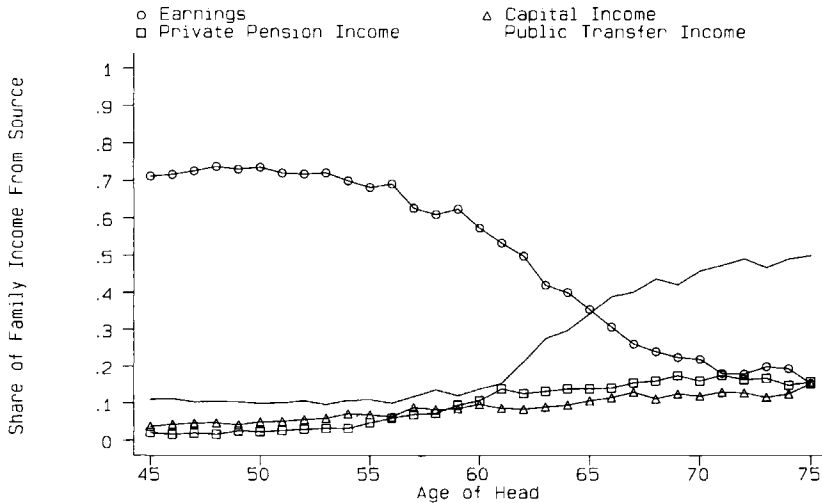
the administrative totals. Some of this may be due to miscoding of family social security receipt as own receipt among men with older wives, but this can explain only a small share of the total. And some may be due to simple miscoding, either of age or of the type of income being received.

In any case, beginning at age sixty-two, the rate of receipt of social security skyrockets, until it is over 95 percent for those over age seventy-five. It is interesting to note that this increase in social security receipt is associated to a small extent with a decline in disability insurance/supplemental security income receipt. This suggests that the net government cost of increased social security receipt after age sixty-two is somewhat smaller than the social security budget alone would suggest.

Figure 11.10 displays the percentage of men and women at each age who are receiving private pension income on their own account (as opposed to survivor benefits from a spouse's pension). This grows fairly rapidly from age fifty-five on, particularly for men, with the result that there is a rapidly growing gender gap; by age seventy-five, the rate of receipt for men is twice that for women. At the same time, however, some older women will be benefiting from survivor benefits paid through their husband's pension.

Finally, figure 11.11 shows the distribution of income sources for couples, arrayed by the age of the head of the family.<sup>4</sup> We consider the distribution of income across four sources: earnings, capital income, private pensions, and public transfers (predominantly social security for older couples, as shown in

4. This differs somewhat from previous figures, where the unit of observation is the older person; we do this since these income concepts are best measured at the family level.



**Fig. 11.11** Distribution of family income by source

fig. 11.9). Earnings are the dominant source of family income until age sixty, although, even for this younger subset of the sample, over 30 percent of income comes from other sources. Beginning at age sixty, earnings and capital income decline in proportional terms, and private pensions and public income (especially the latter) grow as shares of income. The high share of income accounted for by public-sector income at older ages highlights the importance of social security for workers making their retirement decisions.

## 11.2 Key Features of the Social Security System

### 11.2.1 History of the Social Security System in the United States

The landmark Social Security Act of 1935 created social security as well as the Aid to Dependent Children program, which was the start of today's cash welfare system. Originally, the act required that all workers in commerce and industry (except railroads) under age sixty-five be covered by social security. Over the years, the coverage of workers has steadily expanded; today, the only significant group of workers not covered by social security is some state and local government employees. At first, benefits for workers were available only for retired workers over age sixty-five. In 1956, benefits (reduced for early retirement) were made available to women between the ages of sixty-two and sixty-five. In 1961, the same treatment was extended to men. Dependent and survivor benefits were introduced in 1939, with benefits for wives and widows over age sixty-five and children under age eighteen. In 1950, benefits were extended to dependent husbands and widowers over age sixty-five. In 1965, divorced wives became eligible for benefits provided the marriage had lasted

at least ten years, with similar treatment extended to divorced husbands in 1983. In 1956, benefits were extended to disabled workers over age fifty, with extension to disabled workers of all ages in 1960.

Until 1972, it took an act of Congress to increase benefits. Tiring of the repeated struggle over how much to increase benefits, the 1972 act introduced automatic increases in benefits with increases in the consumer price index. This was done by continuing to base benefits on a lifetime average of earnings in nominal terms but increasing the benefit formula (as a function of lifetime earnings) in step with inflation. Unfortunately, since inflation affects both lifetime nominal earnings and the relation between benefits and earnings, this act overindexed benefits. While this overindexing might have been roughly offset by the nonlinearities in the benefit formula had inflation remained low, with the large increase in inflation in the 1970s this overindexing led to a large, unintended increase in benefits that placed the financing of social security in trouble.

In 1977, the current benefit structure was adopted. After reaching retirement age, there is continued adjustment of benefits for increases in the CPI. Determination of the level of benefits when reaching retirement age is now based on lifetime earnings using wage indexing. For each worker, there is calculation of the worker's average indexed monthly earnings (AIME)—an average of a worker's earnings (indexed by the average level of wages in the economy each year) over the highest thirty-five years of his or her career. The indexing is still not done quite right, with a gap of two years between the year used for the wage indexing of earnings (when the worker turns age sixty) and the year that CPI increases begin (when the worker turns age sixty-two) and no indexing of earnings after age sixty. This gap would become important if we had large and varying inflation rates. There has been controversy over the generations (referred to as the *notch babies*) affected by the transition to the new system.<sup>5</sup>

The last major reform of social security came in 1983, in the face of an imminent shortage of funds. This act addressed both short- and long-run financial problems. The most notable of the changes affecting long-run considerations is a phased increase in the normal retirement age, from the current level of sixty-five to sixty-seven, which is reached for workers reaching age sixty-two in 2022 and later. As legislated in 1983, the change in the normal retirement age does not change the age at which people can first claim retirement benefits, which remains at age sixty-two. But the amount of benefits received at age sixty-two, or at any other age, is made smaller if the normal retirement age is older. When the normal retirement age is sixty-seven, a worker retiring at age sixty-two will receive 70 percent of the benefit formula amount (the PIA, or primary insurance amount), rather than the 80 percent received now. Taxation of part of social security benefits began with the 1983 legislation. Also, the incentive to continue working past the normal retirement age was increased. Someone first claiming benefits after the normal retirement

5. For a further discussion of the notch babies, see Krueger and Pischke (1992).

age has benefits increased by a delayed retirement credit. The 1977 legislation raised this credit to 3 percent per year, while the 1983 legislation phased in increases until the credit reaches 8 percent per year.

The social security system was created by the same act that also created a program to provide aid to the poor elderly. In the early days, the elderly received more income from the welfare portion of this act than from social security. Over time, social security has outstripped aid to the aged; currently, the social security program is roughly ten times as large as the program of welfare for the low-income elderly and disabled (Supplemental Security Income).

### 11.2.2 Current Features of the Social Security System

The social security system in the United States today is financed by a payroll tax that is levied on workers and firms equally. The total payroll tax paid by each party is 7.65 percentage points; 5.3 percentage points are devoted to the old age and survivors insurance program, with 0.9 percentage points funding the disability insurance system and 1.45 percentage points funding Medicare's hospital insurance program. The payroll tax that funds old age and survivors insurance and disability insurance is levied up only to the first \$62,700 (in 1996) of earnings (the taxable maximum); the hospital insurance tax is uncapped.<sup>6</sup> Like many other earnings figures in the law, this earnings limit is indexed to increase with average earnings in the economy. Part of the revenue from the income taxation of social security benefits goes to social security. Social security also receives interest (at market rates) on its holdings of Treasury debt.

