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# SOCIAL SECURITY AND RETIREMENT IN GERMANY

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## ABSTRACT

This paper describes the German public old age social security program („*Gesetzliche Rentenversicherung*") and its incentive effects on retirement decisions. The paper presents the key features of the system and expresses retirement incentives in the form of accrual rates of social security wealth and implicit tax rates on earnings. It summarizes labor market behavior of older persons in Germany during the last 35 years and surveys the empirical literature on the effects of the social security system on retirement in Germany.

The paper shows that even after the 1992 reform the German system is actuarially unfair. This generates a substantial redistribution from late to early retirees and creates incentives to early retirement. Indeed, average retirement age is very low in West Germany (about age 59) and even lower in East Germany. This tendency towards early retirement is particularly hurting in times of population aging when the German social security contribution rate is expected to increase dramatically and will substantially exceed the rates in other industrialized countries.

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## Introduction

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 U.S. Social security income represents about 80 percent of household income of households headed by a person aged 65 and over.

The German social security system (the „Gesetzliche Rentenversicherung" and its equivalents[1]) is large because it is mandatory for every worker except for the self-employed and those with very small 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 pre-retirement net earnings for a worker with a 45-year earnings history and average life-time earnings.[2] This is substantially higher than, e.g., 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 beneficiaries. Average retirement age is very low in West Germany (about age 59) and even lower in East Germany.[4] The prevalence of early retirement comes in addition to an already rather old population and has contributed to a significantly higher ratio of pensioners to workers than in other countries. 100 German

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1 E.g., the retirement system of civil servants.

2 This replacement rate is defined as the current pension of a retiree with a 45-year average earnings history divided by the current average earnings of all dependently employed workers. This is different from the „replacement rate" in the appendix table. It is also different from the replacement rate relative to the most recent earnings of a retiring worker that are usually higher than the life-time average.

3 Using the same replacement rate concept as in footnote 2.

4 Average retirement age in a given year is the average age of those workers receiving public pension income for the first time.

The tendency towards early retirement is particularly hurting in times of population aging. The proportion of persons aged 60 and older will increase from 21 percent in 1995 to 36 percent in the year 2035, when population aging will peak. 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 to substantially exceed the rates in other industrialized countries. While in 1997 at about 20 percent of gross income,[6] even conservative estimates put the contribution rate significantly above 30 percent of gross income at the peak of population aging if the current system and the current retirement behavior remain as they are. Population aging will dramatically reduce the rate of return of the German retirement system. Estimations vary by the way benefits and contributions will be adjusted; they will be negative for all cohorts born after about 1970.[7] 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?

The purpose of this paper is a descriptive analysis of the incentive effects of the German old age social security system on retirement decisions. We do so in four parts. In part I, we summarize labor market behavior of older German men and women between 1960 and now. In part II, we provide a general description of the German public pension system. In part III, we conduct a detailed analysis of retirement incentives. Specifically, we compute accrual rates of social security wealth and show that they have actually been negative for those who have not retired early. In part IV, 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 findings and conclude.

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6 Since 1.1.1997, the total contribution rate is 20.3 percent. 10.15 percent are deducted from employees' gross pay, another 10.15 percent are paid by the employer.

7 See Börsch-Supan (1997), Schnabel (1997).

## Part I: 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, and then more closely investigate labor market status and retirement patterns in the early 1990s.

As will be explained later in Section II, we include in the public pension system all branches of the „Gesetzliche Rentenversicherung" (i.e., blue collar, white collar, and mining), and in addition the separate retirement system of civil servants. We distinguish old age, disability, and survivor benefits within the public pension system.

Data for the historical trends comes 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 has 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 1.

### *Historical Trends*

Germany shares the rapid decrease of old age labor force participation with most other industrialized countries (figure 1).[8] This decrease accelerated after 1970. In section IV, we will 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 above 50, and increasingly so for older persons. Female labor force participation increased for all ages below 60. The increase for the age range from 50 to 59 is noteworthy because it contrasts to the decline in male labor force participation due to a high share of disability claims among male workers.

**Figure I–1: Male and female labor force participation rates**

[8] Tables for all figures in this paper are available upon request.

The German public pension system is mandatory for every worker except the self-employed and those with very low earnings (see part II below). Hence, coverage by the public pension system is high and has steadily increased from 77 percent in 1960 until it reached a plateau around 1980 at almost 90 percent (figure 2). The increase in the 1960s and 1970s stemmed from the declining share of 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.

**Figure I–2: Share of workers covered by the German public pension system**

In accordance with coverage, also the number of beneficiaries increased sharply from 1960 to 1995 (figure 3). Among those age 55 years and older, 85 percent received pensions from the public system in 1995 while this share was only little above 50 percent in 1960. Figure 3 distinguishes three kinds of pensions: old age and disability pensions due to contributions out of own earnings, and survivor pensions. Most of those who receive a public pension receive an old age pension. Disability benefits have been rising particularly fast in the early 1980s until more stringent requirements were put in place. Survivor benefits remained about steady.

**Figure I–3: Share of persons aged 55 and older receiving public pension benefits**

The replacement rate of the German public pension system is very generous. It increased from 63 percent in 1960 to 72 percent now (figure 4). Note that the replacement rate varied in the short term as indexation to gross wages (more recently, net wages) has not been automatic but was 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.

**Figure I–4: Replacement rate of the German public pension system**

*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 German Socio-Economic Panel (GSOEP). The data cover some 17,000 persons annually in East and West Germany. We also use VdR data for the number of beneficiaries of the public pension system.

Figure 5 shows the rapid decline in labor force participation around the age of 60 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 56 (male only), 60, and 65. By the age of 66, male labor force participation has dropped below 7.5 percent.

**Figure I–5: Labor force participation rates by age and sex**

Figure 6 looks more closely at the employment status of male and female in Germany. Employment status is defined as actual occupation. „Retired" in this figure refers to persons who call themselves retired independent of whether they receive some kind of pension. They include disabled persons and persons having retired before being eligible for public pensions. „Unemployed" refers to registered unemployed who are still seeking to work. Unemployment increases with age and peeks immediately before age 60. The „unemployed" category does not include those who receive unemployment benefits but are actually retired. As will be explained in section II, unemployment is one of the many pathways to early retirement, and has been encouraged by government in official and even more so in unofficial „pre-retirement" schemes („*Vorruhestand*").

**Figure I–6: Labor force status by age and sex**

Figure 7 links the labor force status of figure 6 with the receipt of public pensions. After age 55, a substantial number of workers goes into early retirement without receiving a public pension (old age or disability pension). These are the above mentioned workers who receive some combination of unemployment benefits and severance pay under several pre-retirement schemes. Eventually, by the age of 65, almost all male and most female pre-retirees will

receive a public pension. Pre-retirement is high: it peaks between ages 56 and 59 at 20 percent for men and 25 percent for women.

**Figure I–7: Labor force status and receipt of public pension by age and sex**

Figure 8 yields a closer look at the different kinds of public pensions that were displayed in the preceding figure. About 95 percent of German elderly men and 85 percent of women receive public old age and disability pension benefits due to their own contributions from earnings. In addition, a large share of women (strongly increasing with age, peaking at 60 percent for women aged 75 and older) and a small share of men receive survivor benefits.

Benefits before age 60 are disability benefits. These disability pensions are converted between ages 60 and 65 to old age pensions. The sharp increase in beneficiaries between ages 60 and 65 mirrors the rapid decline in labor force participation at that age, as we have seen in figure 7. The sharp decline of own pensions among women aged 75 and older is not a true age effect. Rather, the decline reflects a cohort effect because female workers aged 75 and more had a very low labor force participation.

**Figure I–8: Recipients of public pensions by age and sex**

About a quarter of the male elderly (aged 65 plus) receive private firm pensions (figure 9). This pension comes generally in addition to the public pensions depicted in figure 8. The share is low relative to Anglo-Saxon standards, and it is even smaller for 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 9 therefore displays strong cohort effects in addition to true age effects.

**Figure I–9: Recipients of private pension income by age and sex**

In addition to the relatively small number of persons who receive private firm pensions, firm pensions are also relatively low. They make up for less than 5 percent of total retirement income among elderly households while the bulk is provided for by public pensions (about 80

percent). This is visible in figure 10. Private asset income also plays a much smaller role than in the Anglo-Saxon countries and never exceeds 10 percent on average at any age.

**Figure I–10: Source of household income by age of householder**

## Part II: Key Features of the German Pension System

*History of the German retirement insurance*

Germany has the oldest formal social security system, introduced 1889 by Chancellor Bismarck. Originally a fully funded disability insurance, it became a mandatory retirement insurance (*„Gesetzliche Rentenversicherung*", abbreviated 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 70s, the German system evolved to one of the most generous pension systems in the world both in terms of 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 generosity.

As opposed to 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 work life also into the time after retirement.[9] Public pensions are roughly proportional to labor income averaged over the life course and feature only few redistributive properties (much less 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 severe benefit cuts that are currently discussed in response to population aging.

The retirement insurance system consists of several programs, each providing benefits that can be accumulated in some 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, the German retirement insurance is not part of the government budget but a separate entity that is subsidized by the federal government. If there were a surplus, social security contributions could not legally be used to decrease the government deficit like it can in the U.S.

Until 1972, the system was very inflexible and only permitted retirement at age 65, except for disability which, however, made up for roughly 50 percent of new retirement entries (see figure IV–2 below).[10] 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 benefits.[11] At the same time, the reform indexed benefits to the gross wage bill, laying the ground work for an increase of pensions faster than net wages and much faster than inflation. In face of increasing budget problems, these two generous provisions were replaced by the second landmark 1992 pension reform. It 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. Besides closing several loopholes, partial retirement was introduced. Normal retirement age, remaining at age 65 for men, will gradually be increased by the year 2004 to age 65 also for women. Nevertheless, it has become increasingly clear that the 1992 pension reform did not solve the demographic challenge to come. The discussion is still ongoing in Spring 1997; proposals are converging to 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 only be fully effective after the year 2004, because most workers are still „grandfathered" by the pre-1992 legislation. We will 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

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9 Hauser (1995) provides an overview and comparison of European old age social security systems.

10 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 may be reminded that there is substantial „pre-retirement" without public pension income (see figure I-7).

11 There was an adjustment for retiring at ages 66 and 67, see below.

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.

*Coverage and Contributions*

The German pay-as-you-go public pension system features a 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; below this threshold are about 5.6 percent of all workers) are not subject to mandatory coverage.[12]

Roughly 80 percent of the budget of the 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 are 20.3 percent of the first DM 8200 of monthly gross income (upper earnings threshold, „*Beitragsbemessungsgrenze*," about 180 percent of average monthly gross wage).[13] Technically, contributions are split evenly between employees and employers as 10.15 percent are deducted from employees' gross wages and another 10.15 percent are paid directly by the employer. While the 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.[14] Pension beneficiaries do not pay contributions to the pension system and to unemployment insurance.[15] However, pensioners have to pay the equivalent of the employees' contribution to the mandatory medical insurance. The equivalent of the employers' contribution to health insurance is paid by the pension system.

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[12] 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.

[13] Monthly gross household income in Germany is DM 5,300 (in 1996), corresponding to a purchasing power of US-$ 30,300 annually (based on the OECD purchasing power parity of DM 2.10 per US-$).

[14] 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 non-pension income.

[15] An exception are the very few „partial retirees" who pay taxes on their labor income.

The remaining approximately 20 percent of the social security budget are 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 worth of benefits.

*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 1993–1995, 21 percent of male elderly and less than 9 percent of female elderly receive 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 German elderly households (see figure I–9). 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 United Kingdom or the United States and considerably facilitates the analysis of retirement behavior in Germany.

