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Author: Axel Börsch-Supan, Simone Kohnz, Reinhold Schnabel

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The Budget Impact of Reduced Early Retirement Incentives on the German Public Pension System

Axel Börsch-Supan, Simone Kohnz, and
Reinhold Schnabel

5.1 Introduction

The public pension system is the single largest item in Germany's social budget. In 2000, public pension expenditures amounted to some 200 billion euro, representing 21 percent of public spending and 11.8 percent of gross domestic product (GDP). It is the second largest pension budget in the Organization for Economic Cooperation and Development (OECD) surpassed only by Italy (14.2 percent of GDP). It is more than 2.5 times as expensive as the U.S. Social Security system (4.4 percent of GDP; OECD 2001). This paper argues that this large pension budget can be significantly reduced by neutralizing the strong incentives in the German pension system to retire early.

The generosity of the German public pension system is considered a great social achievement and has been a model for many social security systems around the world. It has been successful in providing a reliable level of retirement income over the past 100 years. It is considered one of the pillars of societal stability in Germany. It has survived, albeit under severe modifications, through World Wars I and II, the Great Depression, and, most recently, the German unification.

Axel Börsch-Supan is a professor of economics and director of the Mannheim Research Institute of the Economics of Aging and Statistics, University of Mannheim, and a research associate of the National Bureau of Economic Research (NBER). Simone Kohnz is a PhD student at the Munich Graduate School of Economics. Reinhold Schnabel is a professor of economics at the University of Essen.

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The aging of Germany's population, however, is threatening the very core of its pension system. All industrialized countries are aging, but Germany, together with Italy and Japan, will experience a particularly dramatic change in the demographic structure of its population. The severity of the demographic transition has two causes: a quicker increase in life expectancy than elsewhere, partly due to a relatively low level still in the 1970s, and a more incisive baby boom/baby bust transition (e.g., relative to the United States) to a very low fertility rate of 1.3 children per woman, only a bit higher than the rock-bottom fertility rate of 1.2 in Italy and Spain. Consequently, the ratio of elderly to working-age persons—the old-age dependency ratio—will increase steeply. According to the latest OECD projections, the proportion of elderly (aged 65 and above) will exceed a quarter of the population in 2030, and the German old-age dependency ratio will almost double, from 24.0 percent in 2000 to 43.3 percent in 2030.[1]

The increase in the dependency ratio has immediate consequences for a pay-as-you-go social insurance system because fewer workers must finance the benefits of more recipients. The German social security contribution rate, in 2003 at 19.5 percent of gross income, was projected in the mid-1990s to exceed 30 percent of gross income at the peak of population ageing in 2035 if the accustomed replacement rates were maintained.[2] This led to major pension reforms in 1999 (a failed first attempt) and 2001 (now successful). This reform bade farewell to the pure pay-as-you-go system and introduced a multipillar pension system with a small, but in the eyes of many Germans, revolutionary funded pillar.

The reform did not, however, touch the early and normal retirement age, which are age 60 and 65. This may come as a surprise, since in the light of a prolonged life span, increasing its active part appears to be a rather natural reform option. This option is particularly attractive as increasing the retirement age simultaneously increases the number of contributors and decreases the number of beneficiaries. Moreover, Germans retire quite early. Average retirement age is about 59.5 years, half a year younger than the earliest eligibility age for old-age pensions and more than five years younger than the so-called "normal" retirement age in Germany.[3] Hence, a substantial increase in the retirement age seems to be a reasonable policy option, particularly because age-specific morbidity rates appear to have shifted in line with mortality (Cutler and Sheiner 1998).

The politics of shifting the retirement age, however, are not favorable. According to survey results by Boeri, Börsch-Supan, and Tabellini (2001,

1. Organization for Economic Cooperation and Development (OECD). 2001. The OECD dependency ratio relates persons age 65 and older to persons between ages 15 and 64.

2. See Börsch-Supan (1998, 2000c) and Schnabel (1998) for descriptions of the problems, and Birg and Börsch-Supan (1999) and Börsch-Supan (2002) for concrete reform proposals.

3. See Börsch-Supan and Schnabel (1998).

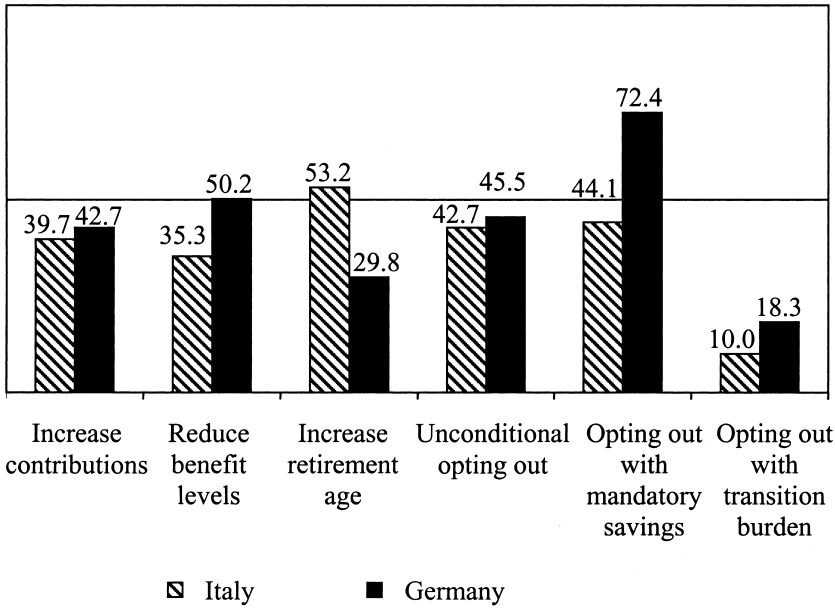


Fig. 5.1 Popularity of pension reform options

2002, and 2005), raising the retirement age is one of the most unpopular pension reform options in Germany (see figure 5.1). An interesting result of this survey, however, is that this option is particularly unpopular among those who are least informed about the costs of the current pension system. Hence, while early retirement is a well-appreciated social achievement among Germans, awareness of the costs of early retirement may moderate the opposition to increasing the retirement age. A rough back-of-the-envelope calculation may make the point. Since life expectancy at age 60 is about eighteen years, each year of early retirement corresponds to about 5.5 percent of pension expenditures. Hence, making the normal retirement age also the mean retirement age would cut pension expenditures by about 28 percent and would reduce the government projection of the contribution rate in 2020 from 22 percent to below 16 percent.