Individuals qualify for an old age insurance pension by working for forty quarters in covered employment, which encompasses most sectors of the economy in recent years.<sup>7</sup> The process of determination of the level of benefits proceeds in several steps. The first step for qualifying workers is computation of the worker's averaged indexed monthly earnings (AIME), which is one-twelfth of the average of the worker's annual earnings in covered employment, indexed by a national wage index. This real wage history is averaged over the highest thirty-five years of earnings. Earlier, a shorter averaging period was used to reflect the immaturity of the system. A key feature of this process is that additional higher-earnings years can replace earlier lower-earnings years since only thirty-five years are used in the calculation.<sup>8</sup>

6. This cap is 2.4 times the median earnings of a full-year (forty-eight weeks or more), full-time (thirty-five hours or more per week) worker; 92 percent of such workers earn less than this amount.

7. Notable exceptions are state and local employees, some of whom are covered and some not. The current Social Security Advisory Council has recommended mandatory coverage in this sector, starting with newly hired workers. Many of these workers will receive benefits anyway because of covered work, before, after, or as a second job during their current employment.

8. In particular, while earnings through age fifty-nine are converted to real dollars for averaging, earnings after age sixty are treated nominally. There is a two-year lag in availability of the wage index, calling for a base in the year in which the worker turns age sixty in order to be able to compute benefits for workers retiring at their sixty-second birthday. While it would be possible to

The next step of the benefits calculation is to convert the AIME into the primary insurance amount (PIA). This is done by applying a three-piece linear progressive schedule to an individual's average earnings, whereby ninety cents of the first dollar of earnings is converted to benefits while only fifteen cents of the last dollar of earnings (up to the taxable maximum) is so converted. As a result, the rate at which social security replaces past earnings (the "replacement rate") falls with the level of lifetime earnings. For a worker with no dependents whose earnings had grown at the same rate as average earnings in the economy and who retired at age sixty-five in 1995 with a 1994 level of earnings of \$15,000, the replacement rate is 50 percent. For 1994 earnings levels of \$25,000, \$35,000, and \$45,000, the replacement rates are 43 percent, 37 percent, and 30 percent, respectively. For someone who always earned the maximum amount subject to taxation, the replacement rate is 24 percent. While 85 percent of social security benefits are subject to tax for retirees with sufficiently high incomes (couples with incomes above \$32,000 in 1993), all earnings are taxed (including the employee portion of the payroll tax), raising the effective replacement rate of the program. Also, many social security recipients are in a lower tax bracket than they were before retirement.

Adjustments to the level of the PIA are made on the basis of the age at which benefits are first claimed. For workers claiming before the normal retirement age (currently sixty-five but legislated to increase slowly to sixty-seven), benefits are decreased by five-ninths of 1 percent per month, so that the benefits of those claiming on their sixty-second birthday are 80 percent of what they would be if they waited until the normal retirement age. The size of the reduction factor will be only five-twelfths of 1 percent for months beyond thirty-six months before the normal retirement age, which will become relevant once the delay in the normal retirement age becomes effective. The reduction is called the *actuarial reduction factor*. Individuals can also delay the receipt of benefits beyond age sixty-five and receive a *delayed retirement credit*. For workers reaching age sixty-five in 1996, an additional 5 percent is paid for each year of delayed receipt of benefits. Under current legislation, this amount will steadily increase until it reaches 8 percent per year in 2009.

While one can claim as early as age sixty-two, receipt of social security benefits is conditioned on the "earnings test" until the worker reaches age seventy: if one earns more than a certain floor level, social security benefits are reduced for each additional dollar of earnings, until, at high earnings levels, one cannot qualify at all. In order to receive all his or her benefits, in 1995 a worker must have earnings below \$8,280 if between the ages of sixty-two and sixty-five and below \$12,500 if between the ages of sixty-five and seventy. These figures increase each year with average earnings in the economy. Bene-

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make adjustments as data become available, this is not done, with all later years entering the AIME calculation without any adjustment for further growth in the national average wage index. This gap would become important if we had large and varying inflation rates.

fits are reduced for any earnings above this limit, \$1.00 for each \$2.00 of earnings for workers between the ages of sixty-two and sixty-five and \$1.00 for every \$3.00 for workers between the ages of sixty-five and seventy. There is a special monthly retirement test for workers in their first year of retirement. In 1996 legislation, the earnings limit for those between the ages of sixty-five and sixty-nine has been increased in a series of steps, reaching \$30,000 in 2002. Months of benefits lost through the earnings test are treated as delayed receipt, entitling the worker to a delayed retirement credit on the lost benefits when he does claim benefits.

There are also important additional benefit provisions based on family structure. Spouses of social security beneficiaries receive an additional benefit, which is 50 percent of the PIA, beginning at age sixty-two, although a spouse receives only the larger of this and her own entitlement as a worker.<sup>9</sup> Dependent children are also each eligible for 50 percent of the PIA, but the total family benefit cannot exceed a maximum that varies with PIA level but is roughly 175 percent of the PIA. Surviving spouses receive 100 percent of the PIA, beginning at age sixty, although there is an actuarial reduction for claiming widow benefits before age sixty-five or if the worker had an actuarial reduction. The benefits for dependents are somewhat complicated by the fact that both spouses may qualify for social security benefits as retired workers. For previous generations, where wives generally earned substantially less over their lifetimes than their husbands, this was not such an important consideration. But, in recent times, it is quite frequent that wives will earn enough so that they would have a PIA of at least half that of their husbands and so will not automatically use the default of dependent benefits; benefits are the maximum receivable under different provisions. Currently, of the 20 million female beneficiaries of social security, 7.5 million are entitled solely as workers, 5 million are entitled both as workers and as dependents/survivors, and another 7.5 million are entitled solely as dependents or survivors.

Benefit payments are adjusted for increases in the consumer price index after the worker has reached age sixty-two. Thus, social security provides a real annuity to its recipients. Social security benefits are largely tax favored: they are taxed only if the sum of other income and half of social security benefits exceed \$32,000 for a joint return, and even at that point they are only partially taxed.

Finally, it is important to note that the social security program does not operate in a vacuum. There are a number of other public assistance programs for which elderly persons are eligible that may also have effects on their labor market behavior. One such program is disability insurance, which provides income insurance to workers physically unable to participate in the labor force. Given the difficulty of distinguishing true career-ending disability, particularly in the near elderly population, this program also potentially has an effect on

9. Spousal benefits can begin earlier if there is a dependent child in the household.

the retirement decisions of older workers. Indeed, there is a large empirical literature in recent years that suggests that variations in disability insurance program parameters do affect labor force participation among those aged forty-five to sixty-five (see, e.g., Bound 1989, 1991; Gruber 1996; Gruber and Kubik 1997; Leonard 1986; and Parsons 1980, 1991a, 1991b).

Moreover, there is an important interaction between disability insurance and social security. As noted above, if individuals receive social security benefits before the normal retirement age of sixty-five, they are reduced by five-ninths of 1 percent per month. However, if an individual with the same earnings trajectory qualifies for disability insurance, then he or she receives the full social security entitlement with no reduction.<sup>10</sup> It is unclear how substitutable social security early retirement and disability insurance are, but this potentially reduces any savings to the government from lowering the benefits for early retirement, or raising the age of early eligibility, without changing the benefit structure for disabled workers. This is highlighted by figure 11.9 above, which showed the interaction between the rise in social security receipt and the decline in disability insurance receipt around age sixty-two.

Another public assistance program that potentially interacts with social security is the supplemental security income program, which provides income support to the low-income elderly (defined as at least age sixty-five) and disabled individuals. Unlike social security or disability insurance, benefits and eligibility for supplemental security income are conditioned on point-in-time income rather than lifetime income. The size of the supplemental security income recipient population is small relative to social security recipients; fewer than 4 percent of social security recipients age sixty-five and older also receive supplemental security income. On the other hand, over two-thirds of supplemental security income recipients do receive some social security income. So supplemental security income is serving both as an alternative to social security for very low-income elderly and as a supplement for those with very low social security income.