*Benefit Types*

The German public pension system (or, as it is referred to in Germany, retirement insurance system) provides *old-age pensions* for workers aged 60 and older, *disability benefits* for workers below age 60, that are converted to old-age pensions latest at age 65, and *survivor benefits* for spouses and children. In addition, pre-retirement (i.e., retirement before age 60) is possible through several mechanisms using the public transfer system, mainly unemployment compensation. We begin by describing old-age pensions.

*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 distinguishes five types of old-age pensions, displayed in table 1, corresponding to normal retirement and four types of early retirement.

**Table II–1: Old-Age Pensions (1972 Legislation)**

| Pension type | Retire-ment 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 to 6 years of unemployment (has changed several times) | yes |

This complex system was introduced by the 1972 social security reform. One of the key provisions was the introduction of "flexible retirement" after age 63 with full benefits for workers with a long service history. In addition, retirement at age 60 with full benefits is possible for women, unemployed, and older disabled workers.[16] "Older disabled workers" refers to those workers who cannot be appropriately employed for health or labor market reasons and are age 60 or older. There are three possibilities to claim old age disability benefits. One has to (1) be physically disabled to at least 50 percent, or (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 average gross wage) (*"erwerbsunfähig," EU*).[17] The weaker earnings test is passed when no vacancies for the worker's *specific* job description are available and the worker has to face an earnings loss of at least 50 percent when changing to a different job (*"berufsunfähig," BU*). As opposed to the disability insurance for workers below age 60 (see below), full benefits are paid in all three cases.

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[16] This *old age* pension for disabled workers is different from the *general* disability pension for younger workers.

[17] The earnings tests are described below. See Riphahn (1995) for a detailed description of disability regulations.

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 age 65. These changes will be fully be phased in by the year 2004. The only distinguishing feature of types B and C of "early retirement" will then be the possibility to retire up to five years earlier than age 65 if a sufficient number of service years (currently 35 years) has been accumulated. As opposed to the pre-1992 regulations, benefits will be adjusted to a retirement age below age 65 in a fashion that will be described below.

*Benefits*

Benefits are strictly work-related. The German system does not have benefits for spouses like in the U.S. Benefits are computed on a life-time contribution basis and adjusted according to the 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 her or his 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 35 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 contribution on behalf of the employee and years that are counted as service years even when no contribution were made at all. These include, for instance, years of unemployment, years of military service, three years for each child's education for one of the parents,[18] some allowance for

[18] Three years after the 1992 reform. This number of years has been changed frequently.

advanced education,19 etc., introducing a second element of redistribution. The official Government computations such as the official replacement rate („Rentenniveau") assume a 45-year contribution history for what is deemed a „normal earnings history" („Eckrentner"). In fact, the average number of years of contributions is slightly below 40 years. Unlike to the U.S., there is neither an upper bound of years entering the benefit calculation, nor can workers choose certain years in their earnings history and drop others.

**TABLE II–2: Replacement Ratios of Social Security Old Age Pensions (1972 Legislation)**

| Relative income | Net replacement ratio | |
|---|---|---|
| | United States | West Germany |
| 50% | 61% | 67% |
| 75% | 55 | 66 |
| 100% | 53 | 71 |
| 150 % | 45 | 77 |
| 200 % | 41 | 75 |
| 300 % | 30 | 53 |

Notes: „Relative income" is expressed as a percentage of the net wage of an average production worker with 40 years of services. Married couple supplement not included. Source: CASMIR [1989], p. 508 and 512.

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 2 shows replacement rates and compares them to the U.S. Note that Germany has much less redistribution than the U.S. The low replacement rates for high incomes result from the upper limit to which earnings are subject to social security contributions.

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19 This allowance used to be very generous but has been dramatically reduced recently.

Before 1992, *adjustment of benefits to retirement age* was only implicit via years of service.[20] Because benefits are proportional to the years of service, a worker with fewer years of service will get lower benefits. With a constant income profile and 40 years of service, each year of earlier retirement decreased pension benefits by 2.5 percent, and vice versa.

The 1992 social security reform will change this. Age 65 will then act as the "pivotal age" for benefit computations. For each year of earlier retirement, up to five years and if the appropriate conditions in table 1 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 1, the pension is increased by 6 percent in addition to the "natural" increase by the number of service years.

Table 3 displays the retirement-age-specific adjustments for a worker who has earnings that remain constant after age 60. The table relates the retirement income for retirement at age 65 (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 % discount rate.[21]

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[20] Curiously, the German system before 1992 provided a large increase in retirement benefits for work at ages 66 and 67. However, it was ineffective because the inducements to early retirement by far offset this incentive.

[21] See Börsch-Supan (1992). The actuarially fair adjustments equalize the expected social security wealth defined in Appendix 2 for a worker with an earnings history starting at age S=20. A higher discount rate yields steeper adjustments.

**TABLE II–3: Adjustment of Public Pensions by Retirement Age**

| | Pension as a percentage of the pension that one would obtain if one had retired at age 65 | | | | |
|---|---|---|---|---|---|
| | Germany | | United States | | Actuarially |
| Age | pre-1992[a)] | post-1992[b)] | pre-1983[c)] | post-1983[d)] | fair[e)] |
| 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 |

Notes: a) "Gesetzliche Rentenversicherung" 1972--1992. b) "Gesetzliche Rentenversicherung" after 1992 reform has fully phased in. c) Social Security (OASDHI) until 1983. d) Social Security (OASDHI) after 1983 Social Security Reform has 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 p.a.
Sources: Börsch-Supan (1992) and own calculations.

While neither the German nor the American system were actuarially fair prior to the reforms, the public retirement system in Germany as enacted in 1972 was particularly distortive. There was less economic incentive for Americans to retire before age 65 and only a small disincentive to retire later than at age 65 after the 1983 Reform, while the German social security system tilted the retirement decision heavily towards the earliest retirement age applicable. The 1992 Reform has diminished but not abolished this incentive effect.

*Related social security programs*

Until now, we have discussed *old age benefits*. The contributions to the 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 („*Erwerbsunfähigkeitsrente,*" *EU*). If only the weaker earnings test is passed and some earnings capability remains, disability pensions before age 60 are only two-thirds of the applicable old age pension („*Berufsunfähigkeitsrente,*" *BU*). In the 1970s and early 1980s, the German jurisdiction has 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 as a device to keep unemployment rates down, their generous interpretation has only recently lead to stricter legislation.

*Survivor pensions* are 60 percent of the husband's applicable pension for spouses that are age 45 and over or if children are in the household („*große Witwenrente*"), otherwise 25 percent („*kleine Witwenrente*"). Survivor benefits are a large component of the public pension budget and of total pension wealth as will be shown in part III. Certain earnings tests apply if the surviving spouse has her own income, e.g., her own pension. This is only relevant for a very small (below 10 percent) share of widows. Only since recently, male and female survivors are treated symmetrically. As mentioned before, 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).

### *Pre-Retirement*

In addition to benefits through the public pension system, transfer payments (mainly unemployment compensation) enable what is referred to as „pre-retirement". As was shown in figure I–7, labor force exit before age 60 is frequent: about 45 percent of all men call themselves „retired" at age 59. Only about half of them retire because of disability; the other 50 percent make use of one of the many official and unofficial pre-retirement schemes.

Unemployment compensation has been used as pre-retirement income in an unofficial scheme that induced very early retirement. Before workers could enter the public pension system at age 60, they were paid a negotiable combination of unemployment compensation

and a supplement or severance pay. At age 60, a pension of type E (see table 1) could start. As the rules of pensions of type E and the duration of unemployment benefits changed, so did the "unofficial" retirement ages. Age 56 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 unemployment compensation for three years; and further years the difference between the last salary and unemployment aid – it all depended on the so-called „social plan" which a firm would negotiate with the workers before restructuring the work force.

In addition, early retirement at age 58 was made possible in an official pre-retirement scheme ("Vorruhestand"), in which the employer received a subsidy from the unemployment insurance if a younger employee was hired. While the first (and unofficial) pre-retirement scheme was very popular and a convenient way to overcome the strict German labor laws, few employers used the official second scheme.

*Partial retirement*

The 1992 Reform also introduced the concept of partial retirement. Partial retirement is possible to 1/3, 1/2 and 2/3. When partially retired, all rules and regulations apply in proportion, e.g., benefits and earnings limits. For instance, if retired to 1/3, the worker receives only 1/3 of the benefits, and only 1/3 of the earnings are applied to the earnings test. In fact, partial retirement is extremely rare.

*Earnings tests*

Earnings tests only apply to early retirement (types B–E in table 1), and only for the time between early retirement and age 65. Normal pensions (type A in table 1) are paid in full irrespective of other wage or non-wage income. To receive benefits before age 65, one has to 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 other earnings. Earnings between 150 and 200 percent of the earnings limit permit the receipt of 50 percent of benefits, and earnings between 100 and 150 percent of the earnings limit two-thirds of full benefits. After age 65, the earnings tests do not apply anymore and full benefits are paid irrespective of the type of pension.

*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 1. There are essentially three ages for entry into the German public pension system:[22] age 60, age 63 and age 65. Very few people enter at other ages. This bundling is entirely created by the institutional provisions of the public pension system. By 1995, age 60 has become the most popular entry age for male and female workers. For male workers, age 63 is the next important entry age while it is age 60 for female workers. There is no spike at age 63 because women may receive public pensions at age 60 unless they have a service life of less than 15 years. This is unlike to the pattern among male workers because they may receive a public pension at age 60 only if they are unemployed or disabled. In turn, there are more women receiving a public pension for the first time at age 65 because more women than men have short earnings histories.

**Figures II–1: Distribution of entries into public pension system by age and sex**

Figure 2 displays an estimate of the related hazard rate, defined as new beneficiaries of the public pension system (from the preceding figure) divided by the total number of workers in the labor force. Unfortunately, there is currently no reliable data to compute the number of „persons at risk" for a true hazard rate. While there are data on dependent workers that are currently employed and are eligible for public pension benefits, there is a large number of so-called latently insured persons who accumulated some claim on public pensions. Some of these persons will eventually receive a public pension but many will not. For example, all

[22] Entry as a beneficiary.

self-employed who have served in the military as a conscript are technically „insured" but will be unable to claim a public pension because they do not have a history as a dependent worker. The problem is particularly severe for women; thus, we do not display hazard rates for women. For men, our estimate in figure 2 shows three „spikes" at ages 60, 63, and 65. 50 percent of eligible male persons at age 60 receive their first pension at this age; of those who continue to work until age 63, 70 percent enter the public pension system at that age; and there is virtually nobody who postpones entry into the public pension system beyond age 65.

**Figure II–2: Hazard rates of receiving a public pension, by age**

Figures 1 and 2 display „retirement" in terms of receiving a public pension for the first time. Figure 3 relates this to labor force exit. It displays the age distribution of labor force exits together with the age distribution of public pension entries, based on GSOEP survey data. Figure 3 shows that the spikes in public pension entry are only partially labor force exits. The other part are „conversions" from other out-of-labor-market states (pre-retirement schemes) to public pensions. Pre-retirement has a spike at age 56 as described above. Note, that Figure II–3 corresponds to figure I–7 which showed stocks rather than flows. The pattern of public pension entries in figure 3 is virtually the same as in figure 1 although the former is based on a sample while the latter is a complete count of all new beneficiaries.

**Figure II–3: Age distribution of public pension entries and labor force exits**

*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 replacement 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 GDR system to the West German one. Between 1990 and 1992, existing pensions in East

Germany were re-valued several times. In the rest of this section we will describe this process and briefly comment on some of the problems during the transition process. [23]

The entire social security system of the GDR was organized in one comprehensive institution (*Sozialversicherung*)[24], 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: the 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 GDR 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 the GDR was poor in international standards although most comparisons to not account for the high subsidy of every-day goods in the former GDR.

