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4   Social Security and Retirement in Germany

Axel Börsch-Supan and Reinhold Schnabel

Old age social security benefits represent the largest part of the German social budget. In 1993, social security benefits amounted to 10.3 percent of GDP, a share more than two and a half times larger than in the United States. Social security income represents about 80 percent of household income of households headed by a person aged sixty-five and over.

The German social security system (the Gesetzliche Rentenversicherung and its equivalents)[1] is large because it is mandatory for every worker except the self-employed and those with very low incomes. In addition, the German social security system is very generous in two respects. First, the system has a very high replacement rate, generating net retirement incomes that are currently about 72 percent of preretirement net earnings for a worker with a forty-five-year earnings history and average lifetime earnings.[2] This is substantially higher than, for example, the corresponding U.S. net replacement rate of about 53 percent.[3] Second, the system has very generous early retirement provisions, including easy ways to claim disability benefits, increasing the number of ben-

1. For example, the retirement system of civil servants.

2. *Replacement rate* is here defined as the current pension of a retiree with a forty-five-year average earnings history divided by the current average earnings of all dependently employed workers. A different definition of *replacement rate* is used in app. B. *Replacement rate* is also defined differently when used relative to the most recent earnings of a retiring worker, which are usually higher than the lifetime average.

3. Using the same replacement rate concept as in n. 2 above.

eficiaries. The average retirement age is quite young in West Germany (about age fifty-nine) and even younger in East Germany.[4] The prevalence of early retirement comes in addition to a population that is already quite old and has contributed to a significantly higher ratio of pensioners to workers than in other countries. Currently, one hundred German workers pay for sixty-four pension recipients, as opposed to only twenty-five pension recipients per hundred workers in the United States.[5]

The tendency toward early retirement is particularly problematic in times of population aging. The proportion of persons aged sixty and older will increase from 21 percent in 1995 to 36 percent in the year 2035, when population aging will peak in Germany. With Switzerland and Austria, this will be the highest proportion in the world. The old age dependency ratio will almost double, from 57 percent in 1995 to 102 percent in 2035. As a consequence, the German social security contribution rate is expected to increase dramatically and sub-stantially to exceed the rates in other industrialized countries. While, in 1997, the contribution rate stood at about 20 percent of gross income,[6] even conser-vative estimates put the contribution rate significantly above 30 percent of gross income at the peak of population aging if the current system and current retirement behavior remain as they are. Population aging will dramatically re-duce the rate of return of the German retirement system. Estimates vary by the way benefits and contributions will be adjusted; rates of return will be around zero for cohorts born after 1970 (see Börsch-Supan 1997; and Schnabel 1997). Key questions for public policy are, therefore, How much of the large and increasing retirement burden can be attributed to the incentive effects of the public pension system, and which features should be changed to accommodate population aging?

This paper presents a descriptive analysis of the incentive effects of the Ger-man old age social security system on retirement decisions. In section 4.1, we summarize the labor market behavior of older German men and women be-tween 1960 and now. In section 4.2, we provide a general description of the German public pension system. In section 4.3, we conduct a detailed analysis of retirement incentives. Specifically, we compute accrual rates of social secu-rity wealth and show that they have actually been negative for those who have not retired early. In section 4.4, we provide a brief survey of the empirical literature that attempts to link the incentives of the social security system with retirement behavior in West and East Germany. We then synthesize our find-ings and conclude.

4. The average retirement age in a given year is the average age of those workers receiving a public pension income for the first time.
5. There is some double-counting in both countries as persons can receive more than one pension.
6. As of 1 January 1997, the total contribution rate is 20.3 percent; 10.15 percent is deducted from the employee's gross pay, another 10.15 percent paid by the employer.

4.1 Labor Market Behavior

In this section, we first depict historical trends in labor force participation, participation in the public pension system, and coverage of the elderly by old age social security, then we more closely investigate labor market status and retirement patterns in the early 1990s.

As will be explained in section 4.2 below, we include in the public pension system all branches of the Gesetzliche Rentenversicherung (i.e., blue collar, white collar, and mining) and also the separate retirement system for civil servants. We distinguish old age, disability, and survivor benefits within the public pension system.

Data for the historical trends come from the German population survey (Mikrozensus, MZ) and the German Department of Labor and Social Affairs (Bundesministerium für Arbeit und Sozialordnung, BMAS). Cross-sectional data for recent years have mainly been drawn from the German Socio-Economic Panel (GSOEP) and from statistics supplied by the German association of public pension providers (Verband der deutschen Rentenversicherungsträger, VdR). These data sources are described in more detail in appendix A.

4.1.1 Historical Trends

Germany shares the rapid decrease in old age labor force participation with most other industrialized countries (fig. 4.1).[7] This decrease accelerated after 1970. In section 4.4, we argue that the dramatic decline after 1970 is at least partly due to the introduction of "flexible" retirement arrangements in 1972 that did not adjust benefits according to actuarial tables. It is interesting to note that male labor force participation declined from 1970 to 1990 for all ages over fifty and increasingly so for older persons. Female labor force participation increased for all ages under sixty. The increase for the age range from fifty to fifty-nine is noteworthy because it contrasts to the decline in male labor force participation due to a high share of disability claims among male workers.

The German public pension system is mandatory for every worker except the self-employed and those with very low earnings (see sec. 4.2 below). Hence, coverage by the public pension system is high and has steadily increased from 77 percent in 1960 to a plateau of almost 90 percent around 1980 (fig. 4.2). The increase in the 1960s and 1970s stemmed from the declining share of the self-employed and farmers in the labor force, while the slight decrease in very recent years was caused by the increase in part-time jobs that do not require participation in the social safety net.

In accordance with coverage, the number of beneficiaries also increased sharply from 1960 to 1995 (fig. 4.3). Among those age fifty-five and older, 85 percent received pensions from the public system in 1995, while this share was

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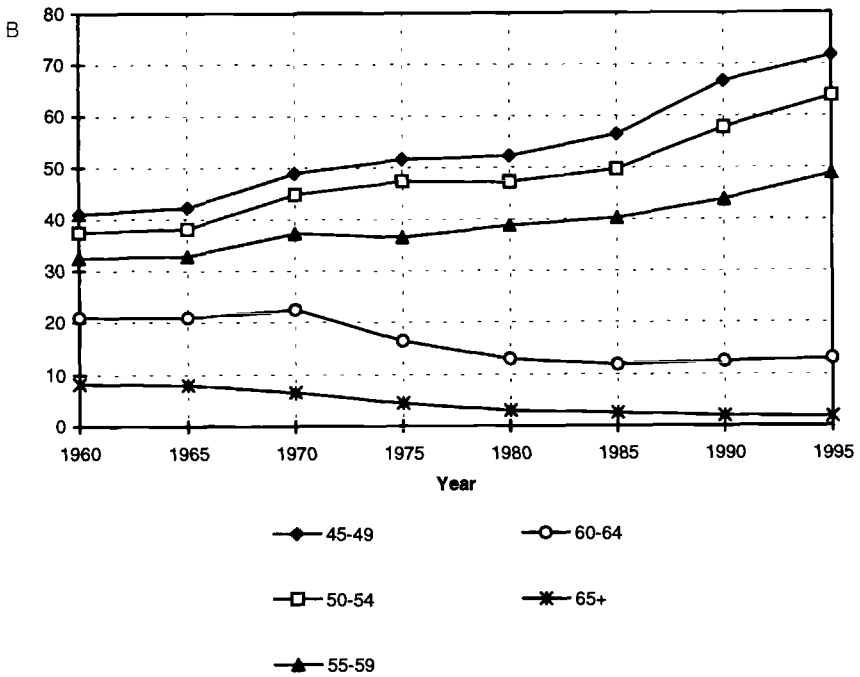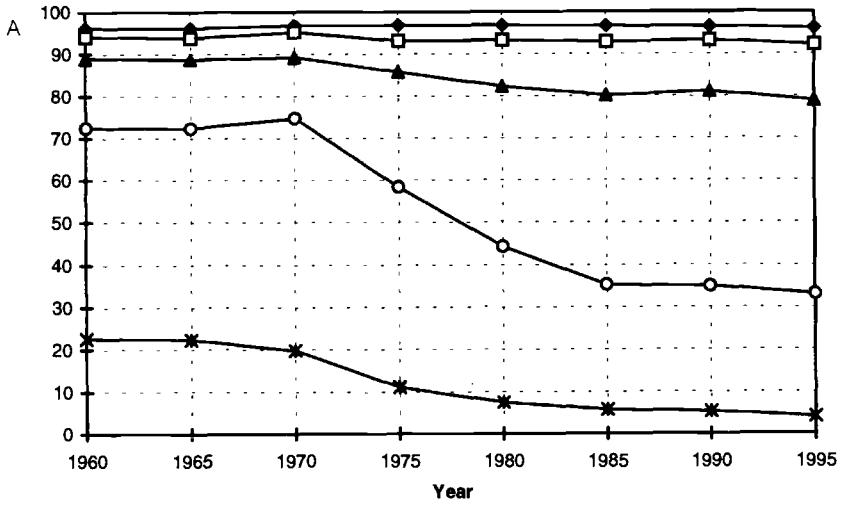7. Tables for all figures in this paper are available on request.

A

100
90
80
70
60
50
40
30
20
10
0

1960 1965 1970 1975 1980 1985 1990 1995
Year

B

80
70
60
50
40
30
20
10
0

1960 1965 1970 1975 1980 1985 1990 1995
Year

◆ 45-49   ○ 60-64

□ 50-54   ✳ 65+

▲ 55-59

Fig. 4.1   Labor force participation rates: *a*, males; *b*, females

Source: Mikrozensus (StatBA 1990, FS1, R4.1.1: S.51, 55; StatJB 1966: S. 149; StatJB 1971: S.121; StatJB 1976: S. 148; StatJB 1981: S.94; StatJB 1986: S. 97).
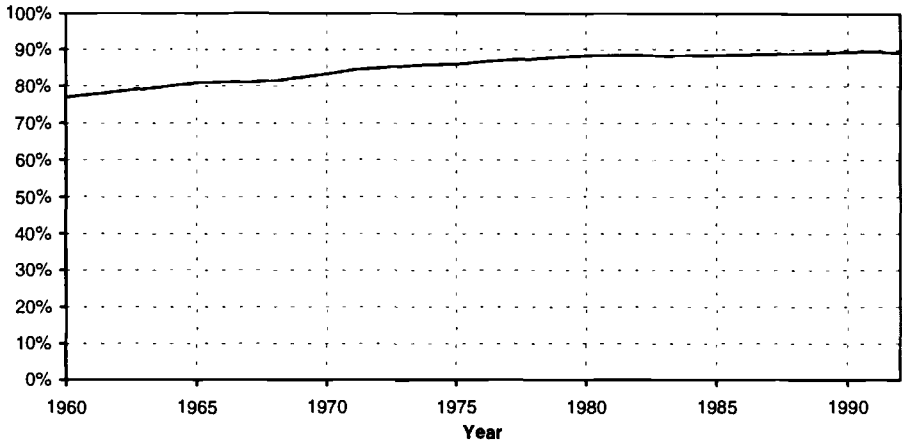
Fig. 4.2 Share of workers covered by the German public pension system
Sources: Stat. Bundesamt, FS1/4.1.1, based on Mikrozensus; own calculations.
Note: Share of white-collar workers, blue-collar workers, miners, and civil servants in total labor force. Not included are those self-employed who are voluntary members of the public pension system.
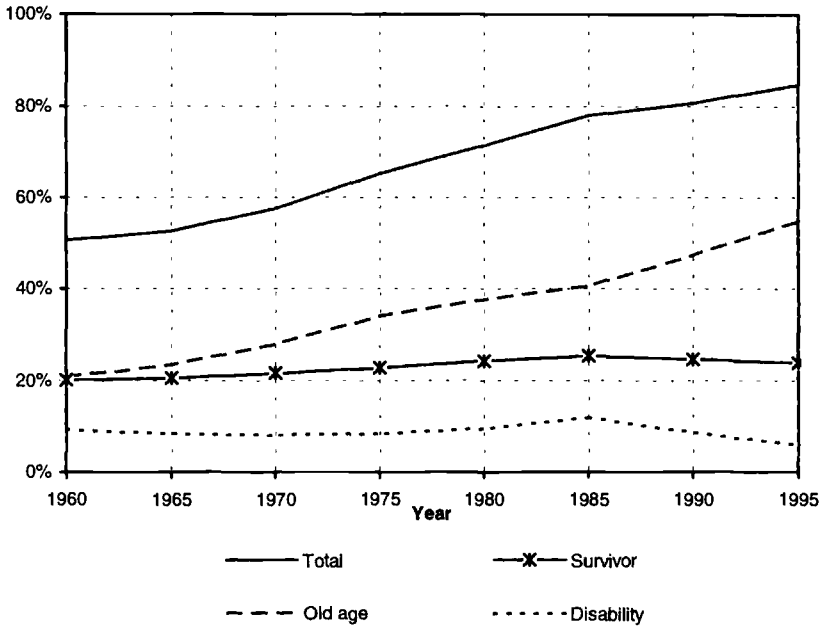

Fig. 4.3 Share of persons aged 55 and older receiving public pensions
Sources: VdR; own calculations.
Note: By definition, all persons receiving old age pensions are age 60 and above. Percentage receiving disability pensions: share of those aged 55 and over estimated from 1992 share. Persons receiving survivor benefits: some double-counting; very small number of persons below age 55 included. Note that table 4.3 below represents the stock of retirees and that fig. 4.29 below shows the flow into retirement.
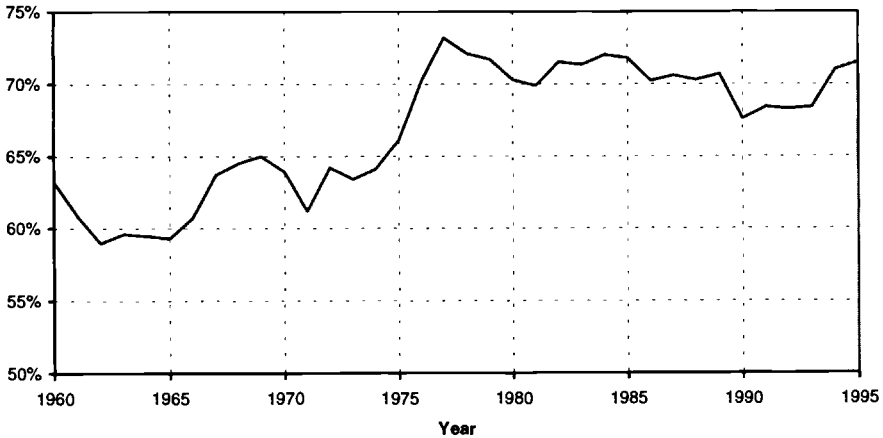
Fig. 4.4   Replacement rate of the German public pension system
Source: BMAS.
Note: Pension after 45 years average contribution as percentage of average net wage. The 1990 rate is low because East German pensions were not yet adjusted to the West German level.

only a little above 50 percent in 1960. Figure 4.3 distinguishes three kinds of pensions: old age and disability pensions based on contributions from own earnings and survivor pensions. Most of those who receive a public pension receive an old age pension. Disability benefits rose particularly fast in the early 1980s, until more stringent requirements were put in place. Survivor benefits remained about steady.