This chapter's aim is to produce a more sophisticated estimate of the budget effects of an increase in the retirement age. This is the third stage of an international research project on the causes for, and the effects of, early retirement. In the first stage (Gruber and Wise 1999), we described and quantified the incentives to retire early in the form of implicit taxes on continued work.

The second stage (Gruber and Wise 2003) provided econometric estimates of the strength of incentive effects on old-age labor supply, using several specifications of incentive variables. These highly significant and large

estimates were used to simulate labor force participation responses to several policy changes. For instance, introducing (almost) actuarially fair adjustments (6 percent per year of delay) would increase the average retirement age of German men by about three years and two months. The effects are about half that size for women.

This third stage uses these estimates and converts them into budget effects on the German public pension system. We simulate the impact of several stylized reform plans on older workers' net fiscal contributions to the finances of the German public pension system. Such reform plans will have two effects on the budget of the pension system: first, a direct effect, by changing contributions and benefits for a given work history (we refer to this effect as the *mechanical* effect) and, second, an indirect effect through labor supply responses to the reform (the *behavioral* effect). We estimate the fiscal implications of both the mechanical and the behavioral effect, using the econometric retirement models from the second stage to predict labor supply responses. The result will be an estimate of the steady-state impact of the reforms on the financial balance sheet of the German public pension system.

More precisely, using a cohort of preretirement-age workers, we first estimate the probability that each worker will exit the labor force via death or retirement at each future age and the net present discounted value (PDV) of retirement program contributions and benefits associated with each type of labor force exit. The resulting weighted average social security wealth (SSW) will be the base for comparison. We will then reestimate the exit probabilities, contributions, and benefits under several reforms to obtain new social security wealth estimates. The key numbers will be the percentage changes in social security wealth, including and excluding a behavioral response to the reform. The difference between these numbers measures the extent to which labor supply responses amplify the effect of reforms on program solvency.

The paper is structured as follows: sections 5.2 and 5.3 describe the institutional background for private sector and civil servants' pensions.[4] Section 5.4 presents data and variable specifications, section 5.5 contains our simulation results, and section 5.6 concludes.

5.2 Private Sector Pensions

In this section we describe the German public retirement insurance (*Gesetzliche Rentenversicherung;* GRV), which covers about 85 percent of the German workforce. Most of these are private sector workers, but the GRV also includes those public sector workers who are not civil servants. Civil servants, about 7 percent of the workforce, have their own pension

4. These sections are updated versions of Börsch-Supan et al. (2002).

system, described in section 5.3. The self-employed, about 9 percent of the work force, are mainly self-insured, although some also participate in the public retirement insurance system. For the average German worker, occupational pensions do not play a major role in providing old-age income. Neither do individual retirement accounts, but there are important exceptions from this general picture. Broadly speaking, the German system is monolithic.

The following descriptions focus on the institutional rules that applied during the period 1984–97, because this is the sample period of the underlying econometric estimates (dubbed "1972 legislation," although there have been several administrative adjustments since). There have been two major pension reforms, in 1992 and 2001. They had, however, only negligible effects on the persons in the estimation sample, since generous grandfathering schemes applied. The last subsection briefly sketches the implications of the two major reforms.

5.2.1 Coverage and Contributions

The German pay-as-you-go public pension system features a very broad mandatory coverage of workers. Only the self-employed and, until 1998, workers with earnings below the official minimum earnings threshold (i.e., *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.

Roughly 70 percent of the budget of the German public retirement insurance is financed by contributions that are administered like a payroll tax, levied equally on employees and employers. Total contributions in 2000 were 19.3 percent of the first DM8,600 of monthly gross income (upper earnings threshold, *Beitragsbemessungsgrenze,* about 180 percent of average monthly gross wage).[5] Technically, contributions are split evenly between employees and employers. While the contribution rate has been fairly stable since 1970, the upper earnings threshold has been used as a financing instrument. It is anchored to the average wage and has increased considerably faster than inflation.

Private sector pension benefits are essentially tax free. Pension beneficiaries do not pay contributions to the pension system and/or to unemployment insurance. 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.

The remaining approximately 30 percent of the social security budget is financed by earmarked indirect taxes (a fixed fraction of the value-added

5. West Germany only, DM 7,200 in East Germany (one DM has a purchasing power of approximately $0.50).

tax and the new eco-tax on fossil fuel) and a subsidy from the federal government. The 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.

5.2.2 Benefit Types

The German public retirement insurance provides *old-age pensions* for workers aged 60 and older, *disability benefits* for workers below age 60, which are converted to old-age pensions latest at age 65, and *survivor benefits* for spouses and children. In addition, preretirement (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.

5.2.3 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, corresponding to normal retirement and four types of early retirement (see table 5.1).

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, the unemployed, and older disabled workers. "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 ways to claim old-age disability benefits. One has to (1) be at least 50 percent physically disabled, (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). 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 the following), full benefits are paid in all three cases.

Figure 5.2 shows the uptake of the various pathways,[6] including the disability pathway described subsequently, (adding to 100 percent on the vertical axis) and their changes over time (marked on the horizontal axis), mostly in response to reforms, benefit adjustments, and administrative rule changes, in particularly the tightening of the disability screening process. This figure shows the multitude of possible pathways. A major undertaking of this chapter is to take account of this diversity.