The retirement system of the former GDR included a mandatory and a voluntary part, which made the transition to the all mandatory West system even more problematic. The mandatory part covered the first 600 marks of income, about 45% of the average GDR income. In 1971, a voluntary part of the public insurance was introduced (*Freiwillige Zusatzrentenversicherung*). In addition, there existed more than 60 supplementary insurance schemes for certain sectors (e.g. doctors, teachers, and – controversial after unification – police, army and 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[25] Retirement age had been fixed at age 60 for women and 65 for men.

As a result of the different supplementary insurance schemes, existing pensions in the GDR were partly higher, partly lower than if they would have 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 so obtained level had to be re-

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[23] For details of the transition, see Schmähl (1991 and 1992).

[24] More exactly they where two institutions, the *Sozialversicherung der Arbeiter und Angestellten* and the *Sozialversicherung bei der staatlichen Versicherung der DDR.*

valued with respect to the currency exchange rate and the relative income standard in East Germany. These reevaluations were governed by political, not economical decisions. Pensions lower than their West German equivalents were immediately lifted up to the level in West Germany, at least to the level of social assistance. Pensions which 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 involved workers form 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 DM. The average pension in East Germany is now essentially equal to the West German average.[26] Only two thirds of this increase were covered by payroll contributions, so 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 GDR 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 55 in East Germany with a net replacement rate of about 65 percent.

## Part III: Retirement Incentives: Accrual Rates of Pension Wealth

As emphasized in the previous section, the German retirement insurance creates strong incentives to retire early. Postponing retirement by one year has two negative effects on social security wealth. The worker has to give up one year of (net) pensions and he has to pay contributions of about 20 percent of his current gross earnings. On the other side, the postponement raises pensions by 3.6 percent through the adjustment factor (after the 1992 reform has 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

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[25] comparing standard workers with equal income and years of service - Schmähl, 1992, table 1.

[26] This is due to two compensating effects: Average service life in East Germany is much longer (47 years, men) than in West Germany (39 years, men). Average earnings, however, are about 20 percent lower in the East.

compensate for mere waiting. The additional year of contributions raises his future pension income profile and the expected value of survivor benefits by roughly 1/40.

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, i.e. 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 age 55 through 70. Contributions before age 55 are sunk. All calculations use 1992/94 mortality tables, conditioned on survival until age 55. In computing present discounted values, we use a 3 percent discount rate as a baseline. Precise definitions can be found in Appendix 2. 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 with the years of service, and apply the adjustment factors of table II–3. Finally, the personal pension base is multiplied by the average pension. We compute accrual rates of social security wealth from age 55 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

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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.

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, [27] and contributions are computed using the budget constraint of the pay-as-you-go system, based on the median demographic projection by the German Bureau of the Census.[28]

As a base case, we consider a married couple with a husband born in 1930 and a wife born in 1933.[29] We assume that the husband is the main income earner, while the wife is eligible for full survivor benefits.[30] Our base case earnings history starts in 1950 when the worker has reached age 20. In 1985, this worker is age 55.[31] Our base case worker has an average labor income history and an age-earnings profile which is increasing until age 55.[32] Thus, the average earner is earning less than the average aggregate labor income in his early work life (72% at age 20) and more than that later on (112% from age 55). The average aggregate labor income is drawn from the GRV-administrations records. We also do the same calculation for workers with 0.7 and 1.77 times average income, corresponding to the mean labor income of the lowest and the highest labor income decile.[33]

The accrual rates for the base case are displayed in figure III-1. Figures III–2 through 7 compare the accrual rates of variations of the base case. In figure 2 we present accrual rates that would have prevailed if the 1972 law had 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

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27 The increase between 1985 and 1995 was 4 percent p.a. In 1996, however, the increase was 0.5 percent.

28 Achte koordinierte Bevölkerunsvorausschätzung, mittlere Variante, vgl. Sommer (1994).

29 Using the GSOEP 1985 to 1995 waves, we estimated the average age difference - controlling for age and cohort effects - for this cohort to be approximately 3 years at retirement age.

30 The means test for survivor benefits is very weak. Only 10 percent of own pensions of widows are above the means test and only 40 percent of the amount exceeding the limit are deducted from the survivor benefit.

31 By choosing age 20 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 65.

32 The earnings profiles have been estimated using the 1 percent sample from the West-German social security records and are taken from Fitzenberger, Hujer, MaCurdy, Schnabel 1995.

33 Based on the labor earnings distribution drawn from the 1995 GSOEP.

for the low and high income cases. Detailed numerical results can be found in an appendix available upon request.

Figure 1 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 60, the worker is not eligible for public pension benefits. Working a year longer at age 55 yields a pension which is 1/35 higher (one additional year of average earnings, relative to 35 years of past earnings history). At a 3 percent discount rate and about a 1 percent chance to die at that age, accrual of expected social security wealth is slightly negative. At age 60, the worker becomes eligible for pension benefits according to the 1992 reform, although at reduced benefits. Postponing retirement from age 60 to age 61 increases pensions by 3.6 percent. However, this is more than offset by a 3 percent discount rate, a chance to die now at 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 60). With the increase in mortality risk, accrual rates become more and more negative until age 65, the „normal retirement age". After age 65, 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 65 to 66, all further accrual rates remain negative.

Figure 1 clearly shows that the adjustments of pension benefits to retirement age established in the 1992 pension reform (see table III–2) are not sufficient to offset the shorter period of retirement, the quickly increasing mortality risk, and the additional years of contributions.

Figure 2 compares the 1992 law with the regulations that applied between 1972 and 1992. Because the 1992 law is not fully implemented until the year 2004, this simulation more closely represents the current retirement incentives. While the pattern is qualitatively similar to figure 1, all accrual rates are lower and negative. The magnitudes are relatively large: Postponing retirement between ages 62 and 65 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 with these incentives, although it substantially reduced them. Most significantly, accrual rates are still negative until age 65. Hence, even the reformed system encourages workers to retire early.

A lower discount rate reduces the penalty of postponing retirement. Figure 3 displays this effect, based on the 1992 legislation. The incentive to postpone retirement before age 65 remains negative even at very small discount rates. With a high discount rate, the incentive to retire late are very negative throughout.

The sensitivity to mortality is similar and shown in figure 4. Lower mortality raises the accrual rates, while higher mortality lowers them. Even at very optimistic mortality assumptions, however, the incentives to postpone retirement between ages 60 and 65 remain negative.

Figure 5 changes the relative income position. Accrual rates are insensitive to income variations within the lowest and the highest decile as they change benefits and contributions in proportion. This is due to the rather condensed income distribution in Germany, where the lowest decile is represented by 30 percent less and the highest less than 80 percent more than average labor income. The income redistribution mechanism in 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 6 varies the marital status; single corresponds to a single male earner. The main reason for this sensitivity is the added leverage by survivor benefits. The younger the wife, the higher are 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.

Finally, figure 7 shows the difference between being able to claim disability benefits before age 60 and not. In the first case, benefits are not adjusted to retirement age at all. In addition, his earnings record is augmented by fictitious earnings of 1/3 of his pre-retirement average annual earnings for each year of disability until age 60. Thus, accrual rates are strongly negative, creating a strong incentive to seek disability status, e.g., by invoking one of the labor market conditions described in part II.

**Figures III –1 through III–7: Accrual Rates of Public Pension Wealth**

Figures 8 through 14 translate the social security wealth accrual into a more convenient metric: it relates the accrual of social security wealth by postponing retirement to the projected earnings during postponement. If this accrual is positive, the remaining workers of the same age subsidize those who have already retired. Figures 8 through 14 actually display the negative accrual divided by projected earnings, hence, the tax rate by which an additional year of work is taxed relative to a year retirement.

As figure 8 shows, additional work is indeed taxed and this at relatively high rates reaching almost 30 percent at age 64. Under the 1972 legislation, these implicit tax rates were even higher, exceeding 50 percent between age 60 and age 64, and again after age 67 (see figure 9). Tax rates are even positive before age 60 when a worker retires without receiving pension benefits until age 60. This is because the increase in the pension which the worker will eventually receive at age 60 is less than loss in wealth due to the additional contributions.

Figures 10 through 13 show variations in 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, a very low mortality, or a very large age differential between husband and spouse is the accrual of social security wealth between age 65 and 67 smaller than the projected earnings during this postponement period.

Finally, figure 14 shows the benefit of claiming disability status. In this case, the implicit tax rate on additional work exceeds 50 percent between ages 55 and 64. The additional pension wealth gained by the disability status is DM 148,000 (almost 2.5 years of average annual gross wages).

**Figures III–8 through III–14: Tax/Subsidy Rates of Public Pension System**

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

## Part IV: Effects of Social Security on Retirement: Evidence in Germany

The German retirement patterns depicted in Section I, and the spikes in the hazards to retire visible in figures II–1 and II–3, 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 experiments" 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 micro econometric studies of the German pension system.

The sharp decline in labor force participation between 1970 and 1980, which was depicted in figure I–1 in the first part of the paper, 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 IV–1 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 in a plunge from age 63 to age 58.5 after 1973. The spike in year 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 retirement increased in absolute numbers and relative to disability retirement due to the introduction of early retirement at age 63 without any health test.

**Figure IV–1: Average retirement ages**

Also, this new possibility to retire early initially substituted for claiming disability. As figure 2 shows, disability is one of the major pathways to retirement in Germany.[34] Note that figure 2 distinguishes two kinds of disability: disability claims before and after age 60. 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 in 1981 when more than 70 percent of new retirees used one of the two disability pathways. In 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 65 also increased since the mid 1980s.

**Figure IV–2: Pathways to retirement**

Figures 3a to 3c present a closer look at the effects of the 1972 pension reform. They show most clearly the change in the frequency of specific retirement ages chosen. The introduction of the window replaced the almost universal 65 year retirement age before 1972 by an almost even split between age 63 and age 65 within the first years after the reform. By the year 1980 age 60 became the most frequent age of retirement.

**Figure IV–3: Distribution of retirement ages before and after the 1972 reform**

The patterns in figures 1 and 2 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 (1996). These studies used microeconometric option value analyses to compute the incentive effects of the non-actuarial adjustment of benefits in the German social security system on early retirement. The option value of 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, 1996). The models are applied to West and East German panel data (SOEP 1984–90 in West Germany, SOEP 1990–92 in East Germany).

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[34] The notion of „pathways" to retirement is loaned from Jacobs et al. (1990).

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 formulae. 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 II–3).

Table 1 summarizes the results in terms of average retirement ages and the percentage taking very early retirement (before age 60). 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 towards early retirement, when it finally will be 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 60 is reduced from 32.2 percent to 28.2 percent.

The third row shows the effect of switching to a non-distorting system with adjustment factors computed for the discount rate estimated in their retirement probability model (see table II–3). The simulation reveals a strong reaction to this change in the social security system. A non-distorting system would shift the retirement age by more than two years. The effects of a non-distorting system are most powerful in the reduction of early retirement, i.e., retirement before the official window period. Retirement at ages 59 and below would drop from currently 32.2 percent to17.8 percent.

**Table IV–1: 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 % |
| Non-distorting System | 60.6 | 17.8 % |

Source: Börsch-Supan (1992) and Börsch-Supan and Schmidt (1996).

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 (SOEP), she confirms aggregate time-series results by 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) try to disentangle labor supply from labor demand effects, using aggregate data. While the results 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. Introduction of the Deutsche Mark at an exchange rate of 1:1 resulted in a massive increase in unit labor cost in East Germany, leading to a dramatic decrease in labor demand. The subsequent reduction in employment resulted in huge unemployment. In addition, labor force participation decreased sharply across all ages, but particularly so for ages 50 and above (table 2a). Transition rates into early retirement were exceptionally high: around five times as high as in the western part of the country (table 2b). This resulted in a mean retirement age in East Germany more than 3 years earlier than in West Germany (table 2c).