The replacement rate of the German public pension system is very generous. It increased from 63 percent in 1960 to 72 percent currently (fig. 4.4). Note that the replacement rate varied in the short term as indexation to gross wages (more recently, net wages) was not automatic but at the discretion of the legislature. The drop after 1990 is due to the inclusion of the initially very low East German pensions, which were subsequently raised to the West German level.

4.1.2   Labor Market Behavior in Recent Years

In order to investigate recent labor market behavior in more detail, we pool the 1993, 1994, and 1995 waves of the GSOEP. The data cover some seventeen thousand persons annually in East and West Germany. We also use VdR data for the number of beneficiaries of the public pension system.

Figure 4.5 shows the rapid decline in labor force participation around age sixty for both female and male workers and the large share of persons who exit the labor force even earlier. Particularly sharp declines in labor force participation are visible at ages fifty-six (male only), sixty, and sixty-five. By age sixty-six, male labor force participation has dropped below 7.5 percent.

Figure 4.6 looks more closely at the employment status of males and females in Germany. *Employment status* is defined as actual occupation. *Retired*
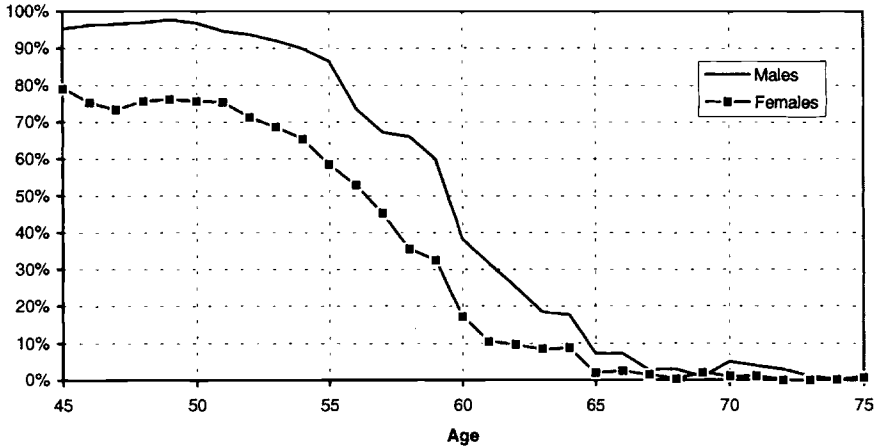
Fig. 4.5   Labor force participation rates
Sources: GSOEP 1993–95; own calculations.
Note: Percentage of sample persons of given age.

in this figure refers to persons who call themselves retired regardless of whether they receive some kind of pension. The category includes disabled persons and persons having retired before being eligible for a public pension. *Unemployed* refers to the registered unemployed who are still seeking work. Unemployment increases with age and peaks immediately before age sixty. The category *unemployed* does not include those who receive unemployment benefits but are actually retired. As will be explained in section 4.2 below, unemployment is one of the many pathways to early retirement and has been encouraged by the government in official and, even more so, in unofficial "pre-retirement" schemes (*Vorruhestand*).

Figure 4.7 links the labor force status of figure 4.6 with the receipt of public pensions. After age fifty-five, a substantial number of workers enter early retirement without receiving a public pension (old age or disability). These are the above-mentioned workers who receive some combination of unemployment benefits and severance pay under several preretirement schemes. Eventually, by age sixty-five, almost all male and most female preretirees will receive a public pension. Preretirement is high: it peaks between the ages of fifty-six and fifty-nine at 20 percent for men and 25 percent for women.

Figure 4.8 yields a closer look at the different kinds of public pensions that were displayed in figure 4.7. About 95 percent of elderly German men and 85 percent of women receive public old age and disability pension benefits as a result of their own contributions from earnings. In addition, a large share of women (strongly increasing with age, peaking at 60 percent for women aged seventy-five and older) and a small share of men receive survivor benefits.

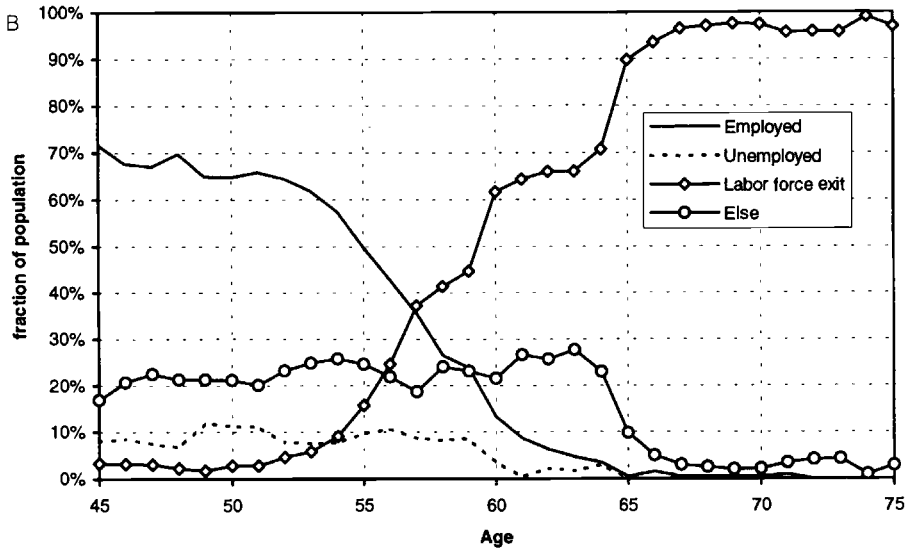Benefits before age sixty are disability benefits. These disability pensions
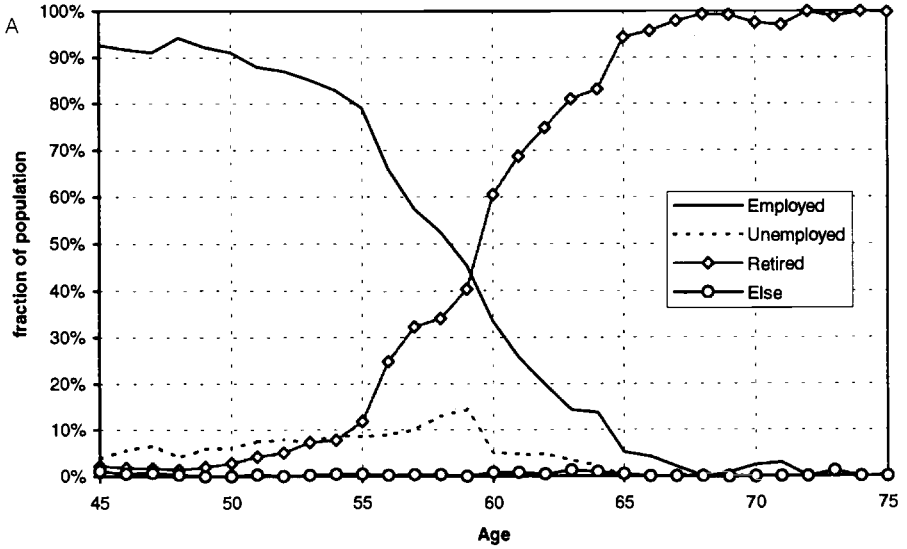
Fig. 4.6 Labor force status: *a*, males; *b*, females

Source: GSOEP 1993–95.

Note: Percentage of sample persons at given age. Unemployed = registered unemployed who are willing to work.
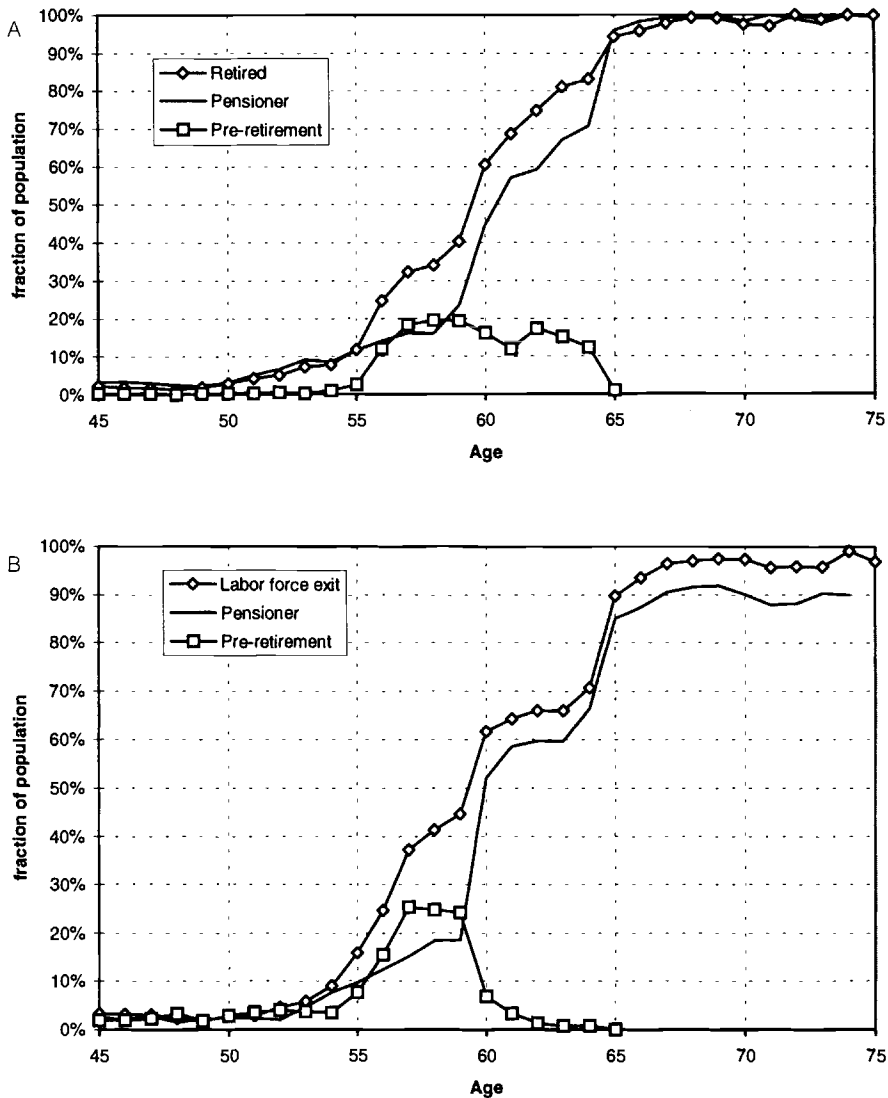
Fig. 4.7 Labor force status and receipt of own pension: *a*, males; *b*, females

Source: GSOEP 1993–95.

Note: Labor force exit = retired from labor market (includes persons who receive pensions and persons with preretirement status); pensioner = receives old age or disability pension; preretirement = retired from labor market (1) receiving unemployment benefits and/or (2) receiving compensating payments from (former) employer while at zero hours of work.

Fig. 4.8   Recipients of public pension income: *a*, **males;** *b*, **females**
Sources: GSOEP 1993–95; own calculations.
Note: Survivor, old age, disability, and civil servant pension recipients as share of sample persons at given age.

Fig. 4.9 Recipients of firm pensions by age
Sources: GSOEP 1993–95; own calculations.
Note: Firm pensions as share of sample persons at given age.