Through the 1992 social security reform and its subsequent modifica-

6. See Jacobs, Kohli, and Rein (1990) for this concept.

Table 5.1 **Old-Age pensions (1972 legislation)**

Pension type	Retirement age	Years of service	Additional conditions	Earnings test
A Normal	65	5		No
B Long service life ("flexible")	63	35		Yes
C Women	60	15	10 years 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 3 years of unemployment (has changed several times)	Yes

Note: This legislation was changed in the reform of 1992. It has been effective until the year 1998.

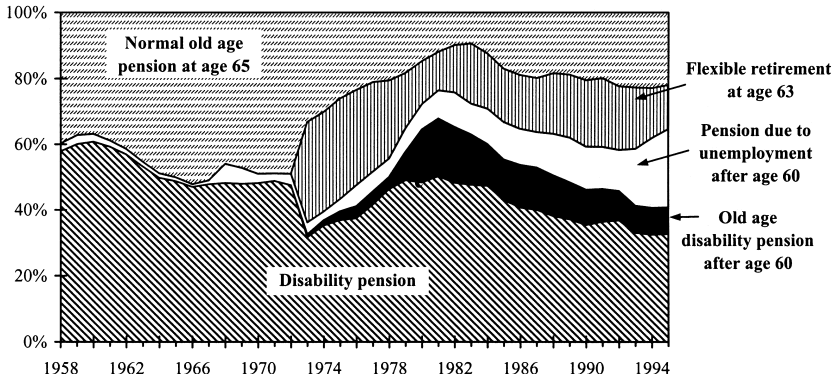


Fig. 5.2 **Pathways to retirement (males), 1960–95**

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

5.2.4 Benefits

Benefits are strictly work related. The German system does not have benefits for spouses, as in the United States.[7] Benefits are computed on a lifetime basis and are adjusted according to the type of pension and retirement age. They are the product of four elements: (1) the employee's relative earnings position, (2) the years of service life, (3) adjustment factors for pension type and (since the 1992 reform) retirement age, and (4) the aver-

7. There are, of course, survivor benefits.

age 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 thirty-five years. A similar rule was introduced in the 1992 reform: for contributions between 1973 and 1992, multiples below 75 percent are multiplied by 1.5 up to the maximum of 75 percent, effectively reducing the redistribution for workers with income positions below 50 percent.

Years of service life are years of active contribution plus years of contribution on behalf of the employee and years that are counted as service years even when no contribution was 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, some allowance for advanced education, and so forth, introducing a second element of redistribution. The official government computations, such as the official replacement rate (*Rentenniveau*) assume a forty-five-year contribution history for what is deemed a normal earnings history (*Eckrentner*). In fact, the average number of years of contributions is about thirty-eight years. Unlike the United States, 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.

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. The net replacement rate for a worker with a forty-five-year contribution history is 70.5 percent in 1998. For the average worker with thirty-eight years of contributions, it is reduced to 59.5 percent. Unlike the United States, the German pension system has only little redistribution, as is obvious from the benefit computation.[8] The low replacement rates for high incomes results from the upper limit to which earnings are subject to social security contributions—they correspond to a proportionally lower effective contribution rate.

Before 1992, *adjustment of benefits to retirement age* was only implicit via years of service. Because benefits are proportional to the years of service,

8. See Casmir (1989) for a comparison.

Table 5.2 **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		
Age	Pre-1992[a]	Post-1992[b]	Pre-1983[c]	Post-1983[d]	Actuarially 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

Source: Börsch-Supan and Schnabel (1999).

[a]GRV 1972–92.

[b]GRV after 1992 reform has fully phased in.

[c]U.S. Social Security (OASDHI) until 1983.

[d]U.S. Social Security after 1983 Social Security Reform has fully phased in.

[e]Evaluated at a 3% discount rate, 1992–94 mortality risks of West German males and an annual increase in net pensions of 1%.

a worker with fewer years of service will get lower benefits. With a constant income profile and forty years of service, each year of earlier retirement decreased pension benefits by 2.5 percent, and vice versa.

The 1992 social security reform changed this by the year 2004. 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 5.1 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 5.1, the pension is increased by 6 percent in addition to the natural increase by the number of service years.

Table 5.2 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 percent discount rate.[9]

While neither the German nor the American system were actuarially fair

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

prior to the reforms, the public retirement system in Germany as enacted in 1972 was particularly distorted. 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 toward the earliest applicable retirement age. The 1992 reform has diminished but not abolished this incentive effect.

5.2.5 Disability and Survivor 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 the following) 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 led to stricter legislation.[10]

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 section 5.3. Certain earnings tests apply if the surviving spouse has her or his own income, that is, her or his own pension. This is only relevant for a very small (below 10 percent) share of widows. Only since recently are male and female survivors treated equally. 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).

5.2.6 Preretirement

In addition to benefits through the public pension system, transfer payments (mainly unemployment compensation) enable what is referred to as *preretirement.* Labor-force exit before age 60 is frequent: about 45 percent

10. See Riphahn (1995) for an analysis of disability rules.

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 preretirement schemes.

Unemployment compensation has been used as preretirement income in an official 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 5.1) 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 in 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 workforce.

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

5.2.7 Retirement Behavior

The average retirement age in 1998 was 59.7 for men and 60.7 for women. These numbers refer to West Germany. In the East, retirement age was 57.9 for men and 58.2 for women. The fraction of those who enter retirement through a disability pension has declined; see figure 5.2, and was 29 percent in 1998. Only about 20 percent of all entrants used the normal pathway of an old-age pension at age 65. The most popular retirement age is 60.

5.2.8 Pension Reform

During and since the estimation sample period, there have been two major pension reforms—1992 and 2001—and many smaller adjustments in between. The main changes in the 1992 reform were to anchor benefits to net rather than to gross wages. This has implicitly reduced benefits, since taxes and social security contributions have increased, reducing net relative to gross wages. This mechanism is particularly important as the population's aging accelerates. The other important changes in 1992 were the introduction of adjustments to benefits in some (not all) cases of early retirement and a change in the normal retirement age for women. They have been described in subsection 5.2.4. They will be fully effective in 2009

and will reduce the incentives to retire early, although they are still not actuarially fair, even at very low discount rates.[11]

The 1999 pension reform, which was supposed to lower the replacement rate according to a prespecified so-called demographic factor, was revoked after a change of government. A side effect of this reform, which was not revoked, is a gradual change of eligibility ages for pensions for women and unemployed (types C and E in table 5.1) from age 60 to age 65. This change will be fully implemented by 2017 and will effectively leave a window of retirement for only those who have at least thirty-five years of service.