There are also large private incentives for retirement embedded in firm pension plans. Pension coverage has grown dramatically in the postwar period, and, in 1994, roughly 45 percent of workers aged twenty-one to sixty-five were covered by a pension plan at work.<sup>11</sup> Given the age structure in the pattern of job holding relative to pension provision, a noticeably larger fraction of workers is covered by pension provisions at some time in their careers than this number suggests. On the other hand, some fraction of workers cashes out their pension accumulations when changing jobs, leaving no accumulation when reaching retirement. In 1994, 35 percent of retired workers over age sixty-two who were receiving social security were receiving pension income as well. A

10. This calculation is complicated, of course, by the fact that additional work can affect the benefits computation.

11. Authors' tabulations from March 1995 Current Population Survey.



number of papers in recent years have suggested that pension incentives play an important role in determining retirement behavior among covered workers; this may interact with the social security incentives described below (see Stock and Wise 1990; or Samwick 1993).

Finally, for understanding the role of social security, it is important to consider this program in the broader context of the treatment of older workers in the labor force. The United States has a broad set of protections in place preserving the rights of older workers through the 1967 Age Discrimination in Employment Act, including legal restrictions on age-of-hire rules and on mandatory retirement (Parsons 1996). This levels the playing field between older and younger workers for labor supply decision making, highlighting the potential importance for retirement decisions of financial incentives such as those through social security.

### 11.2.3 The Retirement Effects of Social Security—Theory and Evidence

There is a large U.S.-based literature that describes both the expected effects of the social security system on retirement and evidence on the actual retirement effects of the program. The motivation for examining the effects of social security can be seen clearly by examining the hazard rate out of the labor force for men and women. This is measured as the increase in the rate of labor force leaving from the previous age, relative to the stock of workers participating at the previous age. Figure 11.12 shows the hazard rate for labor force leaving for men. The striking fact about this figure is the dramatic increase in labor force leaving at age sixty-two, which is the age of eligibility for early retirement under social security, and at age sixty-five, which is the normal retirement age. These spikes are very suggestive of a role for social security in explaining

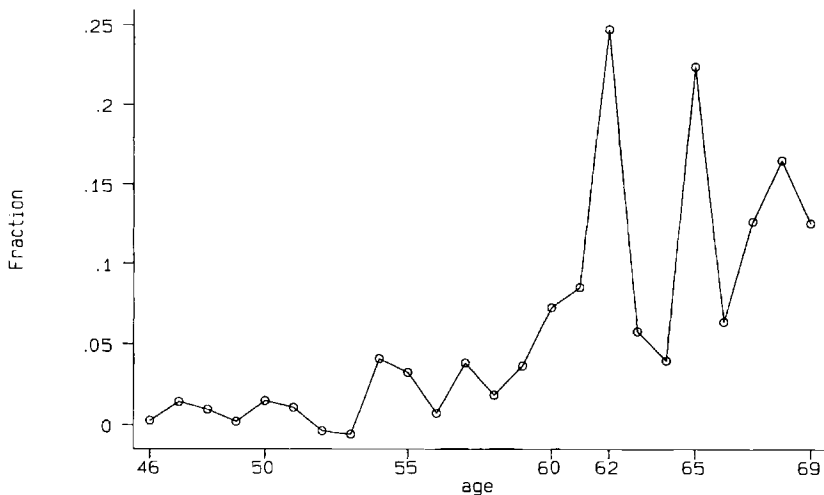
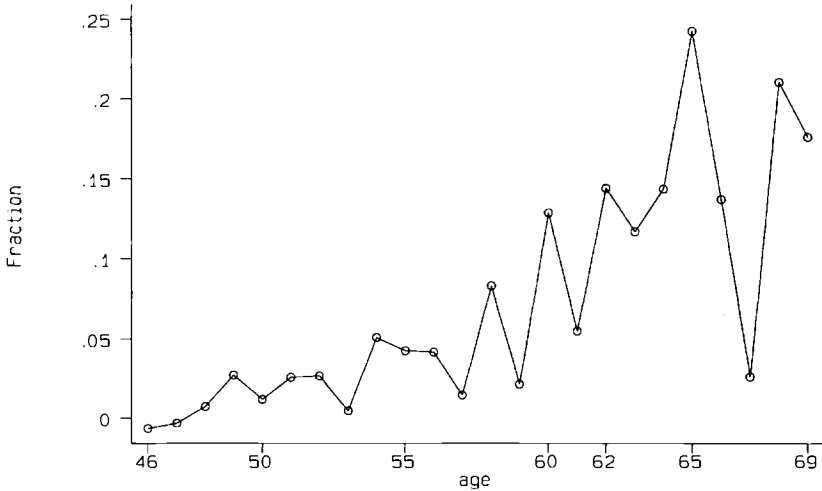


Fig. 11.12 Hazard rate out of the labor force for men



**Fig. 11.13 Hazard rate out of the labor force for women**

the retirement behavior of men. There is also a small spike around age fifty-five, which may reflect the early retirement provisions at that age under many pension plans. There is also another spike around age sixty-eight; the cause here is not clear, although the small denominator of the participation hazard after age sixty-five makes it hard to interpret this finding.<sup>12</sup>

The hazard rate for women is plotted in figure 11.13. The spike at age sixty-five is apparent here as well, but the spike at age sixty-two is not as pronounced. This may reflect the fact that female retirement is determined more by joint timing with husbands than by social security incentives.

In appendix A, we discuss theoretically the various effects that social security has on retirement behavior and then review the extensive U.S.-based literature on social security and retirement. We highlight the sources of agreement and disagreement in the existing literature and conclude that there is fairly broad agreement that the overall structure of social security is an important determinant of retirement, even while there remains disagreement over the effects of variations in program generosity within this structure.

### 11.3 Retirement Incentives

In this section, we use a model of social security benefits determination to assess the incentives of social security on retirement through accrual rate effects.

12. That is, the spike at age sixty-five represents a 9.5 percentage point change in labor force participation, while the spike at age sixty-eight represents only a 4.5 percentage point change; the latter appears almost as large as the former because the denominator is so much smaller.

### 11.3.1 Simulation Modeling

The basis for our analysis is the Social Security Administration's ANYPIA program.<sup>13</sup> This program inputs a set of worker characteristics: age, wife's age, earnings history, and date of retirement. It then computes the benefits entitlement for a given month in the future. To do so, we use the social security base-case assumptions about price and wage growth in the future. The program computes the benefits for the worker, dependent benefits for married workers, and survivor benefits for the case where the worker has died.

The next step in our simulation is to take these monthly benefit entitlements and compute an expected net present discounted value of social security wealth (SSW). This requires projecting benefits out until workers reach age one hundred and then taking a weighted sum that discounts future benefits by both the individual discount rate and the prospects that the worker will live to a given future age.<sup>14</sup> Our methodology for doing so is described in appendix A. For the worker himself, this is fairly straightforward; it is simply a sum of future benefits, discounted backward by time preference rates and mortality rates. For dependent and survivor benefits, it is more complicated since we must account for the joint likelihood of survival of the worker and the dependent. In our base case, we use a real discount rate of 3 percent. To adjust for mortality prospects, we use the sex/age-specific U.S. life tables from U.S. Department of Health and Human Services (1990). Finally, to compute net social security wealth, we subtract out social security payroll tax payments that the individual would make during any continued work. We add both the employee and the employer shares of the payroll tax, under the assumption that the employer share is fully borne by the worker in the form of lower wages. All figures are discounted back to age fifty-five by both time preference rates and mortality risk.

For the output of the simulations, we calculate three different concepts. The first is the net of tax replacement rate, the rate at which social security replaces the (after-tax) earnings of the worker should he continue working in that year. It is important to do this calculation on an after-tax basis in order to account for the fact that social security benefits are not taxed for most families while earnings are. We do so by modeling the average tax rate faced by earners of different earnings levels in each year and whether they are subject to taxation of their social security benefits. The second concept is the accrual rate, the percentage change in social security wealth from the previous year.

Finally, we compute a tax/subsidy rate, which is the absolute change in social security wealth over the potential earnings from working that next year.

13. We are grateful to Steve McKay of the Social Security Administration for his assistance in applying this program to our purposes.