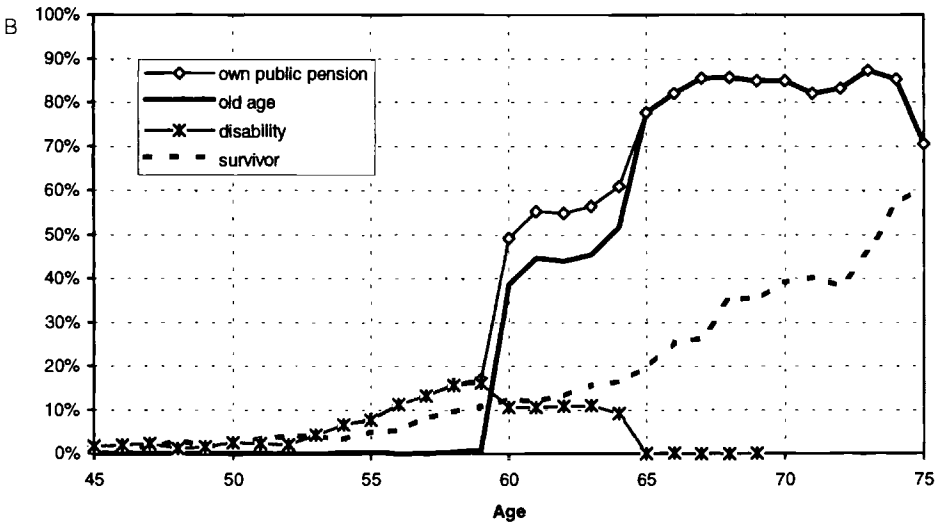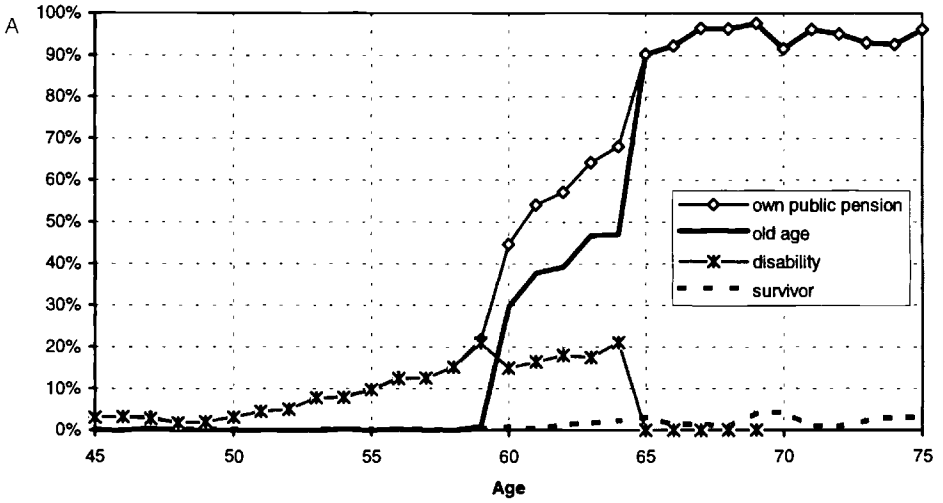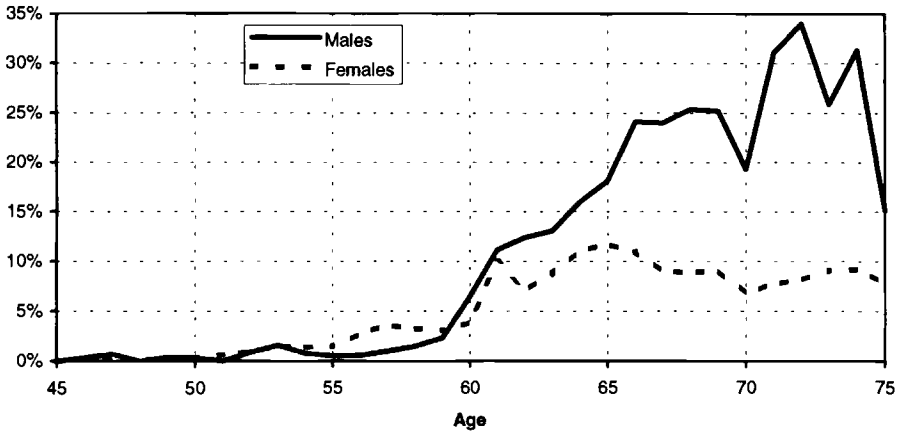are converted between the ages of sixty and sixty-five to old age pensions. The sharp increase in beneficiaries between the ages of sixty and sixty-five mirrors the rapid decline in labor force participation at that age, as seen in figure 4.7. The sharp decline of own pensions among women aged seventy-five and older is not a true age effect. Rather, the decline reflects a cohort effect because female workers aged seventy-five and over had very low labor force participation.

About a quarter of the male elderly (aged sixty-five and over) receive private firm pensions (fig. 4.9). This pension comes generally in addition to the public pensions depicted in figure 4.8. The share is low relative to British and American standards, and it is even smaller for the female elderly. Firm pensions have been popular and were used to create internal company funds until the very favorable corporate income tax treatment was abolished. The "age" pattern in figure 4.9 therefore displays strong cohort effects in addition to true age effects.

Not only do a relatively small number of persons receive private firm pensions, but firm pensions are also relatively low. They account for less than 5 percent of total retirement income among elderly households, the bulk of whose income is provided by public pensions (about 80 percent). This can be seen in figure 4.10. Private asset income also plays a much smaller role than in the United States and the United Kingdom and never exceeds 10 percent on average at any age.
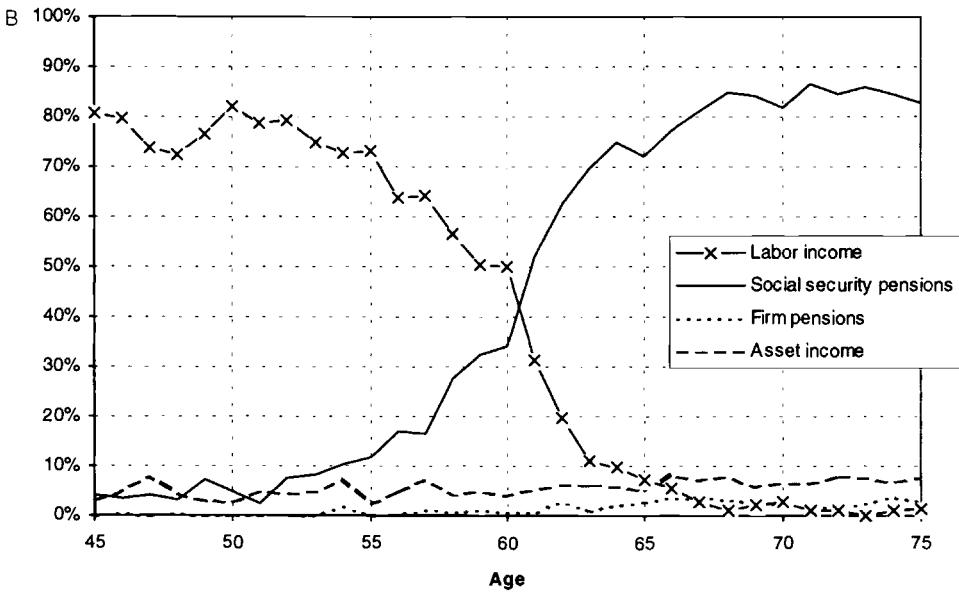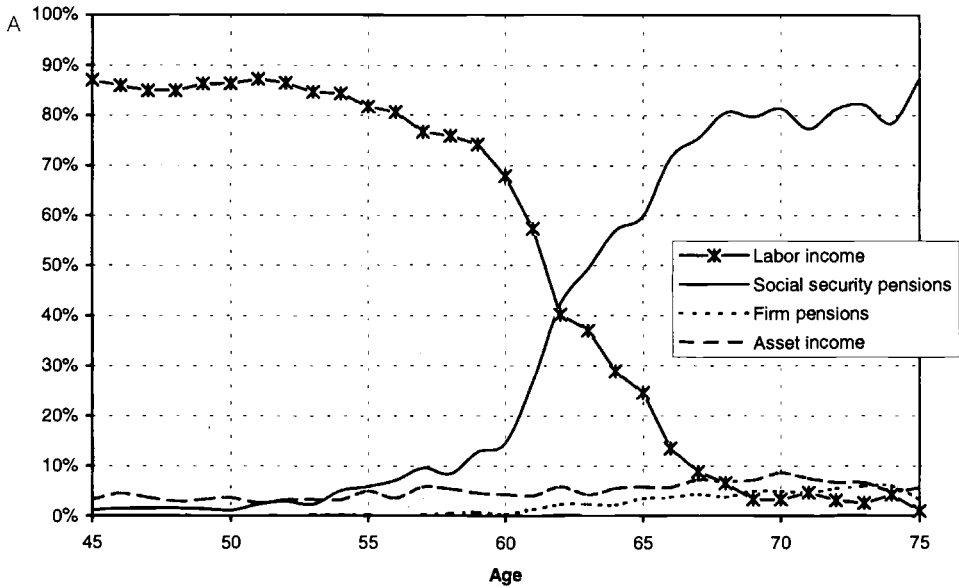
Fig. 4.10 Source of household income by age of householder: *a*, male head of household; *b*, female head of household
Sources: GSOEP 1993–95; own calculations.

4.2   Key Features of the German Pension System

4.2.1   The History of Retirement Insurance in Germany

Germany has the oldest formal social security system, introduced in 1889 by Chancellor Bismarck. Originally a fully funded disability insurance program, the system became a mandatory retirement insurance program (Gesetzliche Rentenversicherung, GRV), which was converted to a pay-as-you-go scheme after its capital stock was severely eroded during the Great Depression and World War II. In the 1960s and 1970s, the German system evolved into one of the most generous pension systems in the world in terms of both its replacement rate and its early retirement provisions. Germany now faces the most dramatic population aging among the industrialized countries, which severely jeopardizes the social security system in its current, generous form.

As opposed to those in many other countries (such as the United Kingdom and the Netherlands), public pensions in Germany are designed to extend the standard of living that was achieved during an individual's work life into retirement.[8] Public pensions are roughly proportional to labor income averaged over the life course and incorporate only few redistributive properties (much fewer than, e.g., in the United States). This is the reason that the German pension system is termed *retirement insurance* rather than *social security,* as in the United States, and most workers still understand their contributions as *insurance premia* rather than *taxes,* although this appears to be changing in the face of the severe benefit cuts currently being discussed in response to population aging.

The retirement insurance system consists of several programs, each providing benefits that can be accumulated in certain cases. The system combines old age pensions, disability pensions, and survivor pensions. East Germany is now fully integrated in the West German retirement system, although a few transitional rules still apply. Strictly speaking, German retirement insurance is not part of the government budget but a separate entity that is subsidized by the federal government. Were there a surplus, social security contributions could not legally be used to decrease the government deficit, as they can in the United States.

Until 1972, the system was very inflexible and permitted retirement only at age sixty-five, except for disability, which, however, made up for roughly 50 percent of new retirement entries (see fig. 4.29 below).[9] The landmark 1972 pension reform introduced the opportunity to retire at different ages during the so-called window of retirement without a direct adjustment of retirement

8. Hauser (1995) provides an overview and comparison of European old age social security systems.
9. We use *retirement* in this section to refer to the receipt of a public pension for the first time unless we also discuss labor force exit in the same context. The reader is reminded that there is substantial "preretirement" without public pension income (see fig. 4.7 above).

benefits.[10] At the same time, the reform indexed benefits to the gross wage bill, laying the groundwork for a system of pensions that increased faster than net wages and much faster than inflation. In the face of increasing budget problems, these two generous provisions were replaced by the second landmark 1992 pension reform. This reform enacted a more actuarially fair formula, and indexation was changed to net rather than gross wages. Since the 1992 reform, the retirement insurance system has been modified in a continuous flurry of small reform steps. Several loopholes were closed, and partial retirement was introduced. Normal retirement age, which remained at age sixty-five for men, will gradually be increased by the year 2004 to age sixty-five for women as well. Nevertheless, it has become increasingly clear that the 1992 pension reform did not solve the demographic challenge to come. The discussion was still ongoing in the spring of 1997; proposals were converging toward a severe reduction of benefits accompanied by more reliance on private savings.

This constant change makes it difficult to describe *the* German retirement insurance system. Moreover, the 1992 reform and its recent modifications will be fully effective only after the year 2004 because most workers are still "grandfathered" by the pre-1992 legislation. We focus our description of the German system on (*a*) the system features between 1972 and 1992 because they describe the behavior of retirees until about the year 2000 and (*b*) the system features after the 1992 reform with all modifications that have been enacted, including the budget reconciliation act of June 1996.

4.2.2   Coverage and Contributions

The German pay-as-you-go public pension system features very broad mandatory coverage of workers. Only the self-employed (8.9 percent of the labor force) and workers with earnings below the official minimum earnings threshold (*Geringfügigkeitsgrenze,* 15 percent of average monthly gross wage— about 5.6 percent of all workers) are not subject to mandatory coverage.[11]

Roughly 80 percent of the budget of German public retirement insurance is financed by contributions that are administrated like a payroll tax, levied equally on employees and employers. Total contributions in 1997 represented 20.3 percent of the first DM 8,200 of monthly gross income (the upper earnings threshold, *Beitragsbemessungsgrenze,* about 180 percent of the average monthly gross wage).[12] Technically, contributions are split evenly between employees and employers: 10.15 percent is deducted from the employee's gross wages, and another 10.15 percent is paid directly by the employer. While the

10. There was an adjustment for retiring at ages sixty-six and sixty-seven (see below).
11. Some professions, most notably civil servants, have their own mandatory retirement system. Although implicit, these systems effectively mimic the general public pension system and are included in it here.
12. Monthly gross household income in Germany was DM 5,300 in 1996, corresponding to a purchasing power of U.S.$30,300 annually (based on the OECD purchasing power parity of DM 2.10 per U.S.$1.00).

contribution rate has been fairly stable since 1970, the upper earnings threshold has been used as a financing instrument. The latter is anchored to the average wage and has increased considerably faster than inflation.

Social security benefits are essentially tax free.[13] Pension beneficiaries do not pay contributions to the pension system or to unemployment insurance.[14] However, pensioners must pay the equivalent of the employee contribution to the mandatory medical insurance. The equivalent of the employer's contribution to health insurance is paid by the pension system.

The remaining approximately 20 percent of the social security budget is a subsidy from the federal government. This subsidy is also used to fine-tune the pay-as-you-go budget constraint, which has a minimal reserve of one month's worth of benefits.

4.2.3 Public versus Private Pensions

Public pensions provide the major source of income after retirement. Although firm pensions exist in Germany, their role is small. In 1993–95, 21 percent of the male elderly and less than 9 percent of the female elderly received private pensions. Moreover, private pension income is small. The average share of private firm pensions in total retirement income is less than 5 percent for elderly German households (see fig. 4.9 above). One can therefore essentially abstract from private pensions and contribute all incentive effects on retirement behavior to the public pension system. This is quite different from the situation in the United Kingdom or the United States and considerably facilitates the analysis of retirement behavior in Germany.

4.2.4 Benefit Types

The German public pension system (or, as it is referred to in Germany, the retirement insurance system) provides *old age pensions* for workers age sixty and older, *disability benefits* for workers under age sixty that are converted to old age pensions at the latest at age sixty-five, and *survivor benefits* for spouses and children. In addition, preretirement (i.e., retirement before age sixty) is possible through several mechanisms using the public transfer system, mainly unemployment compensation. We begin by describing old age pensions.