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 II in this paper. The paper by Börsch-Supan and Schmidt (1996) investigates the magnitude of this inducement effect. The paper uses the methodology mentioned earlier in this section: for a large sample of

West and East German workers, the paper computes the option value of postponing retirement and inserts this value besides other socio-demographic variables into a hazard model of retirement. In spite of the even higher generosity of early retirement provisions and the very different circumstances in East Germany, the authors estimate strikingly similar impacts 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.

**Table IV–2: 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 Labor Force in East and West Germany**

| | West Germany 1984–1990 | | | East Germany 1990–1992 | | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total |
| Initially in labor force | 1589 | 780 | 2369 | 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 |

Source: Börsch-Supan and Schmidt (1996); 1990–92 waves of the East German SOEP, based on all panel-members of age 44 and above in 1990

## Outlook

The responsiveness of the choice of retirement age to the incentives offered by the pension system has strong policy impacts. The public pension system in Germany does not only dispense with using the retirement-age-dependent adjustments as policy instruments for balancing the budget of the pension system, it even yields incentives that work against this because the adjustments are not actuarially fair. Rather than awarding later retirement to moderate the labor supply disincentives created by quickly rising social security taxes, social security regulations in Germany have encouraged early retirement, thus aggravating 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 by the year 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 considerations such 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, i.e., to an electorate which is unlikely to substantially change the balance between per capita benefits and contributions.

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# Appendix 1: Data Sources

## A Mikrozensus (MZ)

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 are the main source of official population and labor market statistics in Germany.

The MZ are a 1 percent random samples of the residential population in Germany, stratified by some regional variables (state, size of city/county, etc.). The primary sampling units are households. All household members age 16 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 due 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 against payment. Our historical data are based publications of the Federal Statistical Office: the Statistical Yearbooks and the more detailed series called „Fachserien".

## B VdR-Data

The VdR („Verband deutscher Rentenversicherungsträger") is a federal institution that represents the 23 social security agencies of the German states („Landesversicherungs-anstalten"), the federally organized social security branch for white collar workers („Bundes-versicherungsanstalt 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 includes 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 which will eventually lead to some pension payments. Women often change from a „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 is small and one can correct the number of males in the labor force by using the Mikrozensus data.

The available VdR data has 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.

## C Publications by the Department of Labor and Social Affairs (BMAS)

The German Department of Labor and Social Affairs („Bundesministerium für Arbeit und Sozialordnung") 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 as appendix to several brochures (quoted in the references) which are freely available on request.

## D German Socio-Economic Panel (GSOEP)

The German Socio-Economic Panel (GSOEP) is an annual panel study of some 6000 households and some 15000 individuals. Its design closely corresponds to the U.S. Panel

Study of Income Dynamics (PSID). The panel started in 1984; twelve waves through 1995 are currently available. Response rates and panel mortality are comparable to the PSID. The GSOEP data provide a detailed account of income and employment status. The data is used extensively in Germany, and the increasing interest in the U.S. 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 the GSOEP waves are considerably smaller than the MZ waves or the VdR enumerations. The GSOEP analyses in this paper are based on cells by age and gender which contain approximately between 300 and 400 persons for ages 45–60, between 200 and 300 persons for ages 60–67 (male) and 60–72 (female), otherwise between 100 and 200 persons.

## Appendix 2: 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:

$$SSW_S(R) = \sum_{t=R}^{\infty} YRET_t(R) \cdot a_t \cdot \delta^{t-S} - \sum_{t=S}^{R-1} c \cdot YLAB_t \cdot a_t \cdot \delta^{t-S}$$

with:

| | | |
|---|---|---|
| | $SSW$ | present discounted value of retirement benefits (=social security wealth) |
| | $S$ | planning age |
| | $R$ | retirement age |
| | $YLAB_t$ | labor income at age $t$ |
| | $YPEN_t(R)$ | pension income at age $t$ for retirement at age $R$ |
| | $c_t$ | contribution rate to pension system at age $t$ |

$a_t$ probability to survive at least until age $t$ given survival until age $S$

$\delta$ 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. See the appendix to the paper by Diamond and Gruber on the U.S. in this volume for a formal description.

The accrual rate of social security wealth between age $t-1$ and $t$ 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 55–year old worker ($S$=55).

„Replacement rate" denotes the ratio of the pension (*YPEN*) which the worker would receive if he would retire at that age, and 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 ($YLAB^{NET}$), the worker would earn if he would postpone retirement. Note that *SSW* is an expected present value including discounting and mortality risk while *YLAB* ignores the probability that the worker could die before age 70:

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

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

**Figure I-1a: Male labor force participation rates**

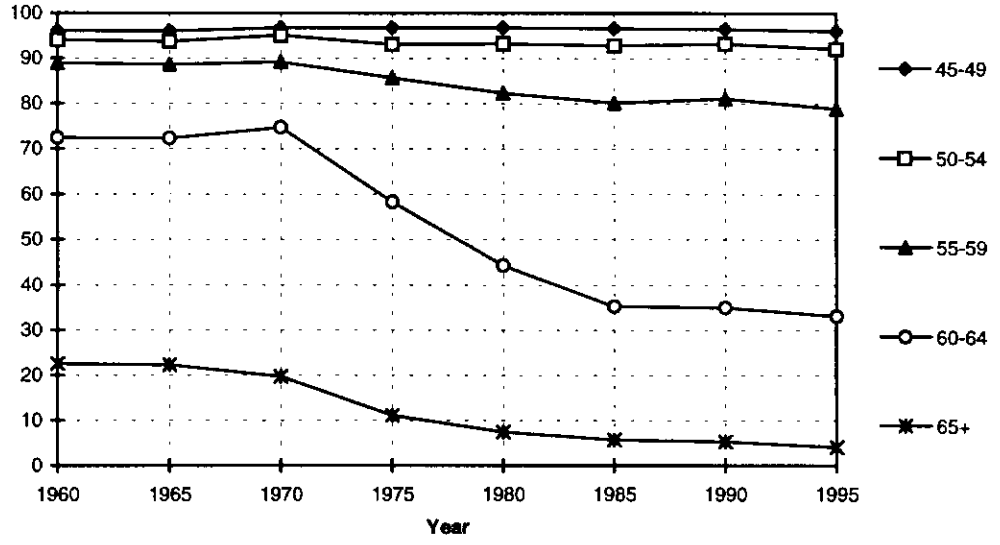
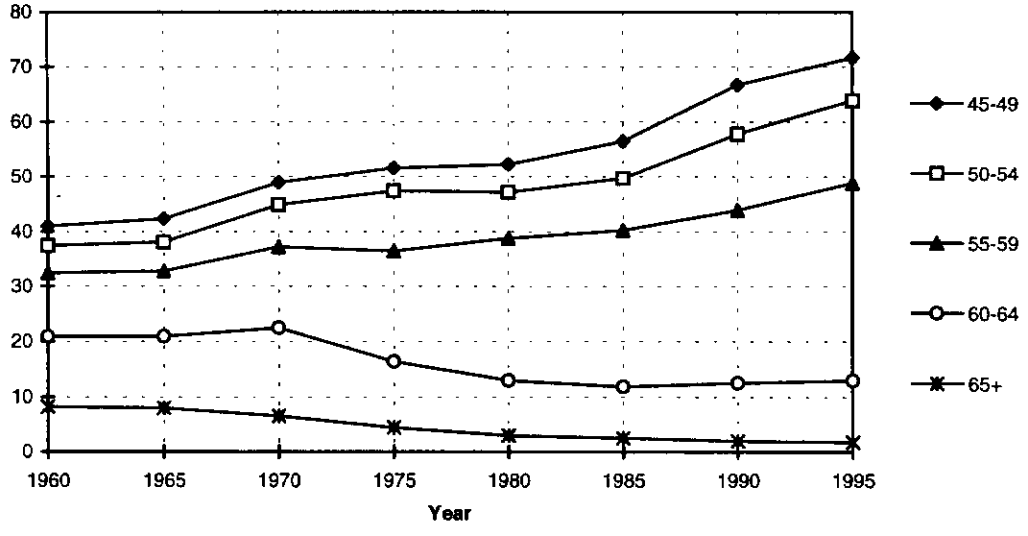
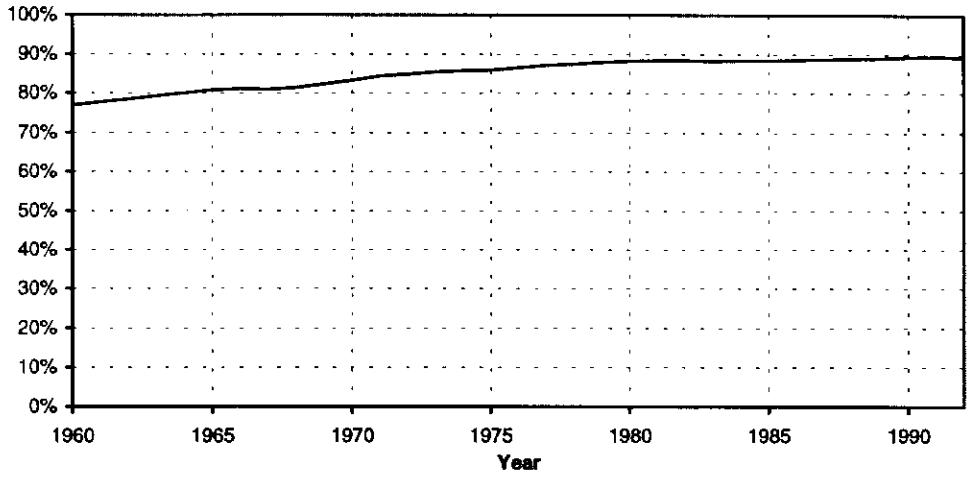



**Figure I-1b: Female labor force participation rates**



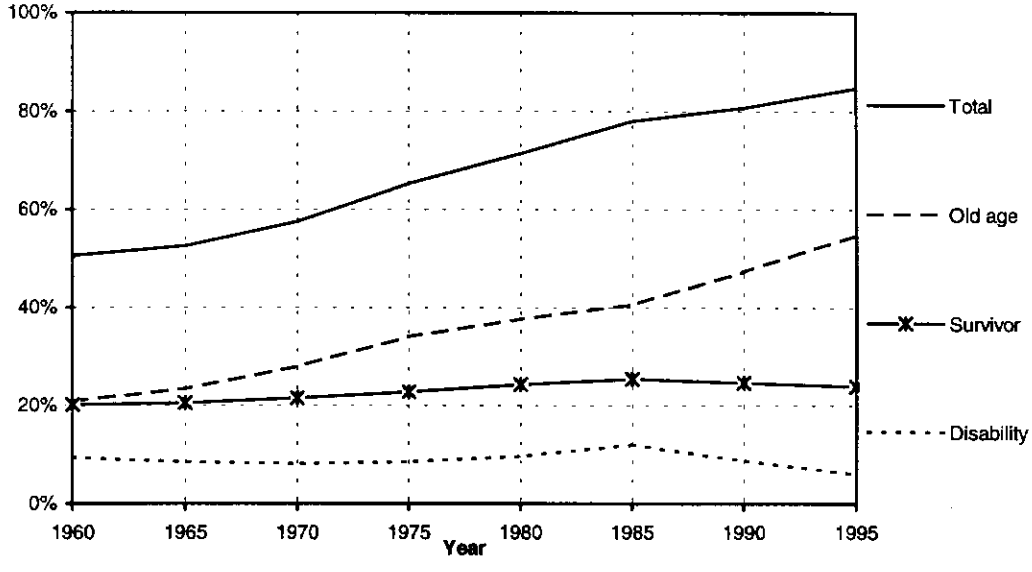

Source: Mikrozensus (StatBA 1990, FS1, R4.1.1: S.51, 55; StatJB 1966: S. 149; StatJB 1971: S.121; StatJB 1976: S. 148; StatJB 1981: S.94; StatJB 1986: S. 97)