14. We have experimented with extending the model to account for ages up to 120 since this is the extent of the life-table information available. This had little effect on the results, however, since so few persons are alive beyond age one hundred.

This represents the implicit tax on or subsidy to continued work in terms of the net change in social security wealth that is implied by that additional year of work. The numerator of this tax/subsidy rate is the opposite of the change in social security wealth from working the additional year. The denominator is the potential earnings over that additional year. Thus, if this figure is positive, it implies that the social security system causes a disincentive to additional work through forgone social security wealth. This is the relevant concept for the worker who is trading off leisure (on social security) against continued work.

Note that, in computing these concepts, we use the unconditional mortality risk beyond age fifty-five; that is, there is some probability that the worker may be dead at each year after his fifty-fifth birthday. An alternative approach would be to use conditional life tables at each year, with the result that, for the worker considering retiring on his sixty-third birthday, we discount the future by the age sixty-three—conditional life table. The correct approach here depends on the perspective from which this computation is taken. Our approach is appropriate if the computation is taken from the perspective of the forward-looking fifty-four-year-old who is considering the retirement incentives at all future ages. The alternative would be appropriate for year-by-year decision making about retirement. Since we discount all our dollar figures back to age fifty-five by both time preference and mortality risk, both concepts yield the same tax/subsidy effects (since both numerator and denominator are deflated); however, they will yield somewhat different values of social security wealth and therefore different accrual rates.

For the purposes of the simulations outlined below, we assume that workers claim social security benefits either at the point of their retirement or when they become eligible if they retire before the point of eligibility. In fact, this is not necessarily true; retirement and claiming are two distinct events, and, for certain values of mortality prospects and discount rates, it is optimal to delay claiming until sometime after retirement (owing to the actuarial adjustment of benefits). In fact, a nontrivial share of individuals who retire before age sixty-two delay claiming their benefits for at least one year. We plan to explore this issue further in future work.

To produce our base-case numbers, we use a typical individual who was born in January 1930 and thus turned sixty-five in January 1995. In theory, to calculate benefits for a worker, we would need his entire earnings history. In practice, we use a “synthetic” earnings history, which uses the median earnings of a cohort through time. As a first step in creating this synthetic earnings history, we use information on the median earnings by calendar year and age cohort from U.S. Department of Health and Human Services (various years). More specifically, we use the median earnings of a sixty-one-year-old in 1991 (the last available year of data) as our base point and then follow this cohort back through time (using the median for sixty-year-olds in 1990, fifty-nine-year-olds in 1989, and so on). We then update this to ages beyond age sixty-

**Table 11.1** Base-Case Incentive Calculation

Last Year of Work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	...	110,574	0	0	0
55	...	111,033	458	.004	-.022
56	...	110,126	-906	-.008	.046
57	...	108,994	-1,133	-.010	.060
58	...	107,734	-1,259	-.012	.069
59	...	106,474	-1,260	-.012	.072
60	...	105,294	-1,180	-.011	.071
61	.403	104,275	-1,019	-.010	.064
62	.440	104,701	426	.004	-.028
63	.476	104,766	65	.001	-.005
64	.703	104,335	-432	-.004	.031
65	.749	101,882	-2,452	-.024	.188
66	.798	99,109	-2,773	-.027	.225
67	.845	95,964	-3,145	-.032	.269
68	.872	91,131	-4,833	-.050	.439
69	.898	86,412	-4,718	-.052	.455

one by using the age-earnings profile for 1991, along with actual inflation data and base-case inflation assumptions.

In pursuing this calculation, we found a relatively steep decline in median earnings after about age fifty, which presumably reflects the fact that more and more of the earning population is working only part-time. However, our synthetic individual is considering the decision to work full-time for an additional year, so this skews the true nature of the underlying earnings history. As a result, we use this synthetic earnings profile through age fifty and then assume that earnings stay constant in real terms from age fifty-one on.

We assume initially that the worker's wife is exactly three years younger than he. We also assume that she has never worked, with the result that she claims as a dependent spouse only and not as a worker as well.

### 11.3.2 Base-Case Results

Table 11.1 shows our base-case results. Each row represents the age of the worker in the last year that he works; that is, the first row represents the effect of working during the fifty-fourth year and retiring on the fifty-fifth birthday (1 January 1985). The first column shows the net replacement rate. This concept is not defined until the worker can actually claim benefits, which occurs if his last year of work is at age sixty-one and he retires at age sixty-two.

At that first point of possible claiming, the replacement rate is roughly 40 percent.<sup>15</sup> This rises somewhat over time as workers increase their social secu-

15. This is lower than the replacement rates used in fig. 11.5 above since our base-case worker has higher earnings than the "average" worker used in that figure.

rity benefits by delaying claiming. The major change occurs for retirement on the sixty-fifth birthday, when the wife turns age sixty-two, since at that point the spouse becomes entitled to dependent benefits. This jump in replacement rates is somewhat artificial in that the worker who retires at age sixty-two will also see a jump at his sixty-fifth birthday, when his wife turns age sixty-two. That is, the replacement rate rises at age sixty-five regardless of the age of retirement. For the worker who works through his sixty-ninth year and collects on his seventieth birthday, social security replaces almost 90 percent of his after-tax earnings.

The next three columns show the evolution of social security wealth over time. In order to understand these results, it is useful to recap the four mechanisms through which additional work affects the computation of social security wealth: (1) The worker must pay social security taxes on his earnings, lowering net social security wealth. (2) The additional year of earnings is used in the recomputation of social security benefits. For workers who have not yet worked thirty-five years, this additional year will be replacing a zero in the benefits computation; for workers who have worked thirty-five years, it will potentially be replacing a previous low-earnings year. For both these reasons, additional work raises net social security wealth. (3) The additional year of work, for work at ages sixty-two and beyond, implies a delay in claiming. This raises future benefits through the actuarial adjustment, but it implies fewer years over which benefits can be claimed. As a result, there is an ambiguous effect on net social security wealth. (4) For each year into the future that we consider, there is some chance that the worker will die, lowering his net social security wealth. This is related to mechanism 3; the probability of mortality raises the required actuarial adjustment to make the worker indifferent to delayed claiming. Thus, it is unclear *ex ante* whether the social security system will tax or subsidize additional work in any given case.

As table 11.1 shows, a worker who retires on his fifty-fifth birthday has accumulated roughly \$110,000 in social security wealth. There is then a small increase in social security wealth for work during the fifty-fifth year; this is because that next year “completes” the worker’s earnings history, with that year of earnings therefore replacing a zero in the benefits computation. After this point, additional earnings affect the benefits computation only to the extent that they replace earlier, lower-earnings years. With a more variable earnings history, as we show below, this “completion” effect will lower the tax rate at older ages as well.

For work in the fifty-sixth to sixty-first years, social security wealth uniformly declines. This decline is driven by two factors: the fact that the worker has some (small) chance of dying<sup>16</sup> and, more important, the fact that the

16. That is, since we discount mortality from the perspective of age fifty-five, a worker who is considering retiring at age fifty-six relative to age fifty-seven has a slightly higher chance of receiving his benefits, increasing his social security wealth.

worker is paying the social security payroll tax if he continues to work. As a result, the accrual rate is negative; there is roughly a 1–1.2 percent decline in social security wealth each year from continued work.

The final column shows the tax/subsidy rate. There is a slight subsidy to work in the fifty-fifth year, as noted above, and then taxes on work in the fifty-sixth through sixty-first years. This tax, however, is lower than the statutory social security payroll tax rate. This differential arises because these additional years of earnings are replacing lower-earnings years in the benefits computation. Thus, there is some tax/benefit linkage in this age range.

There is then a slight subsidy to work during the sixty-second year. This subsidy arises because the worker receives an actuarial adjustment for delaying claiming benefits, which offsets both the payroll tax and the fact that the worker is claiming one year later. That is, for work during the sixty-second year, the system is roughly actuarially “fair.”<sup>17</sup> The fact that the tax rate on continued work actually declines at age sixty-two while retirement jumps up at that age (fig. 11.12 above) is striking and casts some doubt on the full rationality/perfect markets model often used to explain the effects of social security on retirement. This spike at age sixty-two is more likely associated with either the market imperfections or individual irrationalities discussed in the theory section of appendix B.