4.2.5 Eligibility for Benefits and Retirement Age for Old Age Pensions

Eligibility for benefits and the minimum retirement age depend on which type of pension the worker chooses. The German public retirement insurance system distinguishes five types of old age pensions, displayed in table 4.1, corresponding to normal retirement and four types of early retirement.

This complex system was introduced by the 1972 social security reform.

13. Technically, the return on the pay-as-you-go system is taxable. The return is deemed a fixed share of the pension benefits that is below the general income tax exclusion unless the household has substantial nonpension income.
14. An exception is the very few "partial retirees" who pay taxes on their labor income.

Table 4.1   **Old Age Pensions (1972 legislation)**

Pension Type	Retirement Age	Years of Service	Additional Conditions	Earnings Test
A. Normal	65	5		No
B. Long service life ("flexible")	63	35		Yes
C. Women	60	15	10 of those after age 40	Yes
D. Older disabled	60	35	Loss of at least 50% earnings capability	(Yes)
E. Unemployed	60	15	1.5–6 years of unemployment (has changed several times)	Yes

One of the key provisions was the introduction of "flexible retirement" after age sixty-three with full benefits for workers with a long service history. In addition, retirement at age sixty with full benefits is possible for women, the unemployed, and older disabled workers.[15] *Older disabled workers* refers to those workers who for health or labor market reasons cannot be appropriately employed and are age sixty or older. In order to claim old age disability benefits, one must either (1) be physically disabled (at least 50 percent), (2) pass a strict earnings test, or (3) pass a much weaker earnings test. The strict earnings test is passed if the earnings capacity is reduced below the minimum earnings threshold for any *reasonable* occupation (about 15 percent of the average gross wage)—*erwerbsunfähig*.[16] The weaker earnings test is passed when no vacancies corresponding to the worker's *specific* job description are available and the worker faces at least a 50 percent loss in earnings when changing to a different job—*berufsunfähig*. As opposed to disability insurance for workers under age sixty (see below), full benefits are paid in all three cases.

With the 1992 social security reform and its subsequent modifications, the age limits for types B and C of early retirement will gradually be raised to sixty-five. These changes will be fully phased in by the year 2004. The only distinguishing feature of types B and C of "early retirement" will then be the possibility of retiring up to five years earlier than age sixty-five if a sufficient number of service years (currently thirty-five) have been accumulated. As opposed to the pre-1992 regulations, benefits will be adjusted to a retirement age below sixty-five in a fashion that we describe below.

15. This *old age* pension for disabled workers is different from the *general* disability pension for younger workers.
16. The earnings tests are described below. For a detailed description of disability regulations, see Riphahn (1995).

4.2.6 Benefits

Benefits are strictly work related. The German system does not have the kinds of benefits for spouses that exist in the United States. Benefits are computed on a lifetime contribution basis and adjusted according to type of pension and retirement age. They are the product of four elements: (1) the employee's relative contribution position, (2) the years of service life, (3) adjustment factors for pension type and (since the 1992 reform) retirement age, and (4) the average pension. The first three factors make up the "personal pension base," while the fourth factor determines the income distribution between workers and pensioners in general.

The employee's relative contribution position is computed by averaging his or her annual relative contribution positions over the entire earnings history. In each year, the relative contribution position is expressed as a multiple of the average annual contribution (roughly speaking, the relative income position). A first element of redistribution was introduced in 1972 when this multiple could not fall below 75 percent for contributions before 1972 provided a worker had a service life of at least thirty-five years. A similar rule was introduced in the 1992 reform: for contributions between 1973 and 1992, multiples below 75 percent are multiplied by 1.5 up to the maximum of 75 percent, effectively reducing the redistribution for workers with income positions below 50 percent.

Years of service life are years of active contributions plus years of contributions on behalf of the employee and years that are counted as service years even when no contributions were made at all. These include, for instance, years of unemployment, years of military service, three years for each child's education (deductible by one of the parents),[17] some allowance for advanced education,[18] etc., introducing a second element of redistribution. The official government computations, such as the official replacement rate (*Rentenniveau*), assume a forty-five-year contribution history for what is deemed a "normal earnings history" (*Eckrentner*). In fact, the average number of years of contributions is slightly under forty. Unlike in the United States, neither is there an upper bound of years entering the benefit calculation, nor can workers choose certain years in their earnings history and drop others.

Since 1992, the average pension is determined by indexation to the average net labor income. This solved some of the problems that were created by indexation to gross wages between 1972 and 1992. Nevertheless, wage rather than cost-of-living indexation makes it impossible to finance the retirement burden by productivity gains. The average pension has provided a generous benefit level for middle-income earnings. Table 4.2 shows replacement rates and compares them to those in the United States. Note that Germany has much less

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17. Three years after the 1992 reform. The number of years has been changed frequently.
18. This allowance used to be very generous but has been dramatically reduced recently.

Table 4.2   **Replacement Ratios of Social Security Old Age Pensions
                       (1972 legislation)**

	Net Replacement Ratio (%)	
Relative Income	United States	West Germany
50	61	67
75	55	66
100	53	71
150	45	77
200	41	75
300	30	53

Source: Casmir (1989, 508, 512).

Note: Relative income is expressed as a percentage of the net wage of an average production worker with forty years of service. Married couple supplement not included.

redistribution than the United States. The low replacement rates for high incomes result from the upper limit at which earnings are subject to social security contributions.

Before 1992, the *adjustment of benefits to retirement age* was only implicit via years of service.[19] Because benefits are proportional to years of service, a worker with fewer years of service will get lower benefits. With a constant income profile and forty years of service, each year of earlier retirement decreased pension benefits by 2.5 percent, and vice versa.

The 1992 social security reform changed this. Age sixty-five now acts as the "pivotal age" for benefit computations. For each year of earlier retirement up to five, and provided that the appropriate conditions outlined in table 4.1 above are met, benefits will be reduced by 3.6 percent (in addition to the effect of fewer service years). The 1992 reform also introduced rewards for *later* retirement in a systematic way. For each year of retirement postponed past the minimum age indicated in table 4.1, the pension is increased by 6 percent in addition to the "natural" increase caused by number of service years.

Table 4.3 displays the retirement age–specific adjustments for a worker who has earnings that remain constant after age sixty. The table relates the retirement income for retirement at age sixty-five (normalized to 100 percent) to the retirement income for retirement at earlier or later ages and compares the implicit adjustments after 1972 with the total adjustments after the 1992 social security reform is fully phased in. As references, the table also displays the corresponding adjustments in the United States and actuarially fair adjustments at a 3 percent discount rate (see Börsch-Supan 1992).[20]

19. Curiously, before 1992 the German system provided a large increase in retirement benefits for work at ages sixty-six and sixty-seven. However, the incentive proved ineffective because it was far offset by the inducements to early retirement.

20. The actuarially fair adjustments equalize the expected social security wealth defined in app. B for a worker with an earnings history starting at age $S = 20$. A higher discount rate yields steeper adjustments.

Table 4.3   **Adjustment of Public Pensions by Retirement Age**

| | Pension as % of the Pension One Would Obtain Had One Retired at Age 65 | | | | |
| | Germany | | United States | | Actuarially Fair[e] |
Age	Pre-1992[a]	Post-1992[b]	Pre-1983[c]	Post-1983[d]	
62	100.0	89.2	80.0	77.8	80.5
63	100.0	92.8	86.7	85.2	86.3
64	100.0	96.4	94.4	92.6	92.8
65	100.0	100.0	100.0	100.0	100.0
66	107.2	106.0	103.0	105.6	108.1
67	114.4	112.0	106.0	111.1	117.2
68	114.4	118.0	109.0	120.0	127.4
69	114.4	124.0	112.0	128.9	139.1

Sources: Börsch-Supan (1992); and own calculations.

[a]Gesetzliche Rentenversicherung, 1972–92.

[b]Gesetzliche Rentenversicherung after 1992 reform has been fully phased in.

[c]Social security (OASDHI) until 1983.

[d]Social security (OASDHI) after 1983 social security reform has been fully phased in.

[e]Evaluated at a 3 percent discount rate, 1992/94 mortality risks of West German males, and an average increase in net pensions of 1 percent per year.

While neither the German nor the American system was actuarially fair prior to the reforms, the public retirement system in Germany as enacted in 1972 was particularly distorting. There was less economic incentive for Americans to retire before age sixty-five and only a small disincentive to retire later than age sixty-five after the 1983 reform, while the German social security system tilted the retirement decision heavily toward the earliest retirement age applicable. The 1992 reform diminished but did not abolish this incentive effect.

4.2.7 Related Social Security Programs

Until now, we have discussed *old age benefits.* Contributions to German retirement insurance also finance *disability benefits* to workers of all ages and *survivor benefits* to spouses and children.

In order to be eligible for *disability benefits,* a worker must pass one of the two earnings tests mentioned earlier for the old age disability pension. If the stricter earnings test is passed, full benefits are paid (Erwerbsunfähigkeits-rente, EU). If only the weaker earnings test is passed and some earnings capability remains, disability pensions before age sixty are only two-thirds of the applicable old age pension (Berufsunfähigkeitsrente, BU). In the 1970s and early 1980s, the German courts interpreted both rules very broadly, in particular the applicability of the first rule. Moreover, jurisdiction also overruled the earnings test (see below) for earnings during disability retirement. This lead to a share of EU-type disability pensions of more than 90 percent of all disability pensions. Because both rules were used to keep unemployment rates down, their generous interpretation has only recently led to stricter legislation.

Survivor pensions are paid at 60 percent of the husband's applicable pension if the spouse is age forty-five and over or if children are in the household (*große Witwenrente*); otherwise they are paid at 25 percent (*kleine Witwenrente*). Survivor benefits represent a large component of the public pension budget and of total pension wealth, as will be shown in section 4.3 below. Certain earnings tests apply if the surviving spouse has her own income, for example, her own pension. This is relevant only for a very small share of widows—fewer than 10 percent. Only recently have male and female survivors been treated equally. As mentioned above, the German system does not have a married couple supplement for spouses of beneficiaries. However, most wives acquire their own pension by active and passive contribution (mostly years of advanced education and years of child education).

4.2.8   Preretirement

In addition to benefits through the public pension system, transfer payments (mainly unemployment compensation) enable what is referred to as "preretirement." As was shown in figure 4.7 above, labor force exit before age sixty is frequent: about 45 percent of all men call themselves "retired" at age fifty-nine. Only about half of them retire because of disability; the other 50 percent make use of one of the many official and unofficial preretirement schemes.

Unemployment compensation has been used as preretirement income in an unofficial scheme that induced very early retirement. Before workers could enter the public pension system at age sixty, they were paid a negotiable combination of unemployment compensation and supplemental or severance pay. At age sixty, a pension of type E (see table 4.1 above) could be claimed. As the rules of pensions of type E and the duration of unemployment benefits changed, so did the "unofficial" retirement ages. Age fifty-six was particularly frequent in West Germany because unemployment compensation is paid up to three years for elderly workers; it is followed by the lower unemployment aid. Earlier retirement ages could be induced by paying the worker the difference between the last salary and non-means-tested unemployment compensation for three years and for further years the difference between the last salary and means-tested unemployment aid—all depending on the so-called social plan that a firm would negotiate with workers before restructuring the workforce.

In addition, early retirement at age fifty-eight was made possible under an official preretirement scheme (Vorruhestand), in which the employer received a subsidy from unemployment insurance if a younger employee was hired in his or her place. While the first (and unofficial) preretirement scheme was very popular and a convenient way to overcome the strict German labor laws, few employers used the second, official scheme.

4.2.9   Partial Retirement

The 1992 reform also introduced the concept of partial retirement. Partial retirement is possible at the one-third, half, and two-thirds levels. During par-

tial retirement, all rules and regulations apply in proportion, for example, benefits and earnings limits. For instance, if retired at the one-third level, the worker receives only one-third of the benefits, and only one-third of the earnings are applied to the earnings test. In fact, partial retirement is extremely rare.

4.2.10   Earnings Tests

Earnings tests apply only to early retirement (types B–E in table 4.1 above) and only for the time between early retirement and age sixty-five. Normal pensions (type A in table 4.1) are paid in full irrespective of other wage or nonwage income. To receive benefits before age sixty-five, one must pass the strict earnings test with a relatively small earnings limit (the minimum earnings threshold mentioned earlier, about 15 percent of average gross wages).

If the earnings limit is exceeded, the benefit reduction makes use of the somewhat complicated mechanism of partial retirement. As just mentioned, this case is very rare. For instance, if actual earnings are between two and three times the strict earnings limit, the worker will be considered one-third retired. Hence, the worker receives one-third of the benefits in addition to his or her other earnings. Earnings between 150 and 200 percent of the earnings limit permit the receipt of 50 percent of benefits, earnings between 100 and 150 percent of the earnings limit two-thirds of full benefits. After age sixty-five, the earnings tests no longer apply, and full benefits are paid irrespective of the type of pension.

4.2.11   Resulting Retirement Patterns

The regulations of the German pension system are perfectly reflected in the distribution of the ages at which workers receive a public pension for the first time, depicted in figure 4.11. There are essentially three ages for entry (as a beneficiary) into the German public pension system: sixty, sixty-three, and sixty-five. Very few people enter at other ages. This bundling is entirely created by the institutional provisions of the public pension system. By 1995, sixty had become the most popular entry age for male and female workers. For male workers sixty-three is the next important entry age, while for female workers it is sixty. There is no spike at age sixty-three because women may receive public pensions at age sixty unless they have a service life of fewer than fifteen years. This is unlike the pattern among male workers, who may receive a public pension at age sixty only if they are unemployed or disabled. In turn, there are more women receiving a public pension for the first time at age sixty-five because more women than men have short earnings histories.