The 2001 reform was a major change in the system. It will change the monolithic German system of old-age provision to a genuine multipillar system. Benefits will gradually be reduced by about 10 percent, lowering the replacement rate with respect to the average net earnings from 72 percent in 1997 to 64 percent in 2030. The effective benefit cuts are even larger, since the credit of earnings points for education and training will be greatly restricted. On the other hand, a redefinition of the official replacement rate minimizes the perception of these cuts, because the so-defined new replacement rate will be 67 percent with respect to a smaller net earnings base. The resulting pension gap of slightly less than 20 percent of the current retirement income is supposed to be filled with occupational and individual pensions. This new pillar is not mandatory, but the required private savings will be subsidized or tax privileged. The 2001 reform did not change the normal retirement age or the adjustment factors with respect to early retirement age that provide the large incentives to retire early, the main subject of this project.

5.3 Public Sector Pensions

There are two types of workers in the public sector: civil servants and other public sector workers. As already mentioned, the latter are part of the same system as the private sector workers described in the previous section. In addition, they participate in a supplemental system that resembles occupational pensions elsewhere and raises the pensions of public sector workers to the level of civil servants.

Civil servants do not pay explicit contributions for their pensions, as do the other employees in the private and public sectors.[12] Instead, the gross wage for civil servants is lower than the gross wage of other public sector employees with a comparable education. Civil servants acquire pension claims that are very generous compared to workers in the private sector.

11. Not even at zero.

12. Civil servants are also exempt from unemployment insurance contributions, since civil servants have a lifetime job guarantee. The government pays a certain percentage of health expenses of the civil servant and his or her dependents (ranging from 50 to 80 percent). The rest has to be covered by private insurance.

5.3.1 Eligibility: Pathways to Retirement for Civil Servants

There are three pathways for civil servants: the standard, the early, and the disability retirement option. The standard retirement age is 65. Before July 1, 1997, the early retirement age for civil servants was 62, one year less than the early retirement age in the social security system. In 1997, the early retirement age was raised to 63. Discount factors for early retirement are phased in linearly between the years 1998 and 2003, and will reach 0.3 percentage points per month of early retirement, the same as in the private sector and substantially smaller than is actuarially fair. Since our sample covers the years 1984 to 1997, these changes of rules do not play a role in our analysis.[13]

Filing for disability is a third pathway to retirement for civil servants. In the case of disability, a civil servant receives a pension that is based on his or her previous salary. The replacement rate depends on the number of service years reached before disability retirement and the number of service years that could potentially have been accumulated, up to age 60. For those who did not reach the maximum replacement rate before disability, one additional year of service raises the replacement rate by only 0.3 percentage point per year.

5.3.2 Computation of Pensions

The standard pension benefit for civil servants is the product of three elements: (1) the last gross earnings level, (2) the replacement rate as a function of service years, and (3) the new adjustment factors to early retirement. As described earlier, this third component does not affect our sample. There are three crucial differences between civil servants' pensions and private sector benefits. First, the benefit base is gross rather than net income. In turn, civil servants' pensions are taxed like any other income. Finally, the benefit base is the last salary, rather than the lifetime average.

In the following, we concentrate on describing how the system worked for the sample period 1984–97. Benefits are anchored to the earnings in the last position and then updated annually by the growth rate of the net earnings of active civil servants. If the last position was reached within the last two years before retirement, the pension is based on the previous, lower position. Due to the difference in the benefit base, gross pensions of civil servants are approximately 25 percent higher (other things being equal) than in the private sector.

The maximum replacement rate is 75 percent of *gross* earnings, which is considerably higher than the official replacement rate of the private sector system, which is around 70 percent of *net* earnings. The replacement rate depends on the years of service. High school and college education,

13. Very specific rules apply to some civil servants. For example, the regular retirement age for police officers is 60; for soldiers it is even lower, depending on their rank.

military service, and other work in the public sector are also counted as service years. For retirement after June 1997 the college education credit is limited to three years.

Before 1992, the replacement rate was a nonlinear function of service years. The replacement rate started at a value of 35 percent for all civil servants with at least five years of service. For each additional year of service between the 10th and the 25th year the increment was 2 percentage points. From the 25th to the 35th year the annual increment was 1 percent. Thus, the maximum replacement rate of 75 percent was reached with thirty-five service years under the old rule. This is much more generous than the private sector replacement rate of 70 percent, which requires forty-five years of service.

For persons retiring after January 1, 1992, the replacement rate grows by 1.875 percent points for each year of service. Thus, the maximum value is reached after forty years of service. However, there are transitional modifications to that simple rule. First, civil servants who reach the standard retirement age (usually age 65) before January 1, 2002, are not affected at all. Second, for younger civil servants, all claims that have been acquired before 1992 are conserved. These persons gain 1 additional percentage point per year from 1992 on. All persons who have acquired twenty-five service years before 1992 have reached 65 percentage points and would also have gained only 1 additional point per year under the old rule. Only persons with less than twenty-five service years in 1991 can be made worse off by the reform. The new proportional rule only applies if it generates a higher replacement rate than the transitional rule. Our calculations of pension wealth use these institutional changes, but only a few special cases are affected.

The generosity of gross pensions received by civil servants vis-à-vis the private sector workers is only partially offset by the preferential tax treatment of private sector pensions. Since civil servants' pensions are taxed according to the German comprehensive income taxation, the net replacement rates of civil service pension recipients depends on their position in the highly progressive tax schedule. In general, the net replacement rate with respect to the preretirement net earnings is higher than 75 percent, and thus considerably more generous than in the private sector.