During the sixty-third year, the actuarial adjustment is roughly sufficient to compensate for the taxes paid and the smaller number of years of collecting benefits, and there is no net tax or subsidy. There is then a nontrivial tax rate in the sixty-fourth year. For work during the sixty-fifth year, the tax rate jumps up dramatically. For this worker, working during his sixty-fifth year means forgoing over \$2,450 in social security wealth, which amounts to almost 19 percent of what he would earn during that year. This is because the delayed retirement credit is actuarially unfair, given the forgone year of social security benefits. This tax rate rises further with age, with the result that, for the decision to work during the seventieth year, forgone social security wealth amounts to almost half of what he would earn during that year. There is an explicit jump for work in the sixty-eighth year due to spousal claiming behavior. For the spouse, as for the worker, there is a penalty to delaying claiming past age sixty-five. Since we assume that both the worker and his spouse claim when the worker retires, then his working during his sixty-eighth year means that his spouse will not claim until after age sixty-five and so will be penalized. It is important to note, however, that future changes in the delayed retirement credit put in place by the 1983 legislation substantially lower these work disincentives.

17. *Actuarial fairness* here refers to the net of taxes and benefits, not to the structure of benefits only.

**Table 11.2** Incentive Calculation—Single Worker

Last Year of Work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	...	60,934	0	0	0
55	...	60,083	-851	-.014	.043
56	...	58,574	-1,510	-.025	.081
57	...	57,007	-1,567	-.027	.087
58	...	55,366	-1,640	-.029	.095
59	...	53,782	-1,585	-.029	.095
60	...	52,290	-1,492	-.028	.094
61	.430	50,885	-1,405	-.027	.093
62	.465	49,682	-1,203	-.024	.083
63	.503	47,704	-1,978	-.040	.143
64	.540	45,385	-2,319	-.049	.177
65	.568	41,324	-4,061	-.089	.327
66	.598	37,192	-4,132	-.100	.352
67	.627	32,939	-4,253	-.114	.385
68	.657	28,651	-4,288	-.130	.412
69	.687	24,334	-4,317	-.151	.442

### 11.3.3 Other Cases

Table 11.2 explores these same results for a single worker. In this case, there are slightly higher tax rates before the sixty-second year—for two reasons. First, in the married case, if the worker dies, his wife will still get survivor benefits, and the discounting for mortality is therefore not as severe as it is for the single worker. Second, the gains from benefits recomputation are smaller for the single worker since higher benefits affect only him and not both him and his spouse. That is, recomputing benefits for the married worker has a much larger effect both because each additional dollar of benefits turns into an additional \$1.50 through the spousal benefit and because that extra dollar becomes an extra dollar of benefits to the surviving spouse as well. Yet both the married and the single worker pay the same payroll tax, so this results in a larger net disincentive for the single worker.

Interestingly, for the single worker, this disincentive does not diminish noticeably for work during the sixty-second year. Here, the system is actuarially unfair; the extra benefits in future years from delaying claiming are outweighed by the forgone year of claiming and the taxes paid. So, for work during ages sixty-two to sixty-seven, the system offers much larger disincentives to single than to married workers; by age sixty-seven, the implicit tax rate is over 40 percent. On the other hand, for work during ages sixty-eight and sixty-nine, the tax rate is actually lower for single workers owing to the unfairness of the delayed retirement credit for both spouses in the married worker case (as described above).

Tables 11.3 and 11.4 show the effect of considering different earnings histor-



**Table 11.3** Incentive Calculation—Tenth Percentile Married Earners

Last Year of Work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	...	60,936	0	0	0
55	...	61,141	205	.003	-.024
56	...	60,753	-389	-.006	.049
57	...	60,329	-424	-.007	.055
58	...	59,820	-509	-.008	.069
59	...	59,320	-499	-.008	.071
60	...	58,866	-454	-.008	.067
61	.530	58,448	-418	-.007	.065
62	.577	58,841	393	.007	-.064
63	.627	59,310	470	.008	-.080
64	.926	59,504	194	.003	-.035
65	.990	58,521	-983	-.017	.187
66	1.056	57,331	-1,190	-.020	.238
67	1.119	55,232	-2,099	-.037	.445
68	1.156	52,234	-2,997	-.054	.673
69	1.193	49,465	-2,769	-.053	.660

**Table 11.4** Incentive Calculation—Ninetieth Percentile Married Earners

Last Year of Work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	...	124,421	0	0	0
55	...	122,647	-1,775	-.014	.047
56	...	119,903	-2,743	-.022	.076
57	...	117,159	-2,745	-.023	.078
58	...	114,309	-2,850	-.024	.084
59	...	111,498	-2,811	-.025	.087
60	...	108,800	-2,698	-.024	.087
61	.247	106,436	-2,364	-.022	.081
62	.267	105,760	-676	-.006	.024
63	.290	105,362	-398	-.004	.015
64	.432	104,647	-715	-.007	.028
65	.465	101,810	-2,837	-.027	.117
66	.501	98,602	-3,209	-.032	.140
67	.536	95,054	-3,548	-.036	.165
68	.559	89,545	-5,508	-.058	.272
69	.583	84,203	-5,343	-.060	.281

ies for a married worker. We consider two additional cases: that of a worker at the tenth percentile of the earnings distribution and that of a worker at the ninetieth percentile of the distribution. Since we do not have true longitudinal data, we assume that the age/earnings profile is the same at the tenth and ninetieth percentiles as at the median and just use data on the 1995 differences across these percentiles to scale the profiles up and down.

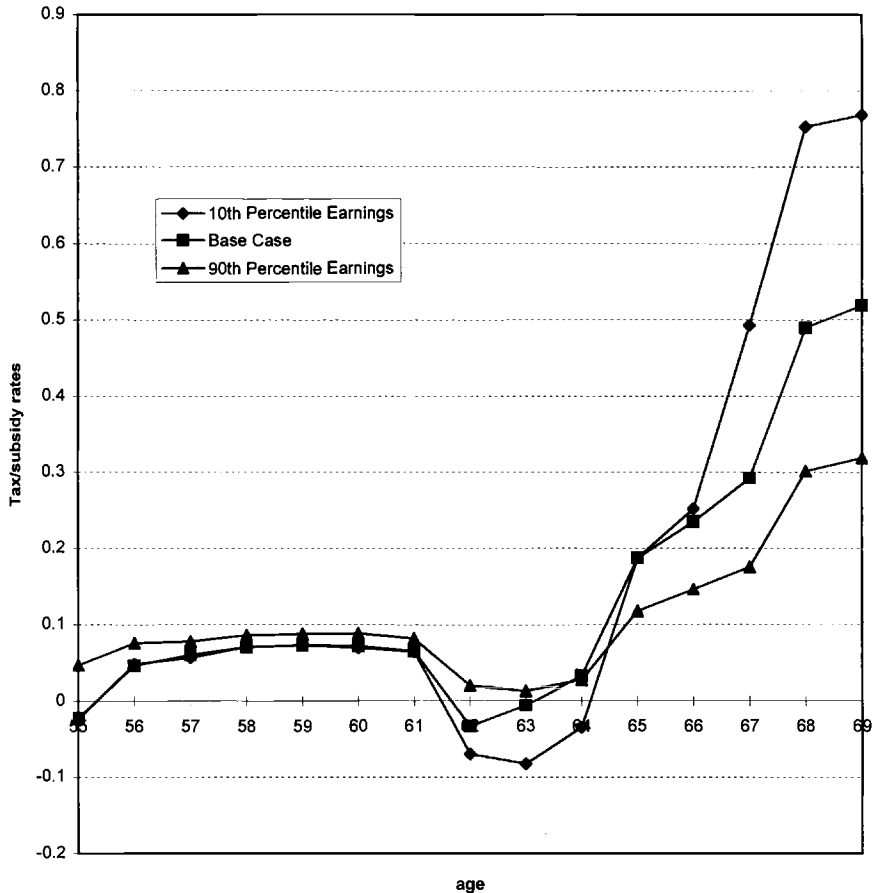


Fig. 11.14 Tax/subsidy rates across earnings profiles

These changes have important effects on the retirement incentives inherent in social security. As the first column of table 11.3 shows, the replacement rate is much higher for the low-earnings worker, confirming the findings of figure 11.5 above. The time pattern of tax/subsidy rates across earnings groups is also shown in figure 11.14. Before age sixty-two, there is a somewhat higher tax rate on high-wage workers since the tax/benefit linkage is reduced by the redistributive nature of benefits computation. From age sixty-two to age sixty-four, there is a large subsidy to continued work for the low-earnings workers, while there is a tax on the high earners. This reflects the fact that the low-earnings workers are getting a much higher return from their social security contributions at this age. This pattern reverses from age sixty-five on, however, as the large negative accruals implicit in social security at older ages are much larger on the smaller base of earnings at the tenth percentile. By age sixty-