Figure 4.12 displays an estimate of the related hazard rate, defined as new beneficiaries of the public pension system (from fig. 4.11) divided by the total number of workers in the labor force. Unfortunately, currently no reliable data exist with which to compute the number of "persons at risk" for a true hazard rate. While there are data on dependent workers who are currently employed and are eligible for public pension benefits, there is a large number of so-called
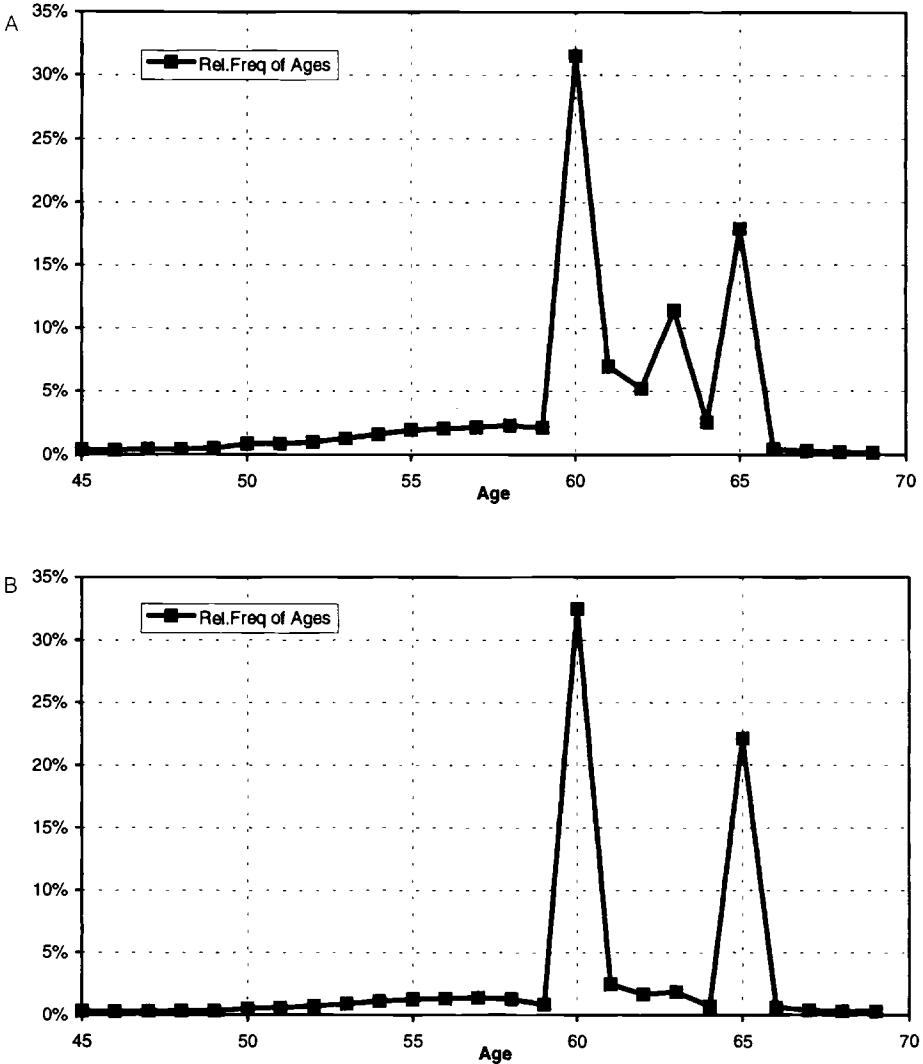
A

B

Fig. 4.11   Distribution of public pension retirement ages: *a*, males; *b*, females
Source: VdR data (complete enumeration of entries into retirement).
Note: Distribution of age of workers receiving benefits for the first time in 1995.

latently insured persons who have acquired some claim on public pensions.
Many of these persons will eventually receive a public pension. For example,
all self-employed persons who have served in the military as a conscript or
who have done an apprenticeship earlier in their career are technically
"insured." The problem is particularly severe for women; thus, we do not
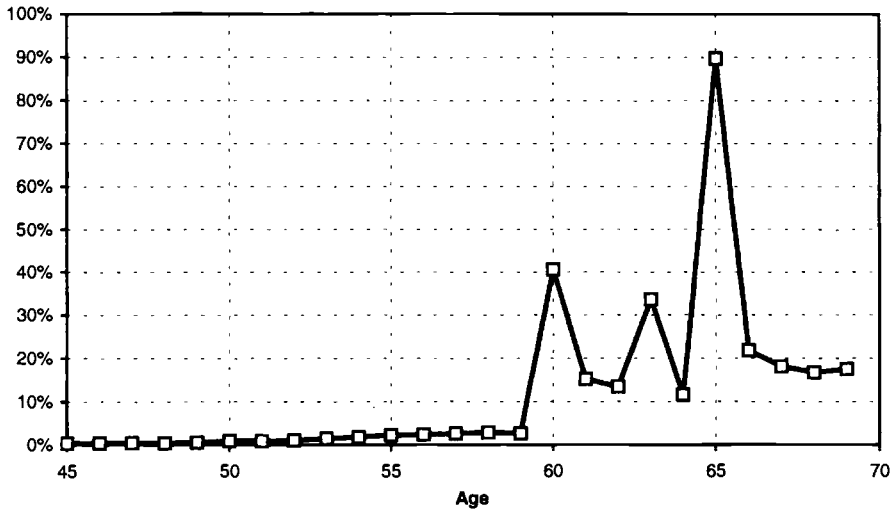display hazard rates for women. For men, our estimate in figure 4.12 shows

Fig. 4.12   Retirement hazard rates by age—males
Source: VdR data (complete enumeration of entries into retirement).
Note: Hazard rates have been estimated from the empirical distribution of males claiming retirement benefits (disability and old age) for the first time in the year 1995. Numbers (derived from flows) do not match perfectly with fig. 4.7 above, which is based on survey data on stocks.

three "spikes" at ages sixty, sixty-three, and sixty-five. Fifty percent of eligible males receive their first pension at age sixty; of those who continue to work until age sixty-three, 70 percent enter the public pension system at that age; virtually no one postpones entry into the public pension system beyond age sixty-five.

Figures 4.11 and 4.12 relate retirement to receiving a public pension for the first time. Figure 4.13 relates it to labor force exit. The figure displays the age distribution of labor force exits, together with the age distribution of public pension entries, on the basis of GSOEP survey data. Figure 4.13 shows that the spikes in public pension entry can be accounted for only partially by labor force exits. They are also partially due to "conversions" from other out-of-the-labor-market states (preretirement schemes) to public pensions. Preretirement has a spike at age fifty-six, as described above. Note that figure 4.13 corresponds to figure 4.7 above, which showed stocks rather than flows. The pattern of public pension entries in figure 4.13 is virtually the same as in figure 4.11, although the former is based on a sample, while the latter is a complete count of all new beneficiaries.

4.2.12   The Integration of East Germany

Since January 1992, Germany has a unified public pension system with the same replacement ratios and the same adjustment factors for new pensioners. This does not imply the same level of pensions, however, because the replace-
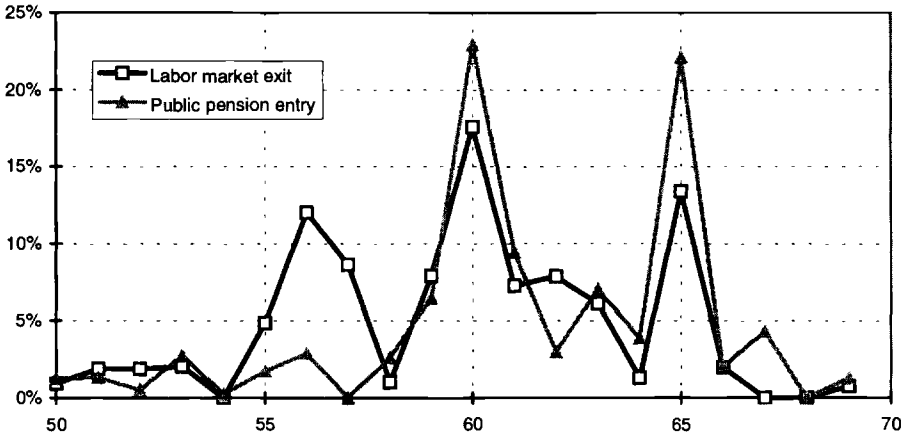
Fig. 4.13   Age distribution of labor force exit and public pension receipt—males
Sources: GSOEP 1993–95; own calculations.

ment rates refer to the relative wage level in either part of the country. Before January 1992, the situation is complicated by the transition of the old East German system to the West German one. Between 1990 and 1992, existing pensions in East Germany were revalued several times. In the rest of this section, we describe this process and briefly comment on some of the problems that arose during the transition process.[21]

The entire East German social security system was organized in one comprehensive institution (Sozialversicherung),[22] financed in equal parts by the state budget and by contributions from workers. This system had to be integrated into the western one, which consists of three independent institutions: social health, unemployment, and retirement insurance, each of which is separately financed by earnings-related contributions and only relatively modestly subsidized by the federal budget.

As opposed to the West German system described above, the comprehensive East German social security system aimed to reintegrate people into the labor force and to keep them working as long as possible. As a consequence, the relative position of pensioners in East Germany was poor by international standards, although most comparisons do not account for the high subsidy of everyday goods in the former East Germany.

The retirement system of the former East Germany included a mandatory and a voluntary part, which made the transition to the completely mandatory

21. For details of the transition, see Schmähl (1991, 1992).
22. More precisely, there were two institutions, the Sozialversicherung der Arbeiter und Angestellten and the Sozialversicherung bei der staatlichen Versicherung der DDR.

western system even more problematic. The mandatory part covered the first M 600 of income, about 45 percent of the average East German income. In 1971, a voluntary part of the public insurance was introduced (Freiwillige Zusatzrentenversicherung). In addition, there existed more than sixty supplementary insurance schemes for certain sectors (e.g., doctors, teachers, and—controversial after unification—the police, the army, and the intelligence service). Taking mandatory and voluntary insurance together, the typical replacement rate varied between 49.9 percent for workers retiring in 1970 and 62.7 percent for workers retiring in 1990.[23] Retirement age had been fixed at sixty for women and sixty-five for men.

As a result of the different supplementary insurance schemes, existing pensions in East Germany were partly higher, partly lower than they would have been had they been calculated under West German rules. The transition process involved two simultaneous changes. First, pensions had to be recalculated on the basis of the West German law. The level so obtained had to be revalued with respect to the currency exchange rate and the relative income standard in East Germany. These revaluations were governed by political, not economic, decisions. Pensions lower than their West German equivalents were immediately raised to the level in West Germany, at least to the level of social assistance. Pensions that were higher than their West German equivalents were reduced in a stepwise fashion to the level in West Germany. This reduction was achieved by at least partly excluding the workers involved from the general income increases in the process of wage and pension revaluation.

Taking both adjustments together, East German pensions on average increased by about 60 percent between mid-1990 and mid-1991, the first year after the introduction of the deutsche mark. The average pension in East Germany is now essentially equal to the West German average.[24] Only two-thirds of this increase was covered by payroll contributions, with the result that a considerable subsidy had to be paid out of the West German federal budget (Schmähl 1992).

At the same time, the fixed retirement age in the former East Germany was abolished in favor of the West German 1972 window rules, as described above. Moreover, special regulations to keep the statistical unemployment rate down (*Vorruhestandsregelungen*) were introduced, permitting retirement at age fifty-five in East Germany with a net replacement rate of about 65 percent.

23. Comparing standard workers with equal income and years of service (Schmähl 1992, table 1).

24. This is due to two compensating effects: average service life was much longer in East Germany (forty-seven years for men) than in West Germany (thirty-nine years for men); average earnings, however, were about 20 percent lower in the East. In addition, female labor force participation in the East was dramatically higher than in the West, raising the average pension for East German women to almost 30 percent above the pension for West German women.

4.3   Retirement Incentives: Accrual Rates of Pension Wealth

As emphasized in the previous section, German retirement insurance creates strong incentives to retire early. Postponing retirement by one year has two negative effects on social security wealth: the worker must give up one year of (net) pensions, and he must pay contributions of about 20 percent of his current gross earnings. On the other hand, postponing retirement raises pensions by 3.6 percent through the adjustment factor (after the 1992 reform has been fully phased in). This increase is less than the actuarially fair adjustment of between 6.5 and 8 percent per year (depending on the age of the worker), which is required to compensate for mere waiting. The additional year of contributions raises the future pension income profile and the expected value of survivor benefits by roughly one-fortieth.

The incentives to retire are conveniently expressed as accrual rates of social security wealth. *Accrual* is defined as the expected gain in social security wealth by postponing retirement one year. Accrual rates express the relative gain, that is, the accrual of postponing retirement one year relative to social security wealth in a given year. We define *social security wealth* as the expected net present value of social security benefits minus any contributions to the public pension system during the retirement window, here defined as the age range from fifty-five through seventy. Contributions before age fifty-five are sunk. All calculations use 1992/94 mortality tables, conditioned on survival until age fifty-five. In computing present discounted values, we use a 3 percent discount rate as a baseline. Precise definitions can be found in appendix B. As long as social security wealth accrual is positive, it is rational to postpone retirement unless labor/leisure preferences or similar considerations dominate the expected gain in social security wealth. Negative accrual rates from a certain age on are sufficient (although not necessary) for retirement at that age.

We use the benefit and contribution rules described in the previous section to compute pension wealth for synthetic income profiles of different types of households. Applying (historical or projected) contribution rates and limits, we compute the social security contributions of households in each year. Contributions are converted to relative contribution positions for each year and are accumulated over time. This yields the first element in the benefit formula, a life-cycle measure of relative contributions. Once the worker is eligible for retirement benefits, we multiply the relative contribution position by years of service and apply the adjustment factors of table 4.3 above. Finally, the personal pension base is multiplied by the average pension. We compute accrual rates of social security wealth from age fifty-five on, although—assuming that the worker does not apply for disability pensions—he will not be able to receive old age social security benefits at that age.

After 1996, we assume a real increase in average pensions equal to the (projected) real net wage increase.