5.3.3 Incentives to Retire

In the estimation sample, most civil servants have reached the maximum replacement rate by the age of 54. Persons who have started to work in the public sector before the age of 23 have reached a replacement rate of 75 percent when taking into account the disability rules. This also holds for civil servants, who—like professors—receive lifetime tenure late in their life cycle. For those groups, the starting age is usually set to 21. Additional

years of service beyond the age of 54 increase pensions only if the civil servant is promoted to a position that has a higher salary. Retirement incentives therefore strongly depend on promotion expectations.

For persons who cannot expect to be promoted after age 54 the pension accrual is zero or very small. For those who have already reached the replacement rate of 75 percent, the accrual of the present discounted pension wealth is negative. Since the replacement rate is 75 percent of the gross earnings in the last position before retirement, the negative accrual of postponing retirement by one year is simply 75 percent of the last gross earnings. This is equivalent to a 75 percent tax on earnings.

For persons who expect to climb another step in the hierarchy the gross wage increase is, on average, 10.5 percent. This raises the pension by approximately 10 percent. In order to cash in the higher pension, the civil servant has to defer retirement by at least one year.[14] In this extreme case, the social security wealth increases 10 percent through the effect of higher pensions and decreases by 5 percent through the effect of pension deferral. In this extreme case, the pension accrual is positive. If the civil servant has to wait several years for the next promotion (or for the promotion to have an effect on pension claims) the accrual of working becomes negative.

The dependency on promotion expectations makes modeling the incentive effects for civil servants very hard, since the researcher needs information on the career prospects of the respondent. We do not have such information in our data and must therefore ignore the effect of potential promotions.

5.3.4 Retirement Behavior

The retirement behavior of civil servants reflects the German pension system's very generous disability and early retirement rules. The average retirement age for civil servants in the year 1993 was 58.9, about one year lower than in the private sector (see section 5.2.7). Disability is the most widely used pathway to retirement for civil servants: 40 percent of those who retired in the year 1993 used disability retirement. Almost one third used the early retirement option at the age of 62. Only about 20 percent of civil servants retired at the regular retirement age of 65.

5.4 Data and Base Model

Our microsimulation model is based on a computation of social security wealth for a large sample of German workers, drawn from the German Socio-Economic Panel (GSOEP). It is the same sample that we used in our

14. For the higher earnings to take effect on pensions it is usually required to work several years after the promotion.

second-stage paper (Börsch-Supan et al. 2003) to estimate the elasticities of labor supply with respect to the incentives toward early retirement. Our simulations then focus on a single cohort, namely all males born in 1942 (age 55 in 1997) and their spouses. Additional aggregate information was taken from data compiled by the German retirement insurance organization (Verband deutscher Versicherungträger [VDR]) and the German Department of Labor (Bundesministerium für Arbeit und Sozialordnung [BMA]). These data include annual statistics on average earnings, pension system entries and exits, retirement age, and so on (VDR 2002) and system parameters (BMA 1997). This section describes the data, the construction of social security wealth, the definition of incentive variables, and then briefly discusses the base estimates from our stage-two econometric estimation.

5.4.1 The German Socio-Economic Panel

The German Socio-Economic Panel (GSOEP) is an annual panel study of some 6,000 households and some 15,000 individuals. The data are gathered by the German Institute for Economic Research (DIW). The GSOEP is a panel survey of private households. Its design closely corresponds to the U.S. Panel Study of Income Dynamics (PSID).[15] The GSOEP includes carefully designed household weights that match the data with the German *Mikrozensus.* The panel started in 1984. We use 14 annual waves, through 1997.

In 1997, the GSOEP had four subsamples: (1) West German citizens (9,000 persons in 1984); (2) Foreign workers from Spain, Italy, Greece, Turkey, and the former Yugoslavia, residing in West Germany (3,000 persons in 1984, oversampled); (3) East German citizens (4,000 persons sampled from 1991 on); and (4) Germans who have remigrated (mainly from Romania and the former USSR; 1,000 persons sampled in 1995). We draw our working sample from samples 1 and 2, since the labor supply patterns of East Germans and remigrants are substantially different from residents in West Germany—such that pooling these samples is not warranted.[16]

We constructed a both-sided unbalanced panel of all persons aged 55 through 70 from subsamples 1 and 2 for which earnings data are available.[17] This panel includes 2,223 individuals, with 14,401 observations.

15. Wagner, Burkhauser, and Behringer (1993) provide an English-language description, code books, and links to an internationally accessible GSOEP version. Börsch-Supan (2000a) discusses the merits and limits of the GSOEP data for studies of retirement behavior.

16. Schmähl (1991) provides a narrative of the transition.

17. We excluded East Germany because retirement patterns in the East are dominated by the transition problems to a market economy. See Börsch-Supan and Schmidt (1996) for a comparison.

Average observation time is 6.5 years. The panel is left-censored, as we include only persons who have worked at least one year during our window in order to reconstruct an earning history. There is only a slight right censoring due to missing interviews. Specifically, foreign workers often leave Germany after retirement. However, since this affects only a few cases, we did not model this censoring. The sample contains private sector workers, civil servants and other public sector workers, and self-employed.

The GSOEP data provide a detailed account of income and employment status. Since the GSOEP performs personal interviews with each member aged 17 and over in the households, we have the same information on husbands and spouses. The personal information includes labor market status, gross and net income, hours worked, education, and marital status, but only a subjective indicator of health (plus disability status and number of doctor and hospital visits). The GSOEP also has a very detailed labor market calendar that provides monthly information on the labor market status (full time, part time, retired, unemployed, education) and its corresponding income for each sample person. This detailed information is augmented during the sample period by a retrospective history of labor force participation that starts with age 15. It carries the annual labor market status (full time, part time, unemployed, out-of-labor force, etc.) but has no retrospective earnings information. Our second-stage paper (Börsch-Supan et al. 2002) describes in detail how we reconstruct the earnings history of each sample person.

Table 5.3 presents the descriptive statistics of the most common socioeconomic variables in our working sample.