**Table 11.5** Incentive Calculation—Incomplete Earnings History for Married Workers

Last Year of Work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	...	97,300	0	0	0
55	...	97,776	476	.005	-.023
56	...	98,274	498	.005	-.025
57	...	98,635	362	.004	-.019
58	...	98,922	287	.003	-.016
59	...	99,303	380	.004	-.022
60	...	99,732	429	.004	-.026
61	.391	100,419	687	.007	-.043
62	.434	102,617	2,198	.022	-.145
63	.476	104,280	1,662	.016	-.115
64	.703	103,848	-432	-.004	.031
65	.749	101,395	-2,452	-.024	.188
66	.798	98,622	-2,773	-.027	.225
67	.845	95,477	-3,145	-.032	.269
68	.872	90,644	-4,833	-.051	.439
69	.898	85,926	-4,718	-.052	.455

nine, the implicit tax rate on low-earnings workers is over twice that on high earners.

Table 11.5 considers a different permutation to the earnings history: assuming that the worker did not start work until 1929 and therefore has an incomplete earnings history (fewer than thirty-five years of work) until he works during his sixty-third year. This has a striking effect on the incentives before age sixty-four. In the place of sizable tax rates on continued work before age sixty-two, there are now small subsidies; and, in the place of a small subsidy at age sixty-two, there is now a much larger subsidy. That is, for a worker with this incomplete earnings history, working during the sixty-second year receives a subsidy of 15 percent owing to the value of replacing a zero in the average monthly earnings computation. Once this worker reaches age sixty-four, however, the incentives are identical to those for the base case since the earnings history has been completed.

## 11.4 Conclusions

The social security program is an important feature of the opportunity set of workers making their retirement decisions. There is clear evidence from both previous work and hazard rate diagrams that the broad structure of the social security program influences retirement timing. Evidence on the effects of variation in the benefits provided by this program is less clear, however. In this paper, we have explicitly documented the implicit tax rates on continued work from this system. We find that, on average, for married men with nonearning

spouses, there is little net tax on continued work around the age of early eligibility for social security but that the tax becomes quite large at the normal retirement age. There is important heterogeneity in these incentives across workers, however, according to features such as marital status and earnings.

The implications of these findings depend critically on the elasticity of the response of retirement behavior to the implicit tax rates of the social security program. As we have noted, this elasticity remains a source of empirical controversy. Future work in this area could employ recent high-quality data on social security entitlements and retirement behavior to resolve this controversy.

## Appendix A

### *Data Sources*

#### **Historical Data**

Labor force participation by age and sex (figs. 11.1 and 11.2 above) is taken from U.S. Bureau of Labor Statistics (various years). Share of workers covered and replacement rates (figs. 11.3 and 11.5 above) are taken from U.S. Congress (1993). Receipt of social security/disability insurance by age and sex (fig. 11.4 above) and median earnings by cohort over time (simulations) are taken from U.S. Department of Health and Human Services (1995).

#### **Contemporaneous Data**

All contemporaneous figures are tabulated by the authors from March CPS data for 1994 and 1995.

#### **Studying Retirement in the United States**

There are two types of data available for studying retirement in the United States:

1. The first are cross-sectional data on participation at a point in time. The CPS is one of a variety of cross-sectional surveys available. Another of note is the National Health Interview Survey (NHIS), which also has health information.

2. The second are longitudinal data that follow individuals over time, providing information on demographics, labor force attachment, and income sources. Some examples here are (a) the Survey of Income and Program Participation (SIPP, 1984–present), which follows a large sample of persons over a period of two to three years; (b) the Panel Study of Income Dynamics (PSID, 1968–present), which has followed a smaller sample of persons since 1968; (c) the Retirement History Survey (RHS, 1969–79) and the National Longitudinal Surveys of Older Men and Women (NLS, 1968–present), which follow large samples of older persons over time, the former survey containing detailed in-

formation on the worker's entire earnings history; and (d) the Health and Retirement Survey (HRS, 1992–present), which updates the RHS with a new cohort of older persons that will be followed for at least ten years. The HRS has the richest data yet available from a retirement survey, including detailed information on earnings histories and firm pension plans.

## Appendix B

### *The Effect of Social Security on Retirement— Theory and Evidence*

#### **Theory**

The major role that social security plays in determining the well-being of the elderly, as well as the dramatic spikes in labor force participation and retirement at exactly the ages of social security entitlement in figures 11.12 and 11.13 above, suggest that social security is a key determinant of retirement behavior. But, in practice, it is quite complicated to model the effects of social security on retirement. In this section, we provide an overview of the effects of the system on retirement. This discussion draws heavily on Crawford and Lillien (1981); for a related discussion, see Burtless and Moffitt (1986).

The discussion proceeds in three steps. First, we consider the effects of social security on retirement in a perfect market/full rationality setting. Then we examine the implications of effects coming from imperfections in the credit and insurance markets. Finally, we consider the implications of behavioral responses that do not correspond to the full rationality model.

In a full rationality/perfect markets setting, one has two types of effects of social security on retirement: income effects and substitution effects. Insofar as the system increases the lifetime wealth of an individual, it will tend to induce earlier retirement (assuming that leisure is a normal good). Such redistributions happen across generations, particularly from the large benefits coming with an underfunded pay-as-you-go system. Such redistribution also happens within a generation, reflecting both deliberate redistributions and the redistributive effects of other policies. For example, the progressivity in the benefit formula is a redistribution to lower earners, for a given life expectancy (although life expectancy does vary systematically with income level). The presence of spouse benefits represents a redistribution from the never married to couples with different earnings histories. The use of an approach based on giving a maximum of an earned benefit and a spouse or surviving spouse benefit redistributes among couples, giving more to couples that have very different earnings levels, particularly one-earner couples. The presence of child benefits helps those having children late in life (so that the children are still young when

the worker retires). Since benefits are paid as an annuity, with the same formula for all, the system redistributes toward those who, *ex ante*, have greater life expectancies. There are similar effects from the disability insurance portion of the program. In terms of substitution effects, one needs to consider the financial implications of continuing work once eligible for retirement benefits, as documented above.

Once one moves away from a perfect market setting, one cannot infer the effects of social security solely from their implications for the shape of the lifetime budget constraint. There are two effects that have been recognized in the literature. Insofar as it is difficult to borrow against future earnings, some young workers will be liquidity constrained, consuming less than they would if they could borrow against future earnings. The payroll tax tightens this constraint, resulting in even lower consumption among such workers. As a result of having consumed less when young, these workers may have more wealth when reaching retirement age, resulting in an income effect leading to earlier retirement.

With imperfect individual annuity markets, social security is providing real annuities that are not available in the market. Correction of this market failure has two effects. One is that the greater efficiency in planning lifetime consumption associated with annuitization works like an income effect, resulting in earlier retirement. Second, the link between work and the size of these annuities is an incentive for additional work at retirement age. Moreover, the inability to tap this source of wealth until reaching the early retirement age will lead some of those who would otherwise have chosen to retire before this age to continue to work until retirement age.