**Fig. I-2: Share of workers covered by the German public pension system**



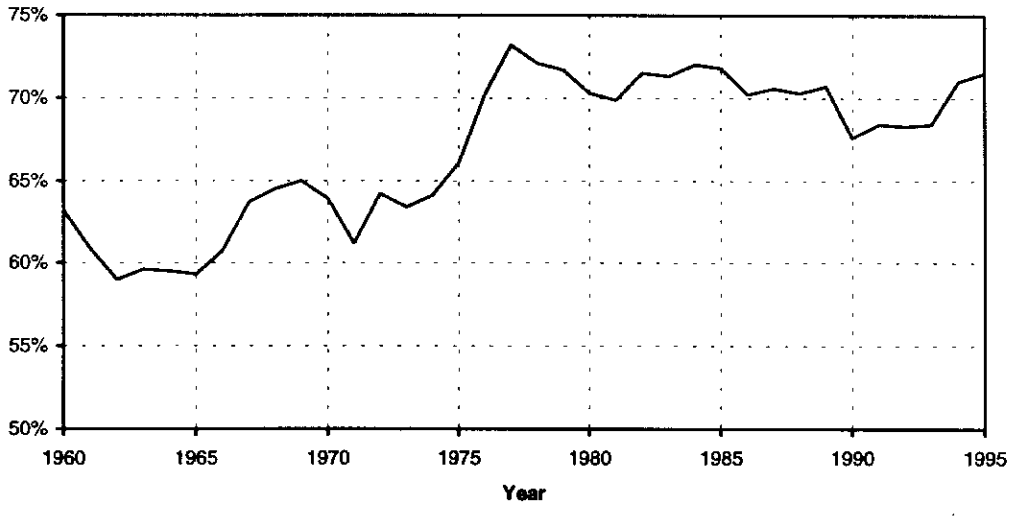

Note: Share of white collar workers, blue collar workers, miners, and civil servants in total labor force. Not included are those self-employed who are voluntary members of the public pension system.
Source: Stat.Bundesamt, FS1/4.1.1, based on Mikrozensus; own calculations.

**Fig. I-3: Share of persons aged 55 and older receiving public pensions**



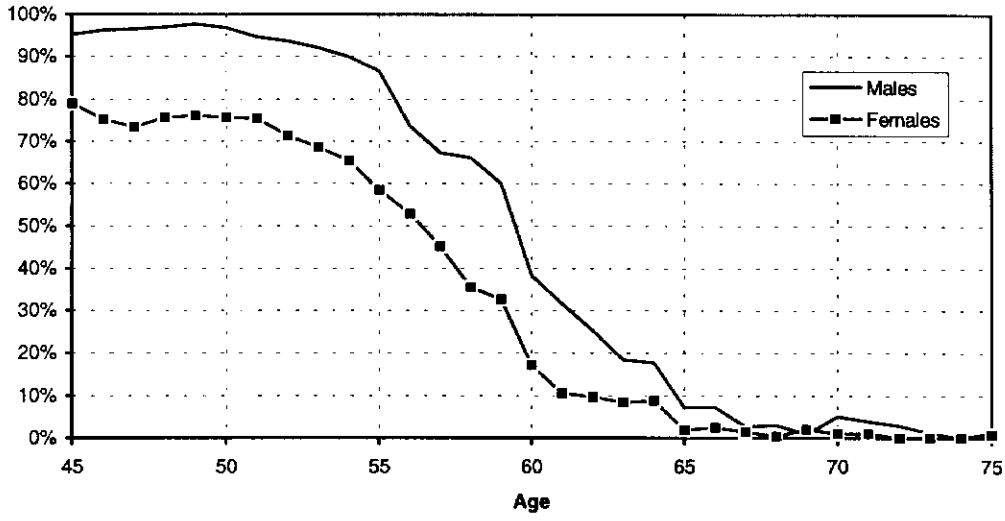

Notes: By definition, all persons receiving old age pensions are age 60 and above. Percent receiving disability pensions: share of those aged 55+ estimated from 1992 share. Persons receiving survivor benefits: some double counting; very small number of persons below age 55 included. Note that table I-3 represents the stock of retirees while figure IV-2 shows the flow into retirement.
Source: VdR, own calculations.

**Fig. I-4: Replacement rate of the German public pension system**




Note: Pension after 45 years average contribution as percent of average net wage. The 1990 rate is low because East German pensions were not yet adjusted to West German level.
Source: BMAS.

**Fig. I-5: Labor force participation rates**




Note: Percentage of sample persons of given age.
Source: GSOEP 1993-95, own calculations.

**Fig. I-6a: Labor Force Status - Males**

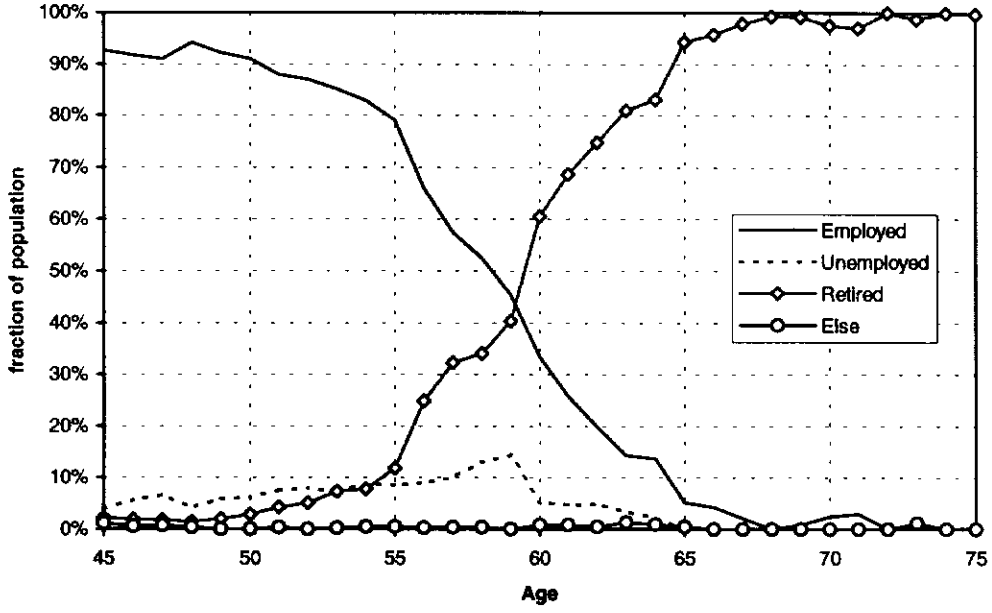
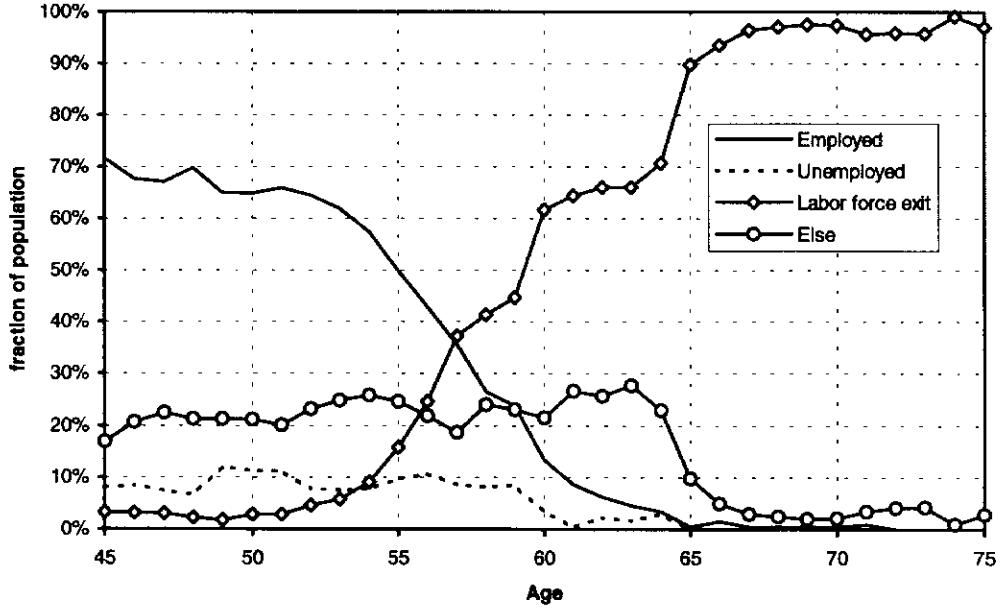



**Fig. I-6b: Labor force status - females**




Note: Percent of sample persons at given age. Unemployed = registered unemployed who are willing to work.
Source: GSOEP 1993-95.

**Fig. I-7a: Labor force status and receipt of own pension - males**

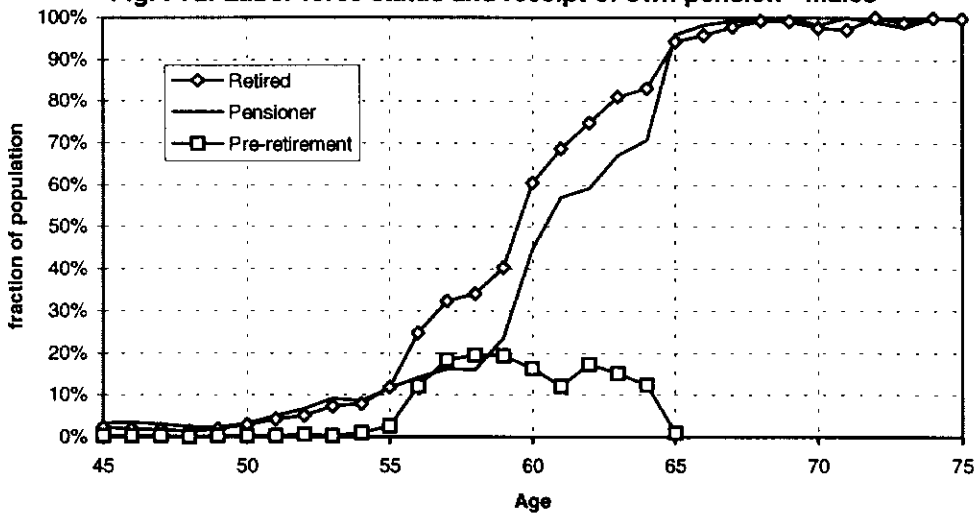
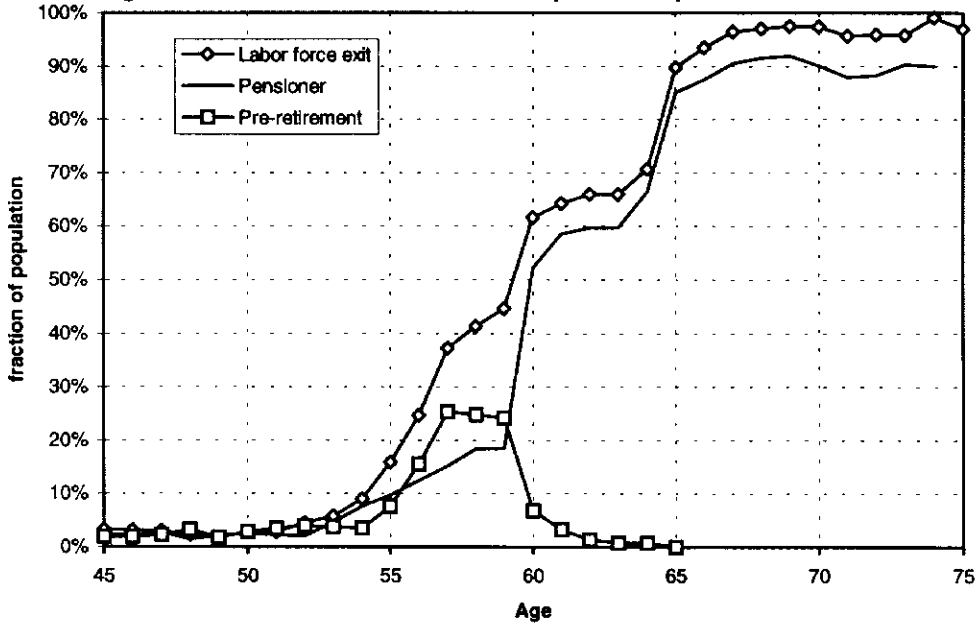