Table 5.3 **Descriptive statistics of main variables**

Variable	Valid observations	Mean	Standard deviation	Minimum	Maximum
Age	14,401	59.77	4.88	53	70
Health	14,401	8.09	3.05	0	10
Married	14,401	86%	34%	0	1
College	14,401	11%	31%	0	1
Skilled	14,401	86%	58%	0	2
Homeown	14,398	52%	50%	0	1
No wealth	14,312	11%	31%	0	1
Financial assets	14,401	22%	42%	0	1
Experience	14,401	450.29	96.01	0	646
Former self-employed	14,401	9%	29%	0	1
Former civil service	14,359	8%	27%	0	1
Children in household	14,401	33%	47%	0	1

Source: GSOEP, working sample of males, 1984–97.

5.4.2 Handling of Multiple Retirement Programs

A worker at age 55, at least theoretically has the choice between three retirement programs:

- old-age pensions, starting at age 60
- disability pensions
- preretirement schemes

The set of choices is actually larger, because some of these programs have several branch programs (within old-age pensions: unemployment, long-service life, etc.) as was depicted in figure 5.2. We refer to these choices as *pathways,* as we have done in figure 5.2. It is important to notice that all of these pathways pay the same benefit, once a person is eligible.[18]

In practice, there is no free choice, since most of these pathways are subject to eligibility criteria. Among those, we distinguish between strict eligibility rules that are tied to objective variables such as age, gender, and previous contribution history, and soft eligibility rules, which are subject to discretionary decisions, notably the determining of a worker's disability status.[19]

In the construction of social security wealth and the incentive variables (see the following), we need to compute expected pension benefits, which depend on the choice of pathway. In the computation of this expected value, we use the observed frequencies as weights. Let's suppose that the observed frequency of disability status at age 59 is 33 percent, and the sample person is not eligible for any other pathway at that age. Then, expected benefits at age 59 for this person will be a third of the (common) benefit level. Börsch-Supan (2001) provides an instrumental variables interpretation of this method and explores the sensitivity with respect to a more sophisticated choice of instruments.

5.4.3 Construction of Social Security Wealth

A key statistic in our computation of budget impacts is the change in the net present value of all future benefits when retirement is postponed. In a slight misuse of terminology, we call the net present value of all future benefits *social security wealth* (SSW) for both private sector and civil servants' pensions.

We define social security wealth as the expected present discounted value of benefits ($YRET$) minis applicable contributions that are levied on gross earnings ($c \cdot YLAB$). Seen from the perspective of a worker who is S years old and plans to retire at age R, social security wealth (SSW) is

18. Strictly speaking, preretirement programs can have any benefit level, because they are negotiated between workers and employers. In practice, however, the outcome of these negotiations is guided by public insurance benefits.

19. *Disability* depends on health as well as labor market characteristics.

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

with

SSW	net present discounted value of retirement benefits
S	planning age
R	retirement age
$YLAB_t$	gross labor income at age t
$YRET_t(R)$	net 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
δ	discount factor = $1/(1 + r)$.

We choose the usual discount rate of 3 percent. Conditional survival probabilities are computed from the standard life tables of the German Bureau of the Census (*Statistisches Bundesamt*). SSW depends also on the *joint* survival probabilities of spouses through survivor pensions. We assume independence of survival of spouses to compute the joint probability.

5.4.4 Specification of Incentive Variables

The *behavioral effect,* which represents the labor supply response to the simulated reform plans as explained in the introduction, is determined by the elasticity of labor supply with respect to the incentives in the pension system. We use two different forward-looking incentive measures:

- *PEAKVAL:* the maximum of future SSW over all possible retirement ages minus the SSW for immediate retirement
- *OPTVAL:* the option value of postponing retirement by 1 year.

The *peak value* suggested by Coile and Gruber (2000) takes the difference between SSW today and SSW in the year in which the expected value of SSW is maximized:

$$PEAKVAL_S(R) = SSW_S(R) - \max_{T>R}[SSW_S(T)]$$

This measure therefore captures the tradeoff between retiring today and working until a year with a much higher SSW. In years beyond the year in which SSW peaks, this calculation collapses to a simple one-year accrual variable.

The peak value captures only the financial aspects of the retirement decision. Alternatively, one might consider the consumption utility of net earnings and pension benefits and also account for the utility aspects of the labor-leisure tradeoff. To this end, we employ as a second incentive variable the option value to postpone retirement (Stock and Wise 1990; Börsch-Supan 2000b). This value expresses for each retirement age the trade-off

between retiring now (resulting in a stream of utility that depends on this retirement age) and keeping all options open for some later retirement date (with associated streams of utility for all possible later retirement ages).

Let $V_t(R)$ denote the expected discounted future utility at age t if the worker retires at age R, specified as follows:

$$V_t(R) = \sum_{s=t}^{R-1} u(YLAB_s^{\mathrm{NET}}) \cdot a_s \cdot \delta^{s-t} + \alpha \sum_{s=R}^{\infty} u[YRET_s(R)] \cdot a_s \cdot \delta^{s-t},$$

with

$YLAB_s^{\mathrm{NET}}$	after-tax labor income at age s, $s = t \ldots R-1$
$YRET_s(R)$	pension income at age s, $s > R$
R	retirement age
α	marginal utility of leisure, to be estimated
a	probability to survive at least until age s
δ	discount factor $= 1/(1 + r)$.

Utility from consumption is represented by an isoelastic utility function in after-tax income, $u(Y) = Y^{\gamma}$. Remember that pension income in Germany is effectively untaxed. To capture utility from leisure, utility during retirement is weighted by $\alpha > 1$, where $1/\alpha$ is the marginal disutility of work.