Turning to individual irrationalities, it is a premise of social security systems that many individuals would not save enough to finance retirement in the absence of compulsion. Forcing people to save more than they would (myopically) choose to results in greater wealth at retirement age and therefore an income effect leading to earlier retirement. Also relevant is the possibility of myopia in making the retirement decision itself, based on evaluating only the consumption possibilities in the near term rather than over the full remaining life span. This might result in some people retiring too soon.<sup>18</sup> Limiting eligibility until the early retirement age reduces this effect.

A further element comes into focus once one considers a couple. Poverty rates among widows are roughly three times as high as among married women of the same age. This suggests that many couples are not choosing sizable joint life annuitization. Insofar as social security requires partial joint life annuitization that would not have been chosen by the couple, it lowers consumption of the workers at retirement age and may lead to more work.

18. One must be careful here in measuring the degree of rationality about retirement decisions. For example, from the perspective of maximizing family social security wealth, a given husband may appear to retire too early. However, if he downweights his wife's consumption in his utility function, his decision may be individually rational.

## Evidence

There is an enormous empirical literature that attempts to evaluate the effects that social security has had on retirement behavior. There are two broad strands of this literature. The first uses aggregate information on the labor force behavior of workers at different ages over time to infer the role that is played by social security. Hurd (1990) and Ruhm (1995) emphasize the spike in the age pattern of retirement at age sixty-two; as Hurd (1990, 597, no. 42) states, "There are no other institutional or economic reasons for the peak." Moreover, both authors show that this peak has grown over time as social security generosity has increased; and Burtless and Moffitt (1986) show that this peak was not present in 1960, before this early retirement option was available. As Ruhm (1995) notes, however, the existence of this peak does not prove that social security is lowering participation rates among all older workers; in fact, it may be inducing longer work among those aged sixty and sixty-one in order to qualify for early retirement at age sixty-two.

Moreover, for workers for whom the actuarial adjustment, additional tax, and AIME recomputation is fair on average, there is no reason for social security per se to induce a spike at age sixty-two; it is only an interaction of social security with liquidity constraints that would yield this response. Indeed, this is exactly what Kahn (1988) finds; there is a spike in retirement at age sixty-two for low-wealth workers but not for very high-wealth workers.

There is also a large spike in retirement at age sixty-five, as noted by many analysts, that would be consistent with the traditionally unfair actuarial adjustment made by social security for additional work beyond age sixty-five. Indeed, using more precise quarterly data, Blau (1994) finds that almost one-quarter of the men remaining in the labor force at their sixty-fifth birthday retire within the next three months; this hazard rate is over 2.5 times as large as the rate in surrounding quarters. However, Lumsdaine and Wise (1994) document that this penalty alone cannot account for this "excess" retirement at age sixty-five; nor can the incentives embedded in private pension plans or the availability of retirement health insurance through the Medicare program. This does not rule out a role for social security here; by setting up the "focal point" of a normal retirement age, the program may be the causal factor in explaining this spike.

The second strand of this literature attempts specifically to model the role that potential social security benefits play in determining retirement. The general strategy followed by this literature is to use micro-data sets with information on potential social security benefit determinants (earnings histories) or ex post benefit levels to measure the incentives to retire across individuals in the data.<sup>19</sup> Then retirement models are estimated as a function of these incentive

19. The data used are generally the Retirement History Survey (Boskin and Hurd 1978; Burtless 1986; Burtless and Moffitt 1984; Hurd and Boskin 1984; Fields and Mitchell 1984; Blau 1994), although some authors have relied on the National Longitudinal Survey of Older Men (Diamond and Hausman 1984), and recent work uses the Survey of Consumer Finances (Samwick 1993).

measures. While the exact modeling technique differs substantially across papers,<sup>20</sup> the conclusions drawn are fairly similar: social security has large effects on retirement, but they are small relative to the trends over time documented in figures 11.1 and 11.2 above. For example, Burtless (1986) found that the 20 percent benefit rise of the period 1969–72 raised the probability of retirement at age sixty-two and age sixty-five by about 2 percentage points. Over this period, however, the labor force participation of older men fell by over 6 percent, and social security can therefore explain only about one-third of the change.<sup>21</sup>

This literature suffers from two important limitations. First, the key regressor, social security benefits, is a nonlinear function of past earnings, and retirement propensities are clearly correlated with past earnings levels. This problem is common to the social insurance literature in the United States.<sup>22</sup> But, for other social insurance programs, there is often variation along dimensions arguably exogenous to individual tastes, such as different legislative regimes across locations or within locations over time, that can be used to identify behavioral models. There is no comparable variation in social security, which is a nationally homogeneous program. Of course, this criticism does not necessarily imply that the estimates of this cross-sectional literature are flawed; as Hurd (1990) emphasizes, the nonlinearities in the social security benefits determination process are unlikely to be correlated with retirement propensities. But there has been little serious effort to decompose the sources of variation in social security benefits in an effort to assess whether the determinants that drive retirement behavior are plausibly excluded from a retirement equation.<sup>23</sup>

This criticism is levied most compellingly by Krueger and Pischke (1992), who note that there is a unique “natural experiment” provided by the end of double-indexing for the “notch generation” that retired in the late 1970s and early 1980s. For this cohort, social security benefits were greatly reduced relative to what they would have expected on the basis of the experience of the early to mid-1970s. Yet the dramatic fall in labor force participation continued

20. The earliest studies (Boskin and Hurd 1978; Fields and Mitchell 1984) used standard linear or nonlinear regression techniques. Later research (Burtless 1986; Burtless and Moffitt 1984) used nonlinear budget constraint estimation to capture the richness of social security's effects on the opportunity set. The most recent work (Diamond and Hausman 1984; Hausman and Wise 1985; Samwick 1993; Blau 1994) uses dynamic estimation of the retirement transition.

21. One exception is Hurd and Boskin (1984), who claim that the large benefits increases of the period 1968–73 can explain all the change in labor force participation in those years.

22. For a careful discussion of this issue in the context of unemployment insurance, see Meyer (1989).

23. At a minimum, one would want to include the level of lifetime earnings as a regressor, but most studies include only earnings in a recent year (i.e., Boskin and Hurd 1978; Burtless 1986). In addition, even using a somewhat longer time frame for measuring the earnings control (as Diamond and Hausman [1984] do) does not solve the problem; one could imagine that certain features of the lifetime pattern of earnings are correlated with both benefit levels and retirement decisions, such as the ratio of earnings around age sixty-two to earnings at earlier ages (since individuals who have relatively high earnings at older ages may have better labor market opportunities around the age of retirement and therefore work longer).



unabated in this era. This raises important questions about the identification of this cross-sectional literature.

The second problem with this literature is that it generally focuses on only one of the two key social security benefits variables, including social security benefits or wealth but ignoring the social security tax/subsidy rate documented above. In theory, as discussed above, both these factors plays an important role in determining retirement behavior. Studies that included this regressor found it to have a significant role in explaining retirement (Fields and Mitchell 1984; Samwick 1993); indeed, even in Krueger and Pischke's (1992) paper, the accrual rate is often right signed and significant even as the wealth effect is insignificant. More recently, Stock and Wise (1990) noted that the correct regressor for considering both social security and pension incentives for retirement is not the year-to-year accrual rate but the return to working this year relative to retiring at some future optimal date.

Thus, to summarize, the past empirical evidence has produced mixed conclusions as to the effect of social security policy on retirement. The abnormal spikes in retirement at the ages of early and normal retirement under social security suggest that the structure of the program plays a fundamental role in retirement timing decisions. Within this framework, however, there is only mixed evidence that changes in the overall generosity of the system have much effect on retirement behavior, although the evidence seems clearer for social security accrual rates than for social security wealth levels.