**Fig. I-7b: Labor force status and receipt of own pension - females**




Notes: *Labor force exit* = retired from labor market (includes persons who receive pensions and persons with pre-retirement status); *pensioner* = receives old age or disability pension; *pre-retirement* = retired from labor market (1) receiving unemployment benefits and/or (2) receiving compensating payments from (former) employer while at zero hours of work.
Source: GSOEP 1993-95

**Fig. I-8a: Recipients of public pension income - males**

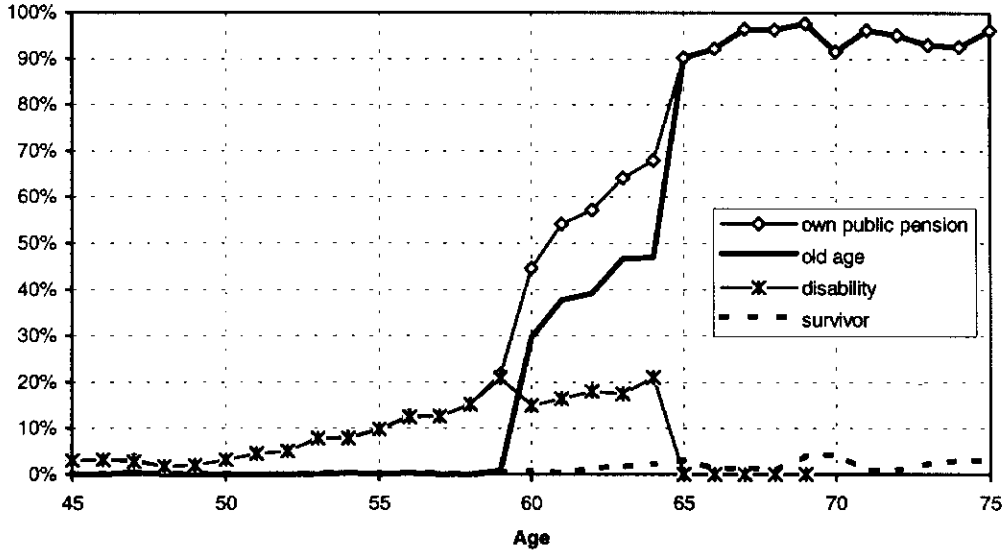
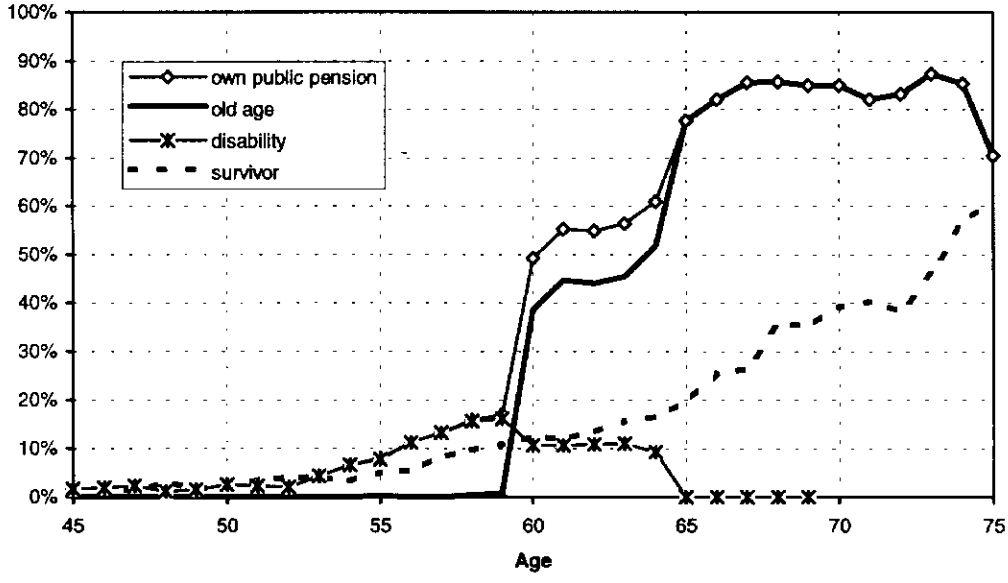
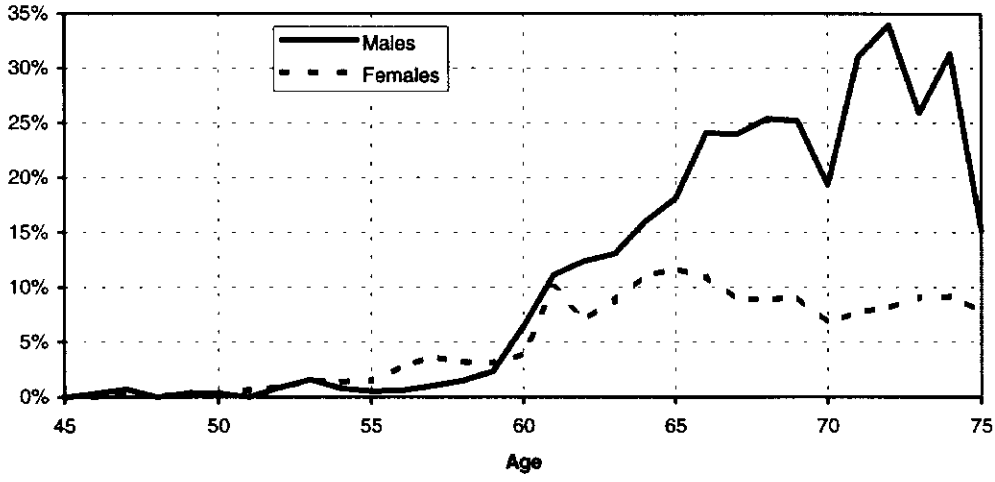



**Fig. I-8b: Recipients of public pension income - females**




Note: Survivor, old age, disability and civil servant pension recipients as share of sample persons at given age.
Source: GSOEP 1993-95, own calculations.

**Fig. I-9: Recipients of firm pensions by age**




Firm pensions as share of sample persons at given age.
Source: GSOEP 1993-95, own calculations.

**Fig. I-10a: Source of household income by age of householder - male head of hh**

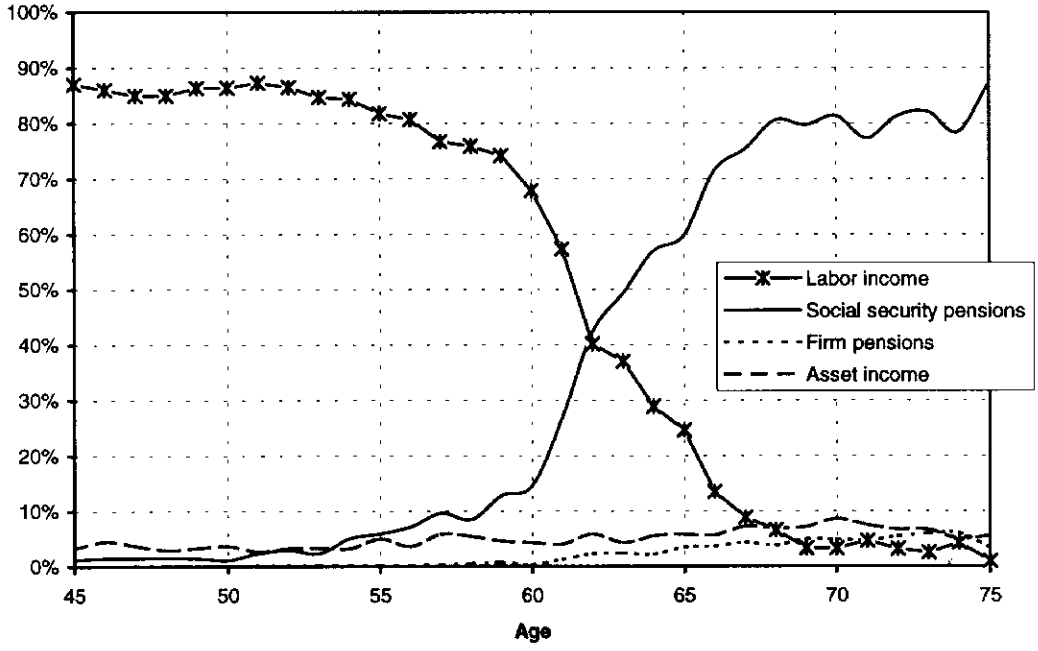
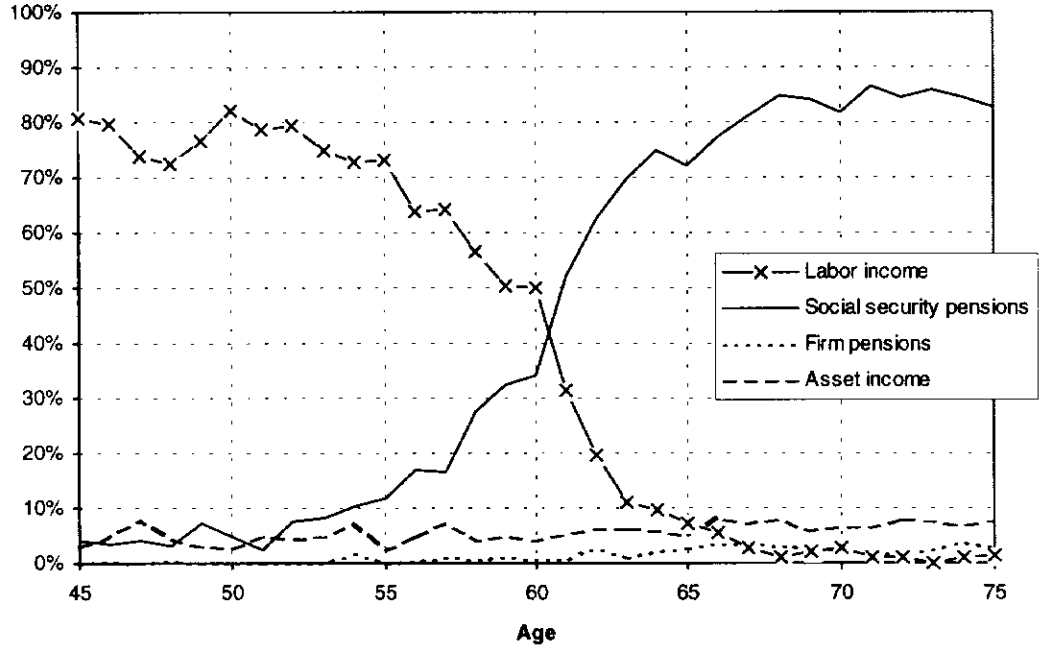



**Fig. I-10b: Source of household income by age of householder - female head of hh**




Source: GSOEP 1993-95, own calculations.