Up to the year 1996, we use historical data on contributions, average wages,

and pensions. After 1996, we have to use projected real wage increases and projected social security contribution rates. In the basic scenario, net wages are assumed to grow by 1 percent annually in real terms,[25] and contributions are computed using the budget constraint of the pay-as-you-go system, based on the median demographic projection by the Federal Statistical Office of Germany.[26]

As a base case, we consider a married couple with a husband born in 1930 and a wife born in 1933.[27] We assume that the husband is the main income earner and that the wife is eligible for full survivor benefits.[28] Our base-case earnings history starts in 1950, when the worker has reached age twenty. In 1985, this worker is age fifty-five.[29] Our base-case worker has an average labor income history and an age-earnings profile that is increasing until age fifty-five.[30] Thus, the average earner is earning less than the average aggregate labor income in his early work life (72 percent at age twenty) and more than that later on (112 percent from age fifty-five). The average aggregate labor income is drawn from the GRV administration records. We also do the same calculation for workers with 0.7 and 1.77 times the average income, corresponding to the mean labor income of the lowest and the highest labor income decile.[31]

The accrual rates for the base case are displayed in figure 4.14 below. Figures 4.15–4.20 below compare the accrual rates of variations of the base case. In figure 4.14, we present accrual rates that would have prevailed had the 1972 law still been in place. We then show accrual rates for a 1 percent and a 6 percent discount rate. Then we vary mortality. In the high-mortality case, we multiply the probability that a person dies at each given age by 1.16 until survivor rates are zero; in the low-mortality case, we multiply by 0.84. Finally, we present accrual rates for the low- and high-income cases. Detailed numerical results are available on request.

Figure 4.14 shows the accrual rates for our base case, the average earner. It is a hypothetical case as we apply the social security rules as if the 1992 reform had been fully phased in. Before age sixty, the worker is not eligible for public pension benefits. Working a year longer at age fifty-five yields a pension that is one-thirty-fifth higher (one additional year of average earnings, relative to

25. The increase between 1985 and 1995 was 4 percent per year. In 1996, however, the increase was 0.5 percent.
26. Eighth coordinated population projection, medium scenario (see Sommer 1994).
27. Using the 1985–95 waves of the GSOEP, we estimated the average age difference—controlling for age and cohort effects—for this cohort to be approximately three years at retirement age.
28. The means test for survivor benefits is very weak. Only 10 percent of widows' own pensions fall above the means test, and only 40 percent of the amount exceeding the limit is deducted from the survivor benefit.
29. By choosing age twenty as the start of the worker's earnings history, we assume that the worker has accumulated enough years of service to qualify for type B ("flexible") early retirement up to five years before age sixty-five.
30. The earnings profiles have been estimated using the 1 percent sample from the West German social security records and are taken from Fitzenberger et al. (1995).
31. Based on the labor earnings distribution drawn from the 1995 GSOEP.

Fig. 4.14   Accrual rates of social security wealth (base case)

Note: Accrual of social security wealth when retiring one year later as percentage of net social security wealth (for a precise definition, see app. B). Figures 4.15–4.20 below display accrual rates for alternative simulations.

thirty-five years of past earnings history). At a 3 percent discount rate and about a 1 percent chance of dying at that age, accrual of expected social security wealth is slightly negative. At age sixty, the worker becomes eligible for pension benefits according to the 1992 reform, although at reduced benefits. Postponing retirement from age sixty to age sixty-one increases pensions by 3.6 percent. However, this is more than offset by a 3 percent discount rate, a chance of dying now of 1.5 percent, and a reduction of the length of retirement by about 5.5 percent (based on a life expectancy of 18.3 years at age sixty). With the increase in mortality risk, accrual rates become more and more negative until age sixty-five, the "normal retirement age." After age sixty-five, benefits are increased by 6 percent for each year of postponement. This raises the accrual rates dramatically. However, with the exception of postponing retirement from sixty-five to sixty-six, all further accrual rates remain negative.

Figure 4.14 clearly shows that the adjustments of pension benefits to retirement age established in the 1992 pension reform (see table 4.2 above) are not sufficient to offset the shorter period of retirement, the quickly increasing mortality risk, and the additional years of contributions.

Figure 4.15 compares the 1992 law with the regulations that applied between 1972 and 1992. Because the 1992 law will not be fully implemented until the year 2004, this simulation more closely represents the current retirement incentives. While the pattern is qualitatively similar to that in figure 4.14, all accrual rates are lower and negative. The magnitudes are relatively large: postponing retirement between the ages of sixty-two and sixty-five by one year corresponds to a loss of more than 6 percent. The 1972 law thus yields a very strong incentive to retire as early as possible. The 1992 reform did not do away
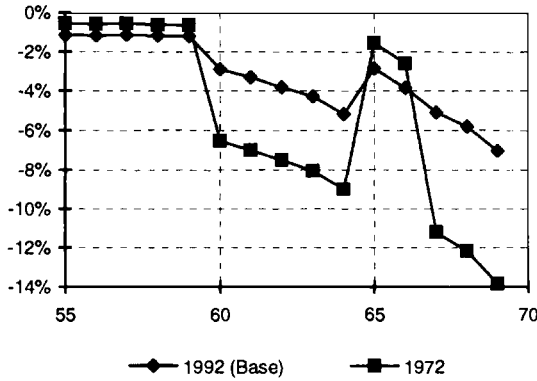
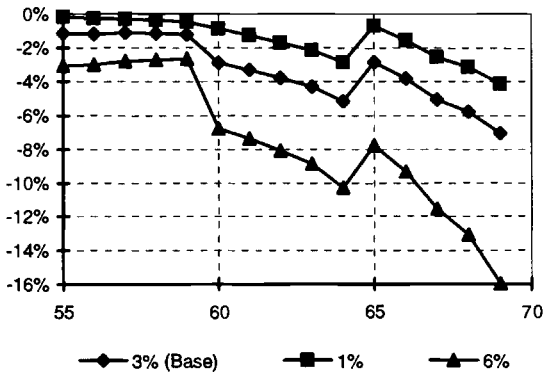**Fig. 4.15   1972 vs. 1992 legislation**

Fig. 4.16   Discount rates

with these incentives, although it substantially reduced them. Most significantly, accrual rates are still negative until age sixty-five. Hence, even the reformed system encourages workers to retire early.

A lower discount rate reduces the penalty of postponing retirement. Figure 4.16 displays this effect, based on the 1992 legislation. The incentive to postpone retirement before age sixty-five remains negative even at very small discount rates. With a high discount rate, the incentives to retire late are strongly negative throughout.

The sensitivity to mortality is similar and shown in figure 4.17. Lower mortality raises the accrual rates, while higher mortality lowers them. Even at very optimistic mortality assumptions, however, the incentives to postpone retirement between the ages of sixty and sixty-five remain negative.

Figure 4.18 changes the relative income position. Accrual rates are insensitive to income variations within the lowest and the highest deciles as they
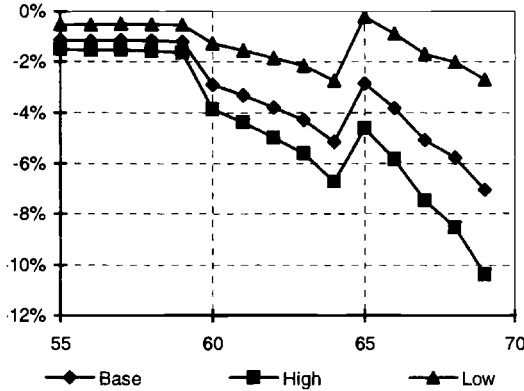
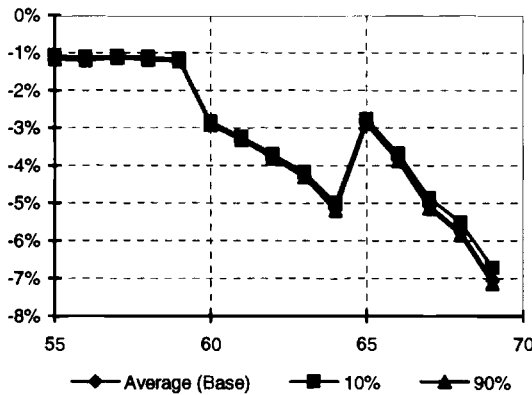**Fig. 4.17   Mortality**

Fig. 4.18   Income by percentile

change benefits and contributions in proportion. This is due to the condensed income distribution in Germany, where the lowest decile is represented by 30 percent less and the highest less than 80 percent more than the average labor income. The income redistribution mechanism in the form of a lower bound of the relative contribution position alters the accrual rates only for extremely low incomes, although the strong incentive effects to retire early remain essentially in place.

These negative incentive effects are even stronger for singles. Figure 4.19 varies marital status; single corresponds to a single male earner. The main reason for this sensitivity is the leverage added by survivor benefits. The younger the wife, the higher total expected benefits. The penalty for postponing retirement varies roughly in proportion to the sum of expected benefits. Hence, increasing the differences in the age of husband and spouse works like the decrease in mortality depicted in figure 4.17 above.
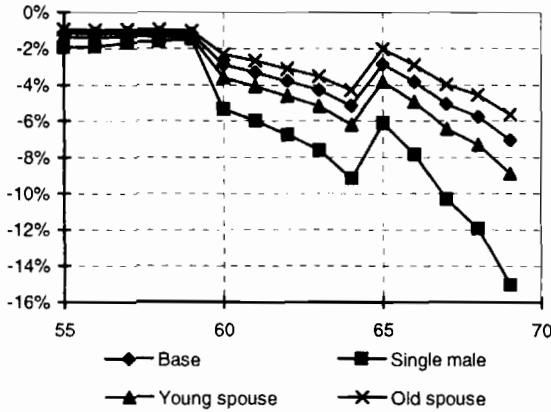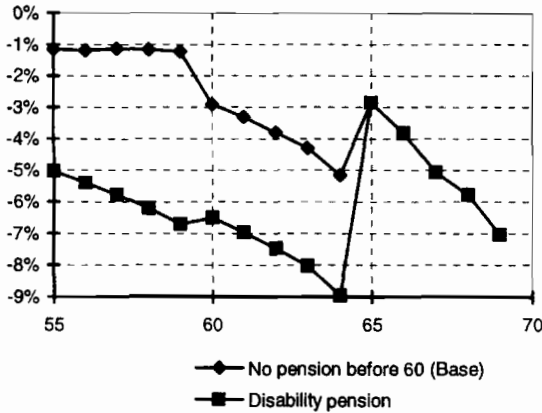
Fig. 4.19   Marital status

Fig. 4.20   Disability

Finally, figure 4.20 shows the difference between being able and not being able to claim disability benefits before age sixty. In the first case, benefits are not adjusted to retirement age at all. In addition, the earnings record is augmented by fictitious earnings of one-third of the preretirement average annual earnings for each year of disability until age sixty. Thus, the accrual rates are strongly negative, creating a strong incentive to seek disability status, for example, by invoking one of the labor market conditions described in section 4.2 above.

Figures 4.21–4.27 below translate social security wealth accrual into a more convenient metric: they relate the accrual of social security wealth by postponing retirement to projected earnings during postponement. If this accrual is positive, the workers of the same age remaining in the workforce subsidize
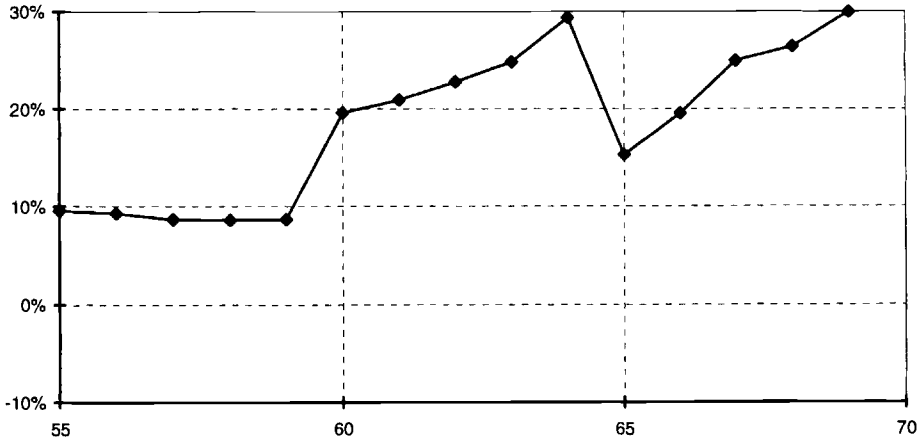
Fig. 4.21   Tax/subsidy rates (base case)
Note: Loss of social security wealth when retiring one year later as percentage of predicted earnings (for a precise definition, see app. B). Figures 4.22–4.27 below display tax rates for alternative simulations.
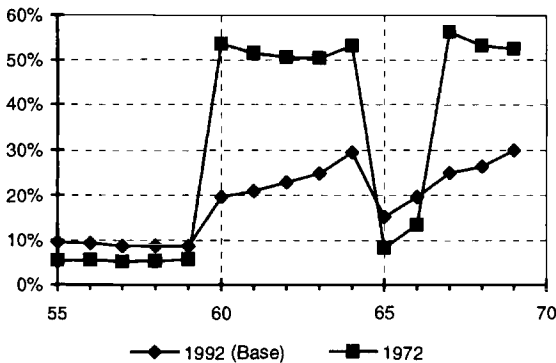

Fig. 4.22   1972 vs. 1992 legislation

those who have already retired. Figures 4.21–4.27 actually display negative accrual divided by projected earnings, hence the tax rate by which an additional year of work is taxed relative to a year of retirement.