### **Redistribution**

The other aspect of social security that has been emphasized by previous work is redistribution. Hurd and Shoven (1985), Boskin et al. (1987), and, more recently, Steuerle and Bakija (1994) document empirically the redistribution within and across generations that we discussed earlier. Table 11B.1 presents a summary of the results from Steuerle and Bakija on redistribution across and within generations. Each figure is the expected lifetime net transfer from the social security system, which is total received postretirement minus taxes paid during the working life. These net transfers are calculated for four demographic groups, for three levels of lifetime earnings, for three dates of retirement. In the first three columns, the expected values use average mortality assumptions; in the last two columns, the authors allow mortality to be income related, accounting for longer lives for higher-income individuals. All figures are in thousands of 1993 dollars.

A number of interesting findings emerge from table 11B.1. First, there is a secular decline in the net transfers from the social security system for newer cohorts; net transfers are positive for all groups retiring in 1960 but negative for most groups for those retiring in 2030. Second, the system transfers resources differentially to females relative to males since the tax structure is the same but females live longer. Third, the system transfers resources disproportionately to couples through spousal and survivor benefits and even more so to

**Table 11B.1**      **Redistribution through the Social Security System (figures are net transfers in thousands of 1993 dollars)**

Wage	Average Mortality			Income-Specific Mortality	
	1960	1995	2030	1995	2030
Single male:					
Low	26.1	12.5	-4.1	5.1	-13.8
Average	36.5	-5.1	-56.2	-5.1	-56.2
High	36.8	-37.1	-248.5	-20.8	-224.3
Single female:					
Low	41.4	33.4	22.5	27.0	13.0
Average	59.4	28.1	-13.8	28.1	-13.8
High	62.1	6.5	-187.3	20.4	-162.9
Single-earner couple:					
Low	62.3	89.5	99.3	86.0	94.2
Average	89.9	122.5	117.0	122.5	117.0
High	97.2	134.7	24.2	144.6	36.2
Two-earner couple:					
Low	68.4	62.6	36.5	53.1	30.0
Average	88.7	78.6	29.4	78.6	29.4
High	98.7	37.1	-173.5	53.5	-154.9

Source: Steuerle and Bakija (1994).

single-earner couples since no taxes are paid by the spouse but he or she gets benefits. Fourth, despite its ostensibly redistributive structure, the system traditionally transferred more resources toward higher-income earners than toward lower-income earners; this is largely because social security was a good investment and the higher-income earners were more heavily invested. But, by 1995, and even more so by 2030, net transfers are progressive for average mortality prospects. Finally, introducing differential mortality prospects somewhat offsets this progressivity.

## Appendix C

In this appendix, we provide the formulas for our computation of social security wealth.

### Notation

AM	=	worker's age;
AF	=	spouse's age;
YM	=	year of worker's birth;
YF	=	year of spouse's birth;
<i>a</i>	=	month of worker's birth;

maxage	= maximum potential age that we consider for both worker and spouse;
$\rho$	= discount rate;
$t$	= number of months after attaining age sixty-two that the worker decides to wait before first claiming benefits;
$m$	= number of months after $t$ that the worker decides to continue working just below the earnings test limit (so that he is still eligible for full benefits despite continued work);
$s$	= number of months that a spouse, aged less than normal retirement age, decides to wait until starting to claim benefits;
$\{s_k\}, k$	= $1, \dots, 12 \times (\text{maxage} - \text{AM})$ = number of months that a widow aged less than her normal retirement age, and whose partner died $k$ months after attaining age sixty-two, decides to wait before claiming her survivor benefits;
$B_x$	= amount of benefits that the worker is entitled to in month $x$ ;
$D_x$	= amount of benefits that the spouse is entitled to claim in month $x$ on the basis of the worker's earnings history;
$C_x$	= amount of benefits that the surviving spouse is entitled to claim in month $x$ in case the worker dies (before retiring) in month $x$ ;
$E_x$	= amount of benefits that the surviving spouse is entitled to claim in month $x$ in case the worker dies (after retiring) in month $x$ ;
$\theta_i^1$	= dummy variable, which is one if $12 \times \text{AF} + k \geq 12 \times 60 + s$ and zero otherwise;
$\theta_i^2$	= dummy variable, which is one if $12 \times \text{AF} + k \geq 12 \times 60 + s_k$ and zero otherwise;
$p_x(\cdot   \text{YM}, \text{sex})$	= cohort- and sex-specific conditional probability measure expressing the probability that the worker is still alive in month $x$ , conditional on being alive in month $x - 1$ (by definition, $p_{12 \times 62} = 1$ );
$q_x(\cdot   \text{YM}, \text{sex})$	= cohort- and sex-specific conditional probability measure expressing the probability that the spouse is still alive in month $x$ , conditional on being alive in month $x - 1$ (by definition, $p_{12 \times \text{AF}} = 1$ );
$w$	= $[12 \times (\text{YM} + \text{AM} - 1) + a + i]/12$ ;
$v$	= $[12 \times (\text{YM} + \text{AM} - 1) + a + k]/12$ ;
$\text{BI}_x$	= increase in benefits in December of year $x$ ;
$\text{SSC}_x$	= contributions to social security system in month $x$ ; and
$i, l, j, k$	= simple counting variables

The construct of interest for our analysis is the net present discounted value (NPDV) of social security benefits. This is the sum of four components:

- PB = NPDV of worker's benefits;
- SpB = NPDV of spousal benefits;
- SuB = NPDV of survivor benefits; and
- SSC = NPDV of social security contributions.

$$\begin{aligned}
 \text{PB} &\equiv \sum_{i=t}^{12(\text{maxage}=\text{AM})} [B_{12\text{AM}+i} \times p_{12\text{AM}+i}(\text{YM}, \text{sex}) \times (1 + \rho)^{-i}], \\
 \text{SpB} &= \sum_{i=t}^{12(\text{maxage}=\text{AF})} \left( D_{12\text{AM}+i} \times \theta_i^2 \right. \\
 &\quad \left. \times \left\{ \prod_{j=0}^i [q_{12\text{AF}+j}(\text{YF}, \text{sex}) \times p_{12\text{AM}+j}(\text{YM}, \text{sex})] \right\} \times (1 + \rho)^{-i} \right), \\
 \text{SuB} &\equiv \sum_{k=0}^{t-1} \left[ \sum_{i=k}^{12(\text{maxage}=\text{AF})} \left( C_{12\text{AM}+i} \times \theta_i^2 \times \left\{ \prod_{j=0}^{k-1} [p_{12\text{AM}+j}(\text{YM}, \text{sex})] \right\} \right) \right. \\
 &\quad \left. \times [1 - p_{12\text{AM}+j}(\text{YM}, \text{sex})] \times \left\{ \prod_{j=0}^i [q_{12\text{AF}+j}(\text{YF}, \text{sex})] \right\} \right. \\
 &\quad \left. \times \left[ \frac{\prod_{l=v}^w (1 + \text{BI}_l)}{(1 + \text{BI}_v)} \right] \right] \times \left\{ [1 - p_{12\text{AM}+j}(\text{YM}, \text{sex})] \right. \\
 &\quad \left. \times \left( \prod_{j=0}^i [q_{12\text{AF}+j}(\text{YF}, \text{sex})] \times \frac{\left[ \prod_{l=v}^w (1 + \text{BI}_l) \right]}{(1 + \text{BI}_v)} \right) \right\} \\
 &\quad + \sum_{k=t}^{12(\text{maxage}=\text{AM})} \left[ \sum_{i=k}^{12(\text{maxage}=\text{AF})} \left( E_{12\text{AM}+i} \times \theta_i^2 \times \left\{ \prod_{j=0}^{k-1} [p_{12\text{AM}+j}(\text{YM}, \text{sex})] \right\} \right) \right], \\
 \text{SSC} &\equiv \sum_{i=0}^{t+m} \text{SSC}_{(12\text{AM})+i}.
 \end{aligned}$$

The net present discounted value of social security benefits (NPDVSSC) is thus

$$\text{NPDVSSC} \equiv \text{PB} + \text{SpB} + \text{SuB} + \text{SSC}.$$

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