**Fig. II-1a: Distribution of public pension retirement ages - males**

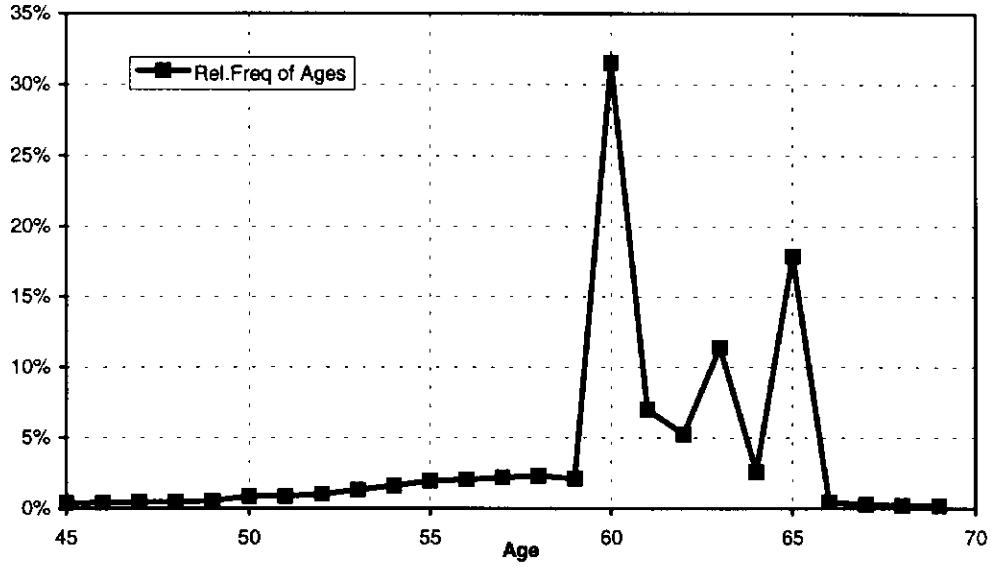
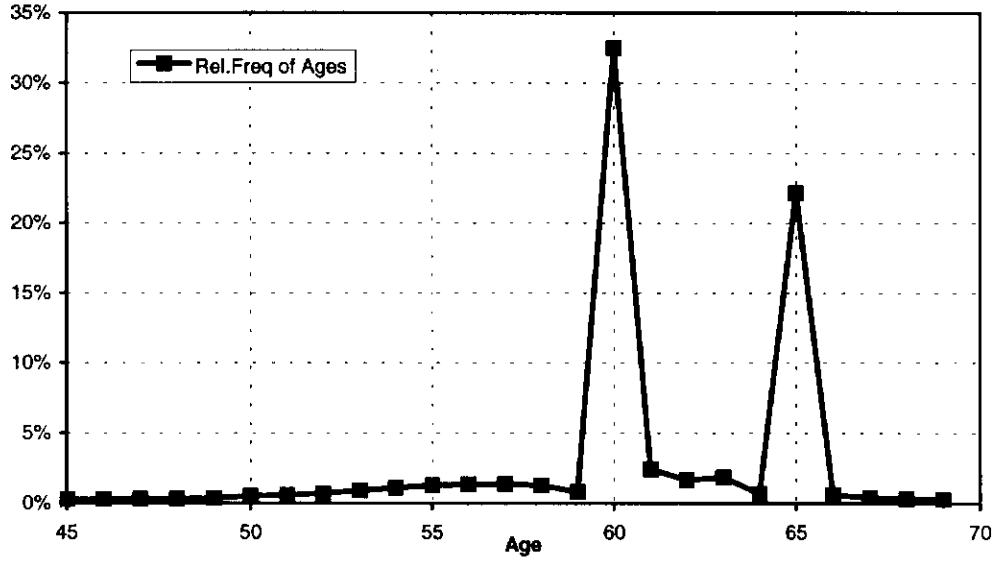
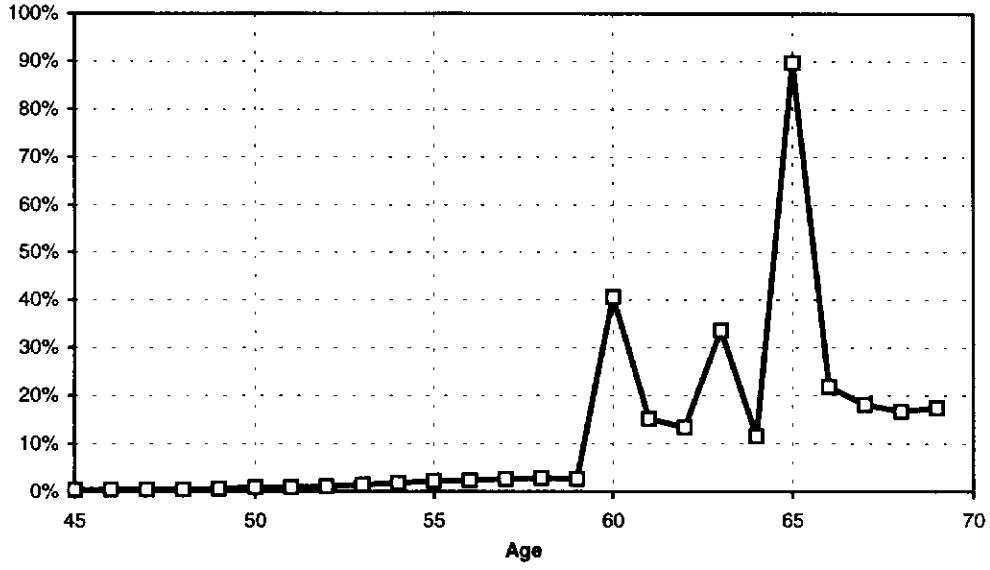



**Fig. II-1b: Distribution of public pension retirement ages - females**



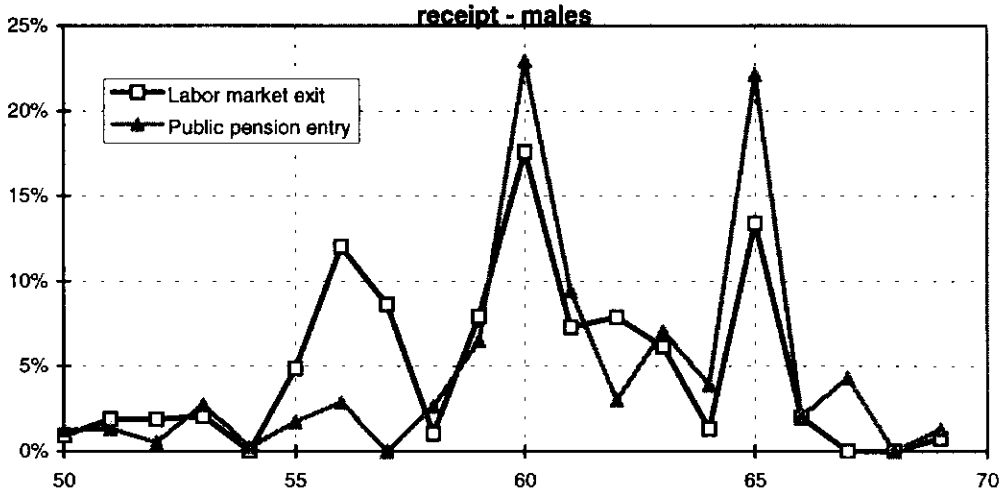

Note: Distribution of age of workers receiving benefits for the first time in 1995.
Source: VdR data (complete enumeration of entries into retirement).

**Fig. II-2: Retirement hazard rates by age - males**



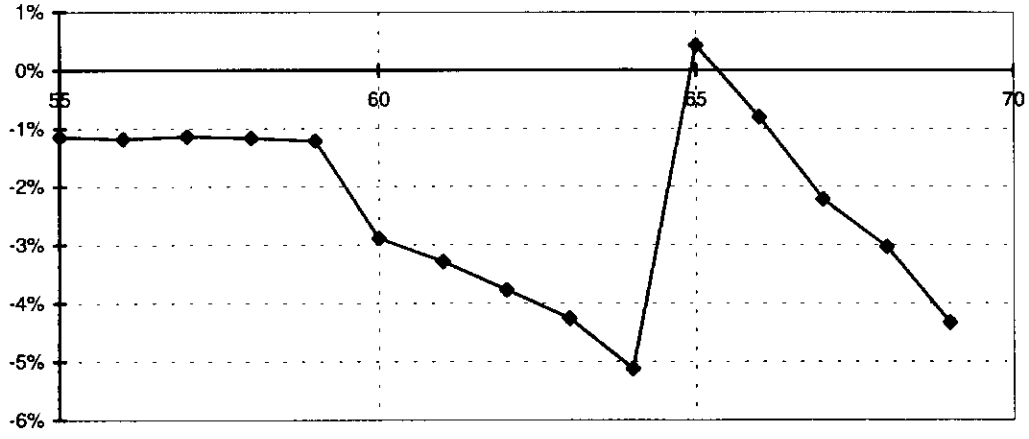

Note: Hazard rates have been estimated from the empirical distribution of male persons claiming retirement benefits (disability and old-age) for the first time in the year 1995. Numbers (derived from flows) do not match perfectly with figure I-7, which is based on survey data on stocks.
Source: VdR data (complete enumeration of entries into retirement).

**Fig.II-3: Age distribution of labor force exit and public pension receipt - males**




Source: GSOEP 1993-95, own calculations.

**Figure III-1: Accrual rates of Social Security Wealth (Basecase)**




Note: Accrual of social security wealth when retiring one year later as percentage of net social security wealth (see appendix for precise definition). Figures III-2 to III-7 display accrual rates for alternative simulations