As figure 4.21 shows, additional work is indeed taxed and at relatively high rates, reaching almost 30 percent at age sixty-four. Under the 1972 legislation, these implicit tax rates were even higher, exceeding 50 percent between age sixty and age sixty-four and again after age sixty-seven (see fig. 4.22). Tax rates are even positive before age sixty when a worker retires without receiving pension benefits until age sixty. This is because the increase in the pension that
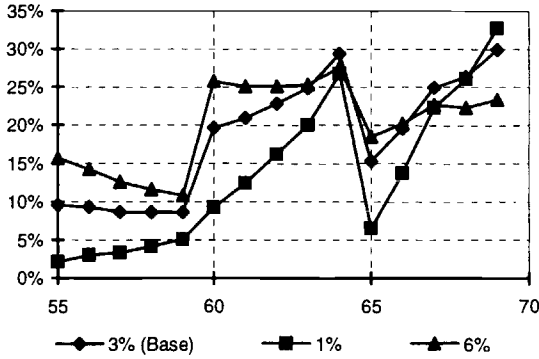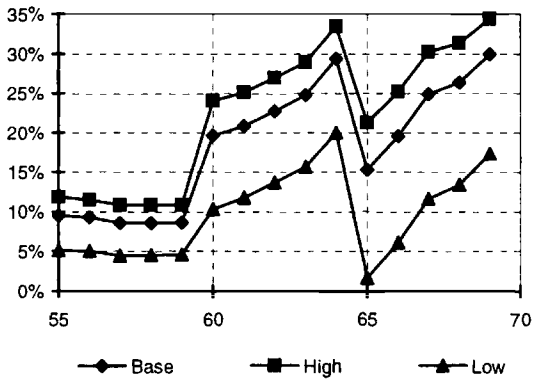
Fig. 4.23   Discount rates

Fig. 4.24   Mortality

the worker will eventually receive at age sixty is less than the loss in wealth due to the additional contributions.

Figures 4.23–4.26 show variations in the discount rate, mortality, income level, and marital status. They repeat the patterns already shown in the accrual rates. Postponing retirement is virtually always a bad economic proposition. Only under a very low discount rate, very low mortality, or a very large age differential between husband and spouse is the accrual of social security wealth between age sixty-five and age sixty-seven smaller than the projected earnings during this postponement period.

Finally, figure 4.27 shows the benefit of claiming disability status. In this case, the implicit tax rate on additional work exceeds 50 percent between the ages of fifty-five and sixty-four. The additional pension wealth gained by disability status is DM 148,000 (almost 2.5 years of average annual gross wages).
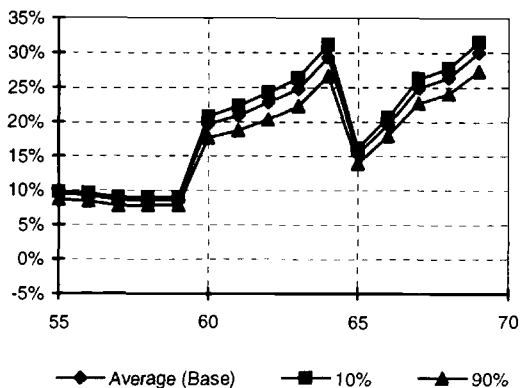
Fig. 4.25   Income by percentile

Fig. 4.26   Marital status

These simulations show quite clearly that retirement incentives are strong in Germany. The following section looks at the actual evidence in Germany.

4.4   Effects of Social Security on Retirement: Evidence in Germany

The German retirement patterns depicted in section 4.1 above, and the spikes in the hazards to retire visible in figures 4.11 and 4.13 above, suggest a strong relation to the provisions of the German retirement system that were described in the previous section, specifically, to the lack of actuarial adjustment of benefits to the various forms of early retirement. This section collects further evidence in this direction. We first look at the few "natural experi-
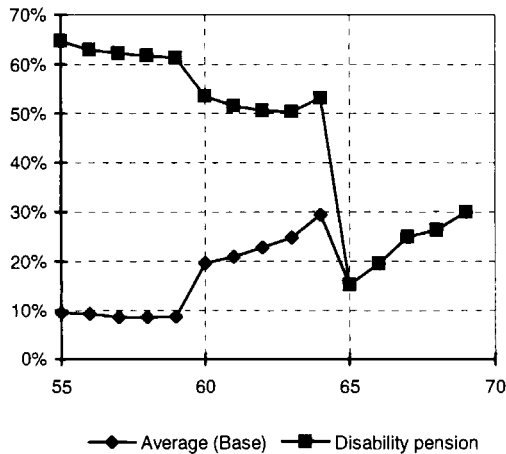
Fig. 4.27   Disability

ments" that have taken place in the German retirement system: the 1972 social security reform, subsequent modifications in particular of the requirements to claim disability benefits, and the transition in East Germany to the West German pension system. We then summarize the evidence from the available microeconometric studies of the German pension system.

The sharp decline in labor force participation between 1970 and 1980, which was depicted in figure 4.1 above, is associated with a steep decline in the average retirement age, defined as the average age of all new social security claimants in a given year. Figure 4.28 plots the average retirement age against the time axis. It shows clearly the effects of the introduction of early retirement at full benefits that were introduced in the 1972 German social security reform. The reform was enacted in the beginning of 1973. Retirement age declines sharply from age 63 to age 58.5 after 1973. The spike in 1973 is due to a composition effect: the average retirement age within both categories of retirement dropped significantly (from 57.8 to 57.1 for disability and from 65.1 to 64.5 for old age retirement). At the same time, the number of old age retirements increased in absolute numbers and relative to disability retirement due to the introduction of early retirement at age sixty-three without a health test.

Also, this new possibility to retire early initially substituted for claiming disability. As figure 4.29 shows, disability is one of the major pathways to retirement in Germany.[32] Note that figure 4.29 distinguishes two kinds of disability: disability claims before and after age sixty. In 1972, immediately before the pension reform, about 50 percent of all new retirees claimed disability. This percentage dropped by almost 15 percent in the single year after the 1972 reform. Claims for disability benefits then began increasing again and peaked

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32. The notion of "pathways" to retirement is borrowed from Jacobs, Kohli, and Rein (1990).
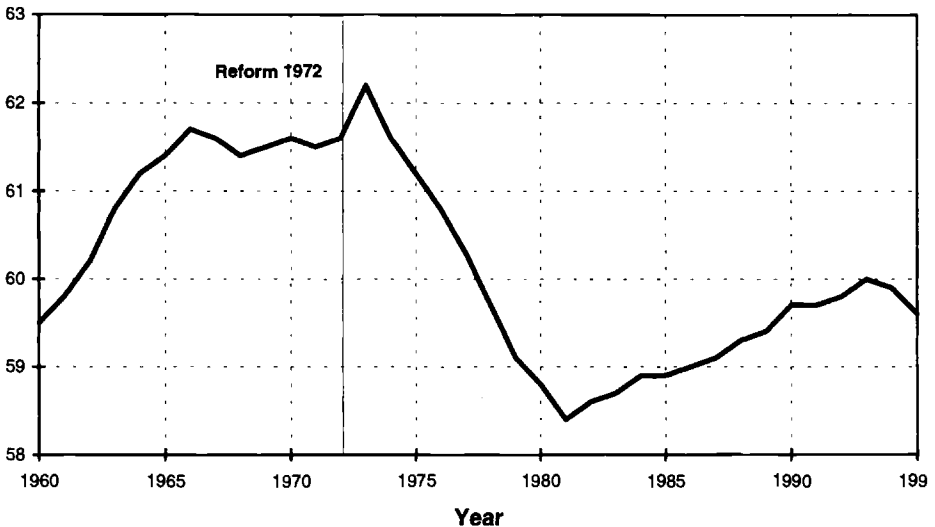
Fig. 4.28   Average retirement ages—West German men
Source: VdR (1997).
Note: Average age of retirement in given year (disability and old age). The spike in 1973 is due to a composition effect: the 1972 reform introduced retirement at age 63, which increased dramatically the number of old age retirements relative to disability retirements. At the same time, average retirement age dropped in both old age and disability retirements.

in 1981, when more than 70 percent of new retirees used one of the two disability pathways. From 1981 on, the requirements for disability benefits were made gradually tighter, and the proportion of disability claimants declined to some 45 percent in 1995.

The other pathways to retirement include an increasing share of early retirement due to unemployment. Because of an increase in interrupted earnings histories, the share of "normal" retirees at age sixty-five also increased since the mid-1980s.

Figure 4.30 presents a closer look at the effects of the 1972 pension reform. It shows most clearly the change in the frequency of specific retirement ages chosen. The introduction of the window replaced the almost universal retirement age of sixty-five before 1972 by an almost even split between age sixty-three and age sixty-five within the first years after the reform. By 1980, sixty became the most frequent age of retirement.

The patterns in figures 4.28 and 4.29 above suggest a causal relation between retirement incentives and behavior. More formal econometric analyses were carried out by Börsch-Supan (1992), Schmidt (1995), and Börsch-Supan and Schmidt (in press). These studies used microeconometric option value analyses to compute the incentive effects of the nonactuarial adjustment of benefits in the German social security system on early retirement. The option value of

Fig. 4.29   Pathways to retirement—males
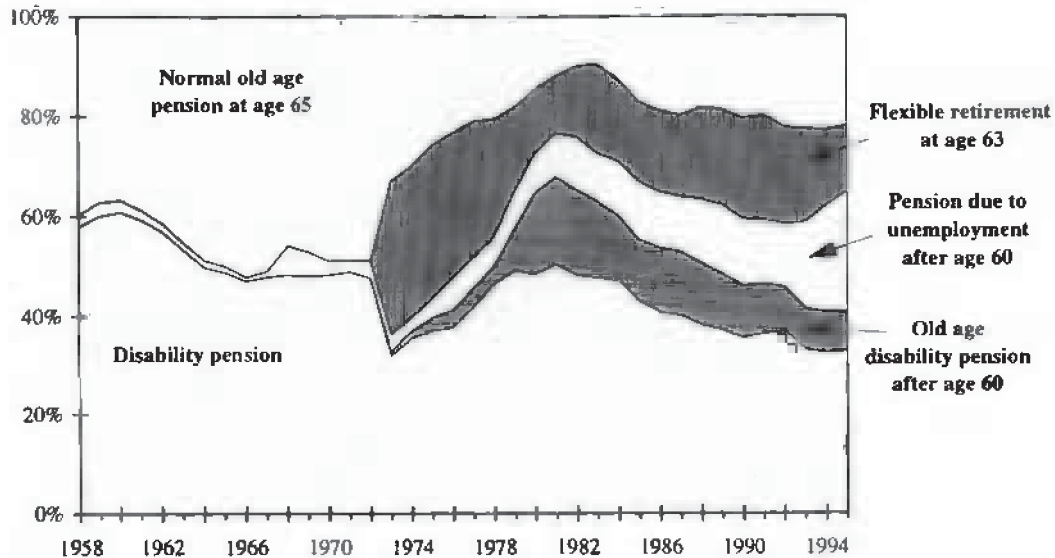
Source: VdR (1997).

Note: Share of new entries into public pension and disability insurance.
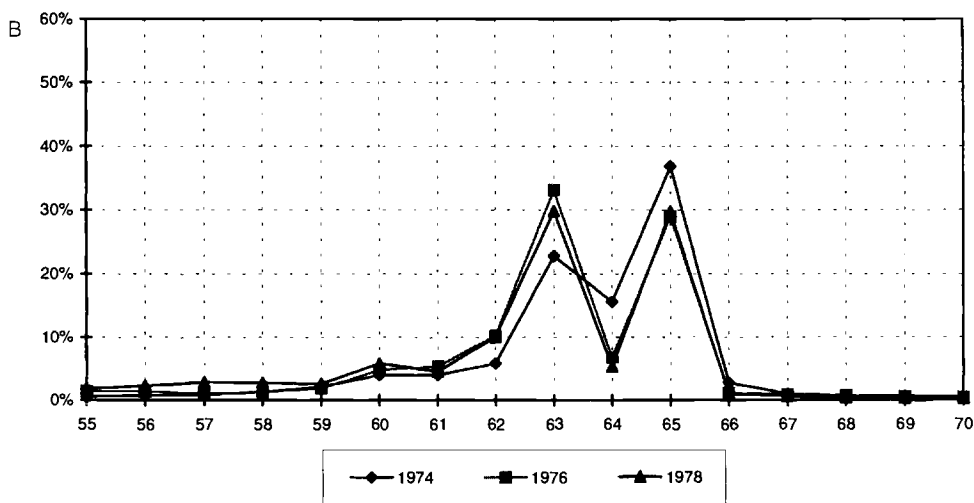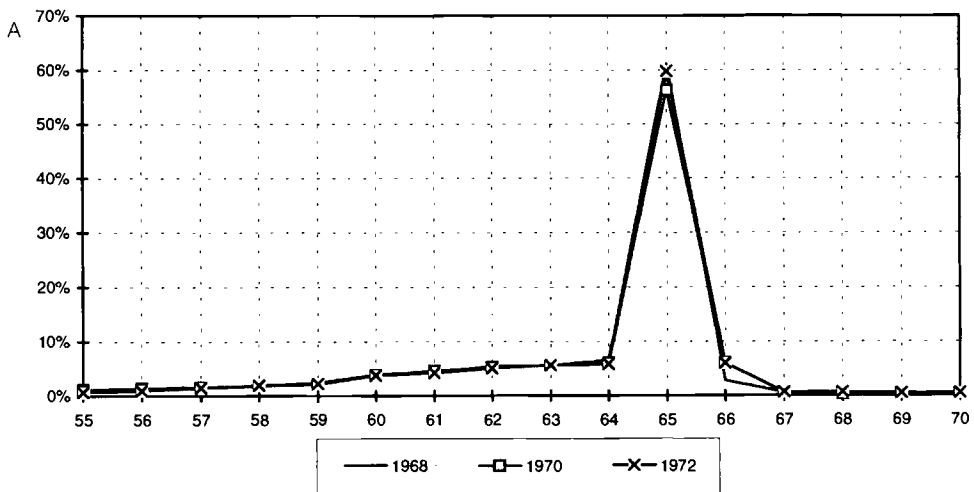
Fig. 4.30 Distribution of retirement ages: *a,* **before the 1972 reform;** *b,* **after the 1972 reform;** *c,* **1970–80**

Source: VdR Rentzugangsstatistik (white-collar workers, male).