The option value for a specific age is defined as the difference between the maximum attainable consumption utility if the worker postpones retirement to some later year minus the utility of consumption that the worker can afford if the worker would retire now. Let $R^*(t)$ denote the optimal retirement age if the worker postpones retirement past age t, that is, $\max[V_t(r)]$ for $r > t$. With this notation, the option value is

$$G(t) = V_t[R^*(t)] - V_t(t).$$

The option value captures the economic incentives created by the pension system and the labor market, because the retirement income $YRET_s(R)$ depends on retirement age, according to the adjustment factors and on previous labor income by the benefit rules summarized in sections 5.2 and 5.3.

We compute the peak and option values for every person in our sample, using the applicable pension regulations and the imputed earning histories. The parameters chosen are a discount rate δ of 3 percent, a curvature parameter γ of 1.0, and a relative utility parameter α of 2.8; see our second-stage paper.

5.4.5 Base Model Estimates

The *behavioral effect* is based on the probit estimates obtained in the second stage of this project. See Börsch-Supan et al. (2002) for a detailed discussion. The probit estimations regressed old-age labor force status on one

Table 5.4 **Marginal effect of incentive variables**

	Option value: Age			Peak value: Age		
	Linear	Quadratic	Dummies	Linear	Quadratic	Dummies
Males						
Without SSW	–0.00023237	–0.0020934	–0.0024276	–0.0012644	–0.00107072	–0.00292954
	(–5, 5)	(–5, 0)	(–5, 5)	(–3, 8)	(–3, 2)	(–5, 7)
With SSW	–0.00030332	–0.00027806	–0.0003286	–0.00126031	–0.00105993	–0.00293449
	(–6, 1)	(–5, 6)	(–6, 2)	(–3, 7)	(–3, 2)	(–5, 7)
Females						
Without SSW	–0.00005129	–0.00006159	–0.00010106	–0.00133364	–0.00159996	–0.00270272
	(–3, 4)	(–3, 1)	(–3, 1)	(–5, 1)	(–5, 0)	(–4, 2)
With SSW	–0.00005499	–0.00006957	–0.00013015	–0.00155703	–0.00189241	–0.00384073
	(–3, 7)	(–3, 4)	(–3, 7)	(–5, 2)	(–5, 1)	(–4, 6)

Source: GSOEP, working sample, 1984–97.
Note: $\partial P/\partial x$ and *t*-statistics (in parentheses).

of the two incentive variables—peak value and option value—just described, and a set of other explanatory variables: an array of socioeconomic variables such as age, gender, marital status, wealth (indicator variables of several financial and real wealth categories), and a self-assessed health measure ranging from 0 for poor to 10 for excellent health.

Table 5.4 summarizes the base estimation results from 24 different models.[20] We use two different incentive variables (option value and peak value). For each of these incentive variables, we run probit regressions with three age specifications (linear, quadratic, and a full set of age dummies) and with and without including social security wealth. We pool public and private workers, but have separate regressions for males and females.

All incentive variables have the correct sign and are highly significant. They are very robust across all the different specifications, including inclusion of other covariates, sample selection, and definition of retirement (not shown in table 5.4). Including age dummies yields larger marginal effects and better precision, while including SSW has a very small weakening effect.

Among the other covariates, self-reported health is highly significant: healthier workers retire substantially later than those who report poor health. The effect of a college degree on retirement age is also very strong—independent of wealth and income effects. The wealth variables are barely significant: persons with higher wealth (homeownership, financial assets) afford an earlier retirement. Also, higher labor income weakens labor force attachment. The self-employed tend to work longer, while civil servants retire earlier.

20. The estimates differ slightly from those in Börsch-Supan et al. (2002) due to various changes in the common definitions' template.

5.5 Simulation Results

We now apply these estimated coefficients to simulate the budget effects of pension reforms. We first describe the design of the simulations. Second, we sketch the behavioral responses to the reforms, namely the changes in retirement age. Third, we present the budget effects, both in summary and disaggregated by age, by behavioral and mechanical effects, and by benefits and taxes/contributions. We end this section by discussing distributional issues.

5.5.1 Design of Simulations

All simulations are based on the 1942 cohort of preretirement workers (age 55 in 1997). We include (a) all male workers and their spouses (if any) and (b) all single female workers of this cohort.

Since this leaves us with a rather small sample, we augment this original cohort by thirteen additional cohorts, born between 1929 and 1941, by synthetically de-aging them to the more youthful 1942 cohort. This is done by assigning the persons in the earlier cohorts the earnings history and other characteristics (including age) they would have had at age 55. This procedure is possible because we have constructed complete earnings histories.

Based on this synthetic cohort, we first estimate the probability that each worker will exit the labor force via death or retirement at each future age and the net present discounted value of retirement program contributions and benefits associated with each type of labor force exit. The resulting weighted average social security wealth is our base for comparison. We then reestimate the exit probabilities, contributions, and benefits under several reforms in order to obtain new social security wealth estimates. Our key result is the percentage change in social security wealth, including and excluding a behavioral response to the reform, as the difference between these numbers measures the extent to which labor supply responses amplify the effect of reforms on program solvency.

We use three hypothetical reform scenarios (Three-Year Reform, Actuarial Reform, and Common Reform, explained in more detail later) and apply them systematically to several variants of our estimated models of retirement. These variants include the option value and the peak value model, each of which is estimated using a linear and a dummy-variable age specification. In the latter case and in combination with the Three-Year Reform, we introduce yet another two variants: keeping the dummy variables at their original ages (fixed dummies specification), or shifting them along with the shift in the incentive variables (shifted dummies specification). These latter variants are designed to bracket possible behavioral effects that are embedded in the age dummies; in particular, habitual effects associated with age 65 as a psychological anchor for retirement decisions.

The Three-Year Reform increases the age of early and normal retirement by three years relative to the status quo; it also shifts the corresponding adjustment factors, if applicable. The Actuarial Reform introduces a 6 percent per year actuarial adjustment, pivoted at age 65, roughly doubling the value that was legislated by the 1992 reform in Germany. The Common Reform changes all national systems to a common system with an early retirement age of 60 years, a normal retirement age of 65 years, a 60 percent replacement rate at age 65, and a 6 percent per year actuarial adjustment, pivoted at age 65. For Germany, this adds a reduction in the replacement rate of some 10 percentage points to the effect of the Actuarial Reform.