**Figure III-2: 1972 versus 1992 legislation**

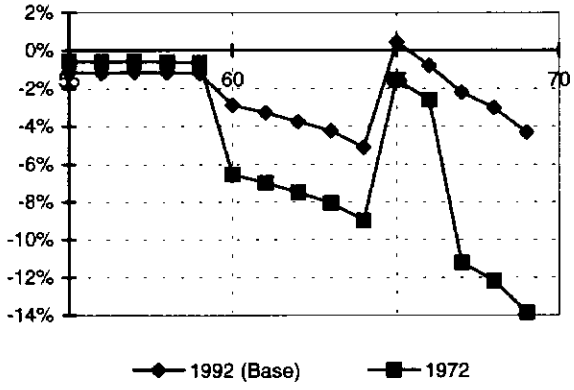



**Figure III-3: Discount rates**

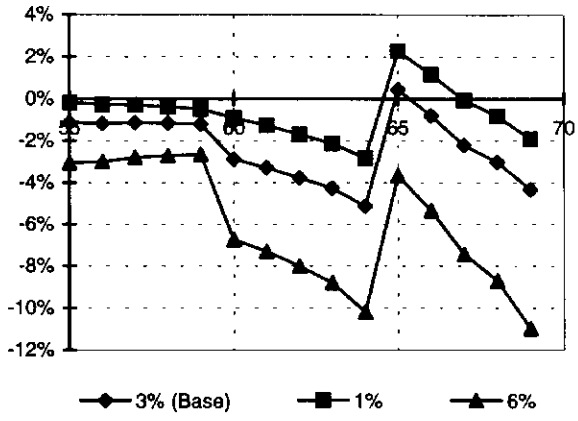



**Figure III-4: Mortality**

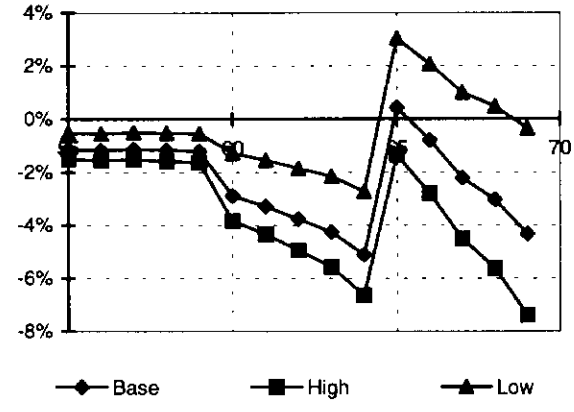



**Figure III-5: Income by percentile**

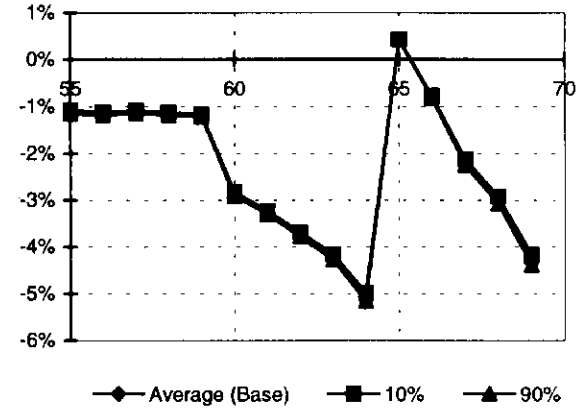



**Figure III-6: Marital Status**

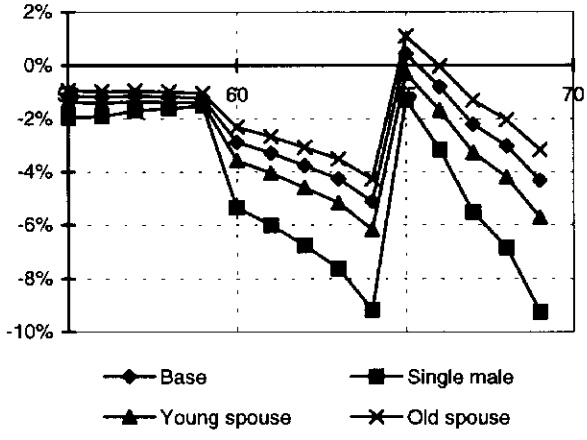



**Figure III-7: Disability**

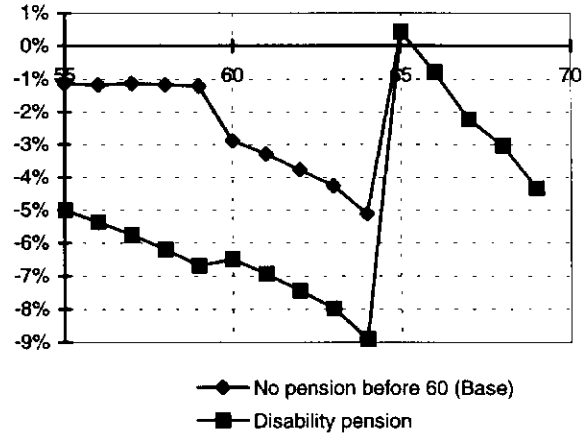
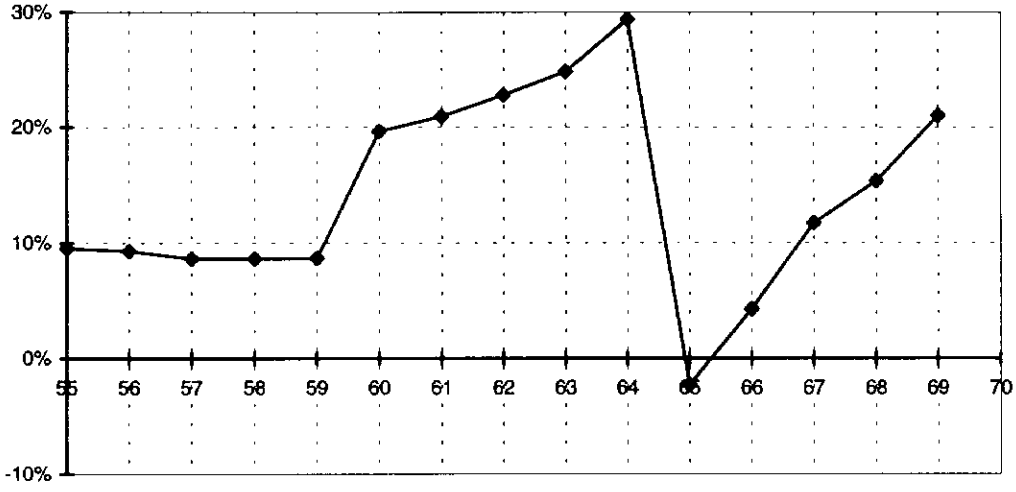
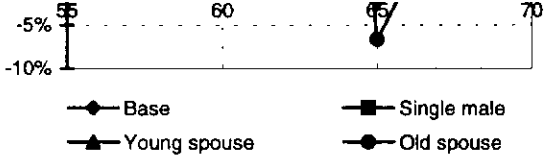


**Figure III-8: Tax/subsidy rates (Basecase)**




Note: Loss of social security wealth when retiring one later as percentage of predicted earnings (see appendix for precise definition). Figures III 9 to III-14 display tax rates for alternative simulations.


-5%
-10%
55
60
65
70
Base
Single male
Young spouse
Old spouse

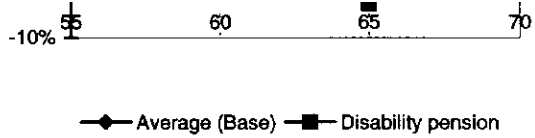
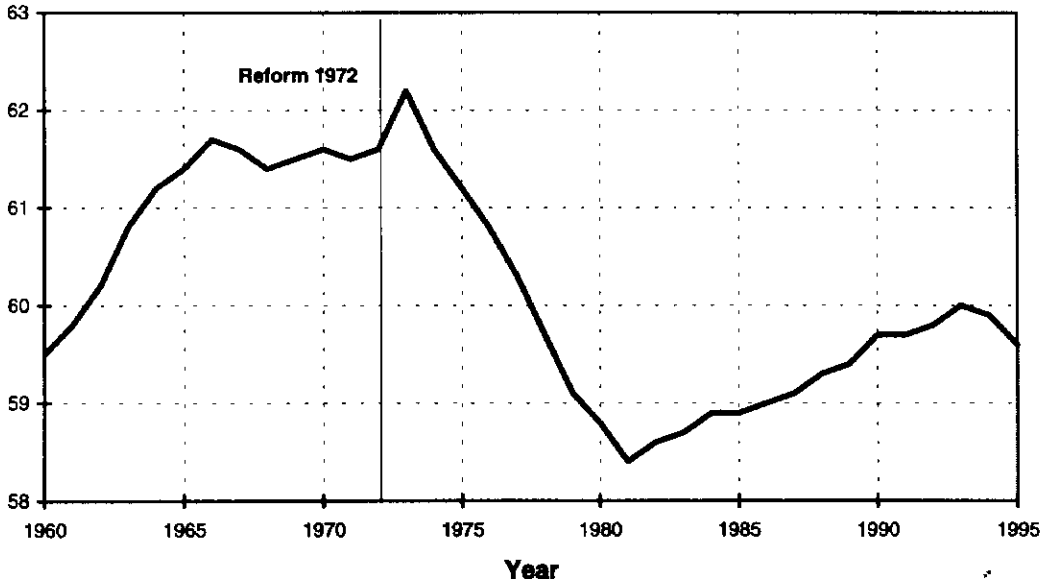
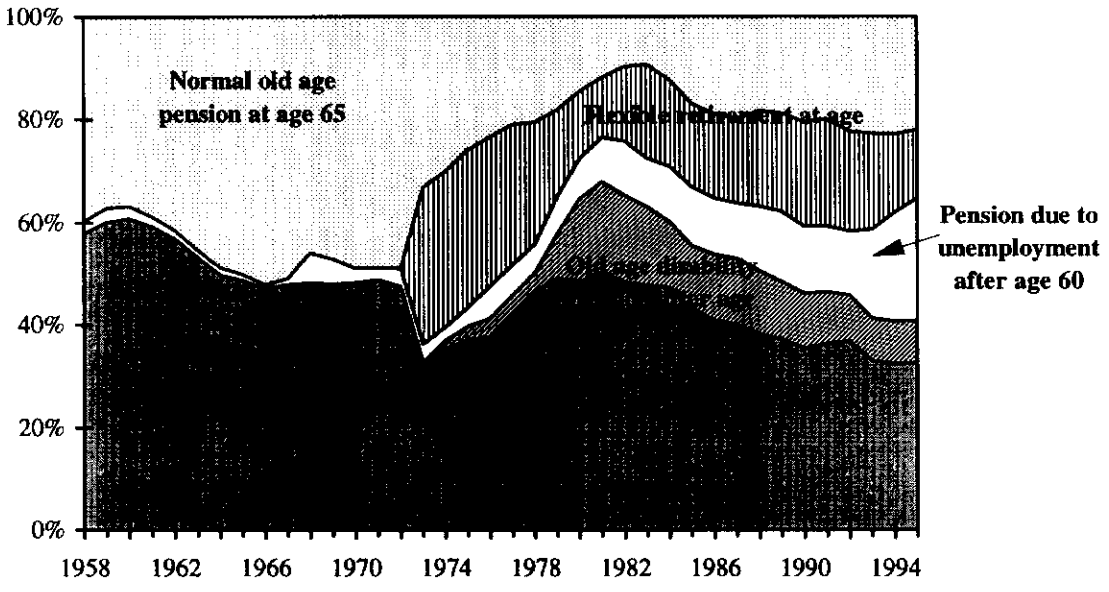

-10%
55
60
65
70
Average (Base)
Disability pension

**Fig. IV-1: Average retirement ages - West German men**



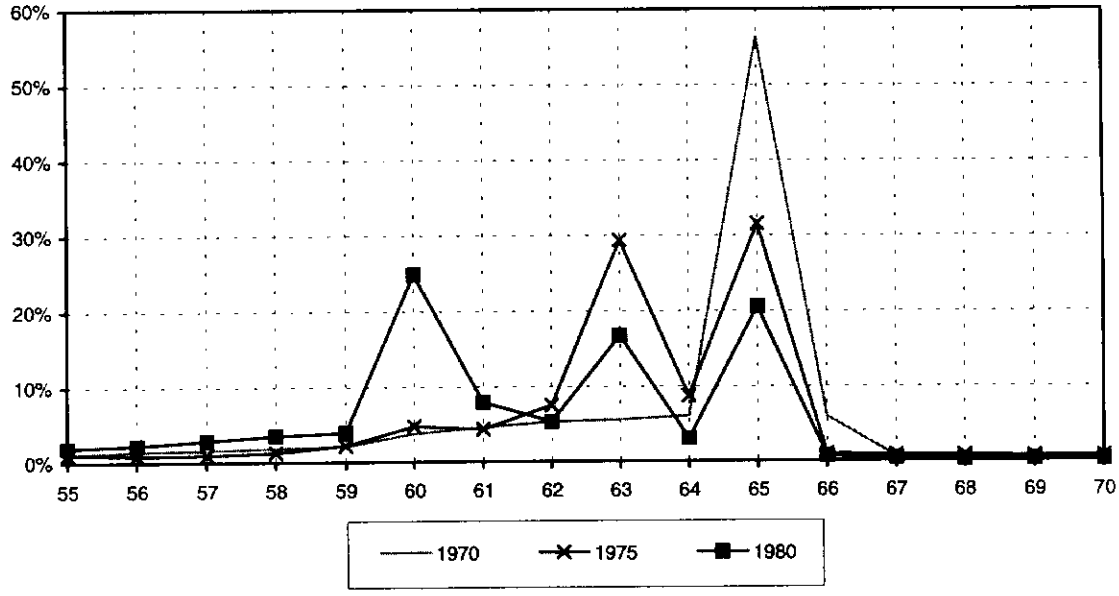

Note: Average age of retirement in given year (disability and old age). The spike in year 1973 is due to a composition effect: the 1972 reform introduced retirement at age 63, which increased dramatically the number of old age retirement relative to disability retirement. At the same time average retirement age dropped in both old age *and* disability retirement.
Source: Rentenversicherung in Zeitreihen, VDR, 1997.

**Fig. IV-2: Pathways to retirement - males**




Note: Share of new entries into public pension and disability insurance
Source: Rentenversicherung in Zeitreihen, VDR, Februar 1997.

**Figure IV-3c: Distribution of retirement ages 1970 to 1980**




Notes: After 1980 the distribution of retirement ages remained relatively stable.
Source: VdR Rentzugangsstatistik; white collar workers, male