Note: After 1980, the distribution of retirement ages remained relatively stable.
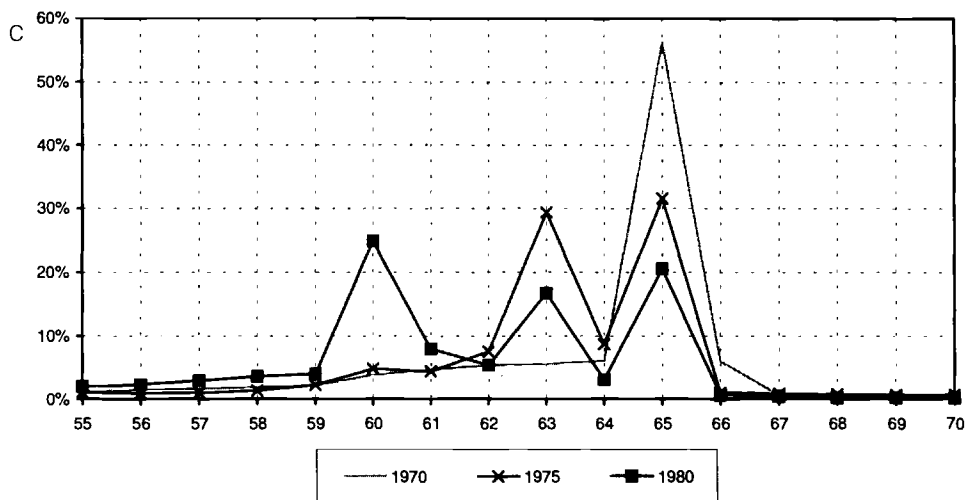
C

Fig. 4.30 (cont.)   Distribution of retirement ages

postponing retirement is computed according to Stock and Wise (1990) and inserted as an independent variable in a binary logit regression of labor force participation (Börsch-Supan 1992) and various hazard models of the retirement age (Schmidt 1995; Börsch-Supan and Schmidt, in press). The models are applied to West and East German panel data (GSOEP 1984–90 in West Germany, GSOEP 1990–92 in East Germany).

Both methodologies produce almost identical results. The option value has strong predictive power; its coefficient is highly significant and large. The authors use these results in several micro-simulation models to predict retirement ages under alternative retirement age–dependent adjustment formulas. For each sample person, the option value is changed from its actual value to the value that results from inserting alternative adjustment factors in the pension computation formula (see table 4.3 above).

Table 4.4 summarizes the results in terms of average retirement ages and the percentage taking very early retirement (before age sixty). The first row gives the baseline retirement age under the old German public pension system as observed in 1984. The low average retirement age is due to (physical and economic) disability retirement. The second row predicts the effects of the 1992 German social security reform. This reform will remove some, but by no means all, of the distortions toward early retirement when it is finally fully implemented in 2004. It will increase the average retirement age by about half a year. The micro simulation also reveals that retirement before age sixty is reduced from 32.2 to 28.2 percent.

Table 4.4   Simulated Retirement Age and Early Retirement

	Mean Retirement Age	Early Retirement (%) (retirement age < 60)
System before 1992 reform	58.5	32.2
After 1992 reform	59.0	28.2
Nondistorting system	60.6	17.8

Sources: Börsch-Supan (1992); and Börsch-Supan and Schmidt (in press).

The third row shows the effect of switching to a nondistorting system with adjustment factors computed for the discount rate estimated in the retirement probability model (see table 4.3 above). The simulation reveals a strong reaction to this change in the social security system. A nondistorting system would shift the retirement age by more than two years. The effects of a nondistorting system are most powerful in the reduction of early retirement, that is, retirement before the official window period. Retirement at ages fifty-nine and below would drop from the current 32.2 percent to 17.8 percent.

Riphahn (1995) has analyzed the disability provisions of the German retirement insurance system and found strong incentive effects. While she used a small data set derived from the German panel (GSOEP), she confirms the aggregate time-series results of Jacobs, Kohli, and Rein (1990) that show that the proportion of disability pensions varied strongly and positively with the generosity of the disability provisions.

Riphahn and Schmidt (1995) and Jacobs, Kohli, and Rein (1987) attempt to disentangle labor supply from labor demand effects, using aggregate data. While the results obtained by Jacobs, Kohli, and Rein are not fully conclusive, the analysis by Riphahn and Schmidt shows a dominance of supply effects, largely introduced by the incentives of an actuarially unfair pension formula.

Finally, unification provided another "natural experiment" to identify the incentive effects of the German retirement system. The introduction of the deutsche mark at a one-to-one exchange rate resulted in a massive increase in unit labor cost in East Germany, leading to a dramatic decrease in labor demand. The result was huge unemployment. In addition, labor force participation decreased sharply across all ages, but particularly so for ages fifty and over (table 4.5A). Rates of transition into early retirement were exceptionally high: around five times as high as in the western part of the country (table 4.5B). This resulted in a mean retirement age in East Germany more than three years younger than in West Germany (table 4.5C).

Most of this early retirement appears to have been induced by the very generous early retirement provisions in East Germany mentioned at the end of section 4.2 above. Börsch-Supan and Schmidt (in press) investigate the magnitude of this inducement effect. Their paper uses the methodology mentioned earlier in this section: for a large sample of West and East German workers,

Table 4.5   **Labor Force Transition in East Germany**

A. The Rapid Decline in Labor Force Participation in East Germany (%)

	1990	1991	1992
Full-time employed	56.9	44.5	37.4
Not in labor force	33.6	48.3	59.1
Observations	3,764	3,456	3,328

B. Transitions out of the Labor Force in East and West Germany

	West Germany, 1984–90			East Germany, 1990–92		
	Male	Female	Total	Male	Female	Total
Initially in labor force	1,589	780	2,369	483	482	965
Transitions per year	65.3	46.9	101.3	95.0	105.0	200.5
Transitions rate (%)	4.1	6.0	4.3	19	21	20.0

C. Mean Age at Labor Force Exit, 1984–90

	Men	Women	Total
East Germany	55.4	56.3	55.8
West Germany	58.3	56.5	57.7

Sources: Börsch-Supan and Schmidt (in press); 1990–92 waves of the East German SOEP based on all panel members of age forty-four and above in 1990.

the paper computes the option value of postponing retirement and inserts this value alongside other sociodemographic variables in a hazard model of retirement. In spite of the even greater generosity of early retirement provisions and the very different circumstances in East Germany, the authors estimate strikingly similar effects of the retirement incentives as measured by the respective coefficients of the option values in the East and West German regressions. Hence, *conditional on the different incentives* in East and West Germany, the response to these incentives is rather similar and very strong in both parts of the country.

4.5 Outlook

The responsiveness of the choice of retirement age to the incentives offered by the pension system has strong policy implications. Not only does the public pension system in Germany dispense with using the retirement age–dependent adjustments as policy instruments for balancing the budget of the pension system, but it even yields incentives that work against this because the adjustments are not actuarially fair. Rather than rewarding later retirement to moderate the labor supply disincentives created by rapidly rising social security taxes, social security regulations in Germany have encouraged early retirement, thus aggra-

vating the imbalance between the number of workers and pensioners in times of population aging.

The 1992 German social security reform will only moderately remove some of these distortions when fully phased in (in 2004). It is predicted to increase the average retirement age by only about half a year. A truly age-neutral system would shift the retirement age by up to four times as much.

The renewed social security debate in Germany, only a few years after the most recent reform, focuses on further changes in the benefit structure and applicable retirement ages. Major changes, such as a transition from the current pay-as-you-go system to a partially or fully funded system, are not seriously debated among government officials. While such considerations as meeting the Maastricht criteria and reducing the high unemployment rate dominate the current social security debate in Germany, one should keep in mind that changing the retirement system later will become more complicated by the change in the politics of the social security system: the political power will shift from the working population to the retired population, that is, to an electorate that is unlikely substantially to change the balance between per capita benefits and contributions.

Appendix A
Data Sources

Mikrozensus

Since 1957, the Federal Statistical Office conducts a yearly survey called the Mikrozensus (MZ), which is comparable to the American Current Population Survey. The MZ is the main source of official population and labor market statistics in Germany.

The MZ is a 1 percent random sample of the residential population in Germany, stratified by regional variables (state, size of city/county, etc.). The primary sampling units are households. All household members age sixteen and older are personally interviewed. Before German unification, sample size was approximately 250,000 households and 600,000 persons. The questionnaire is regulated by federal law and includes information on demographics, household structure, labor market status, and sources of income. Unfortunately, until very recently, access to the raw data was extremely limited owing to restrictive data protection regulations. The latest versions are now available as public-use files on submission of a research proposal to the Federal Statistical Office in Wiesbaden.

The Federal Statistical Office publishes extensive tabulations of results based on the MZ and also conducts specific analyses on request (analyses for which it charges). Our historical data are based on publications of the Federal

Statistical Office: the statistical yearbooks and the more detailed series called *Fachserien.*

Verband deutscher Rentenversicherungsträger Data

The Verband deutscher Rentenversicherungsträger (VdR) is a federal institution that represents the twenty-three social security agencies of the German states (Landesversicherungsanstalten), the federally organized social security branch for white-collar workers (Bundesversicherungsanstalt für Angestellte), and some occupation-specific organizations (e.g., the mining industry). By federal law, one of the tasks of the VdR is to provide statistics on the German social security system.

The VdR data on social security pensions include all employees who are enrolled in the public pension system (as contributors and as beneficiaries) and are based on the individual social security accounts and the payments of pensions through the postal service (Deutsche Post AG, formerly Deutsche Bundespost). Each individual record consists of some hundred variables, such as demographic information, complete contribution history, years of service, retirement age, type of pension, and pension income. These data are not available to researchers outside the VdR. The VdR publishes for each year tabulations of stock and flow data on pensions and retirement. Our hazard rates of retirement are based on the VdR publications on retirement (by age) and on the number of employees covered by the social security system (by age).

Unfortunately, the number of persons retiring also includes persons who were self-employed or not working previous to retirement. This reduces the value of the VdR data in computing retirement hazard rates. Almost every German has a social security record and thus some ("latent") pension claims that will eventually lead to some pension payments. Women often change from an "out-of-labor-market status" into retirement. Thus, one cannot calculate reliable hazard rates without knowing the labor force status before retirement for women. The bias of hazard rates for men is less severe because the number of self-employed men is small and one can correct the number of males in the labor force by using the Mikrozensus data.

The available VdR data have no intertemporal links. Hence, one cannot identify where a new entrant into the public pension system comes from. We use the GSOEP data to link labor force exit with public pension entry.

Publications by the Department of Labor and Social Affairs

The German Department of Labor and Social Affairs (Bundesministerium für Arbeit und Sozialordnung, BMAS) publishes historical data on the German public pension system. These include contribution rates, contribution limits, average earnings, average pension, net and gross replacement rates, the volume of contributions and benefits by type of pension, and the number of contributors and beneficiaries. These data are contained in several publications that are available on request (BMAS 1990, 1996a, 1996b).

The German Socio-Economic Panel

The German Socio-Economic Panel (GSOEP) is an annual panel study of some six thousand households and some fifteen thousand individuals. Its design closely corresponds to the U.S. Panel Study of Income Dynamics (PSID). The panel was begun in 1984; twelve waves were available in 1997. Response rates and panel mortality are comparable to the PSID. The GSOEP data provide a detailed account of income and employment status. The data are used extensively in Germany, and increasing interest in the United States prompted the construction of an English-language user file available from Richard Burkhauser and his associates at Syracuse University. Burkhauser (1991) reports on the usefulness of the German panel data and provides English-language code books as well as an internationally accessible GSOEP version.

Already in 1990, the West German panel was augmented by an East German sample. This permitted a fascinating account of the transition in East Germany.

The sample size of GSOEP waves is considerably smaller than that of the MZ waves or the VdR enumerations. The GSOEP analyses in this paper are based on cells by age and gender that contain roughly three to four hundred persons aged forty-five to sixty, roughly two to three hundred persons aged sixty to sixty-seven (male) and sixty to seventy-two (female), and otherwise roughly one to two hundred persons.

Appendix B
Computation of Social Security Wealth

Social security wealth is defined as expected present discounted value of benefits minus applicable contributions. Seen from the perspective of a worker who is S years old and plans to retire at age R, social security wealth (SSW) is computed as follows:

$$\text{SSW}_s(R) = \sum_{t=R}^{\infty} \text{YPEN}_t(R) \cdot a(s)_t \cdot \delta^{t-S} - \sum_{t=S}^{R-1} c_t \cdot \text{YLAB}_t \cdot a(s)_t \cdot \delta^{t-S},$$

where SSW = present discounted value of retirement benefits (= social security wealth); S = planning age; R = retirement age; YLAB_t = labor income at age t; $\text{YPEN}_t(R)$ = pension income at age t for retirement at age R; c_t = contribution rate to pension system at age t; $a(s)_t$ = probability of surviving at least until age t given survival until age S; and δ = discount factor = $1/(1 + r)$.

The calculations for a couple are more complicated. They include benefits for the surviving spouse, weighted by the survival probability of the spouse.

For a formal description, see Diamond and Gruber, chap. 11 in this volume, app.).

The accrual rate of social security wealth between age $t - 1$ and age t is defined as

$$ACCR_{55}(t) = [SSW_{55}(t) - SSW_{55}(t - 1)] / SSW_{55}(t - 1).$$

Note that these rates are computed from the perspective of a fifty-five-year-old worker ($S = 55$).

Replacement rate denotes the ratio of the pension (YPEN) that the worker would receive if he would retire at that age to the approximate net wages (YLAB^{NET}) he would earn if he would postpone retirement. Note that the mortality risk does not enter this calculation:

$$REPL(t) = YPEN_t(t) / YLAB_t^{NET}.$$

Tax rate refers to the ratio of the negative social security wealth (SSW) accrual to the approximate net wages (YLAB^{NET}) that the worker would earn if he would postpone retirement. Note that SSW is an expected present value including discounting and mortality risk and that YLAB ignores the probability that the worker could die before age seventy:

$$TAXR(t) = -[SSW_{55}(t) - SSW_{55}(t - 1)] / YLAB_t^{NET}.$$

A negative tax rate represents a "subsidy" to the pensioner.

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