Even without a behavioral reaction, that is, without a response in labor supply, these reforms have an automatic effect on fiscal contributions by changing contributions and benefits for a given work history. We call this the *mechanical* effect of a reform. For instance, a shift in the early retirement eligibility age from age 60 to age 61 will leave those who retire at age 60 without benefits for a year, substantially reducing pension benefits.

Labor supply, however, is likely to respond to the shift in the early retirement age. This is the behavioral effect. Following up on our example, most of these early retirees will now work one additional year, adding the payroll contributions to the budget of the public pension system. The fiscal impact of this behavioral effect depends on two factors: first, on the strength of the labor force response as estimated in the previous section, and second, on the fiscal implications of the shift in retirement patterns. If a pension system is actuarially fair, a change in the average retirement age will not have any fiscal effect, provided that the discount rate used to define actuarial fairness equals the discount rate used to compute fiscal implications.[21]

There is actually a third effect, namely, the macroeconomic feedback effect of these reforms on the level of taxes and contributions. For instance, if a reform implies lower benefits, the government might lower the contribution rate to the pay-as-you-go budget. We do not model such feedback effects; our simulations are in this sense static simulations that exclude dynamic budget effects.

We simulate both the mechanical and the behavioral effect, using the econometric retirement models from the second stage to predict labor supply responses. The result is an estimate of the steady-state impact of the reforms on the financial balance sheet of the German public pension system.

21. We assume the same discount rate of 3 percent to define actuarial fairness and to compute intertemporal budget effects. One might argue that one should use a higher discount rate for actuarial fairness, reflecting the real rate of return on the capital market, and a lower discount rate for budget calculations, reflecting the low implicit rate of return of the pay-as-you-go system (Schnabel 1998, 1999).

Table 5.5 Expected retirement age

Model	Men	Women
Sample		
Sample frequencies	61.87	61.76
Base simulation		
Option value model, linear age	62.00	62.01
Option value model, dummies	61.87	61.79
Peak value model, linear age	62.00	62.01
Peak value model, dummies	61.88	61.79
Three-Year Reform		
Option value model, linear age	61.37	61.91
Option value model, dummies fixed	61.14	61.63
Option value model, dummies shifted	64.37	64.28
Peak value model, linear age	61.91	61.93
Peak value model, dummies fixed	61.75	61.68
Peak value model, dummies shifted	64.63	64.54
Actuarial Reform		
Option value model, linear age	65.28	63.86
Option value model, dummies fixed	64.92	63.92
Option value model, dummies shifted	64.96	64.14
Peak value model, linear age	63.53	64.08
Peak value model, dummies fixed	64.38	63.81
Peak value model, dummies shifted	64.34	64.01
Common Reform		
Option value model, linear age	65.42	62.77
Option value model, dummies fixed	65.02	62.69
Option value model, dummies changed	65.04	62.93
Peak value model, linear age	63.19	62.82
Peak value model, dummies fixed	64.05	62.71
Peak value model, dummies changed	63.97	62.93

Note: Expected value is taken over distribution truncated at age 72.

5.5.2 Behavioral Effects and Their Fiscal Implications

We begin with the behavioral effect, then describe its implications on the budget, and finally add the mechanical effect to obtain the total budget impact. We first summarize the behavioral effects of the hypothetical pension reforms on old-age labor supply as a change in the mean retirement age (see table 5.5) and then present detailed results in a set of graphs.[22]

The Three-Year Reform has little effect in the linear age and dummies-fixed specifications, and actually changes it insignificantly in the wrong direction. This may come as a surprise, but it is easy to explain. Since we

22. Figures differ from Börsch-Supan et al. (2003), since they refer to different reform implementations.

model the Germany disability insurance as a perfect substitute for old-age pensions, there is no effective early retirement age. Since there are no actuarial adjustments, shifting the normal retirement age has no economic implications as well (although there may be a psychological effect—this is modeled in the shifted-dummy specification following). The only difference of the Three-Year Reform is a shift of the bonus for retiring at age 66 or 67 to 69 and 70—but since most people have retired long before these ages, the reform undoes the minor incentive at the ages 66 and 67, and therefore shifts the average retirement age slightly forward. If we assume in the shifted-dummies specification, however, that the entire retirement behavior shifts by three years for psychological reasons related to the signaling effect of the normal retirement age, we more or less tautologically see such change.

In contrast, the other two reform policies shift the retirement age quite substantially, by between two and four years. Considering the overall length of retirement in Germany, which is currently about 18 years, the orders of magnitude are quite significant.

Figure 5.3 gives a more detailed description of the behavioral effect by looking on the impact of reforms by age of labor force exit. The figure has eighteen panels, corresponding to the eighteen simulation results in table 5.5. For each of the three reforms, we present six simulation variants. These variants include the option value and the peak value model, each of which is estimated using a linear and a dummy-variable age specification (see table 5.4). We split the latter specification in two treatments of the set of dummy variables, indicating age when we simulate the reform impact: (a) keeping the dummy variables at their original ages, and (b) shifting them along with the shift in the incentive variables. These two treatments are designed to bracket possible behavioral effects that are embedded in the age dummies; in particular, habitual effects, associated with age 65 as a psychological anchor for retirement decisions. Treatment (a) assumes that this anchor stays constant in spite of the three-year shift in retirement age in our first reform option, and the actuarial adjustment in the second reform option. Treatment (b) shifts the anchor according to the shift in the so-called normal retirement age.

We begin with figure 5.3, panel A. The linear age model does not capture the spikes typical for retirement behavior. They are clearly visible in the second and third panel, where dummy variables describe the effect of age on retirement. As previously described, the Three-Year Reform does not matter much in the German system unless the entire set of dummies is shifted by three years as well, modeling a shift in the perceived normal retirement by three years—see the third panel. In this case, not surprisingly, the spikes shift about three years later.

Panels B and C of figure 5.3 show the behavioral effects of the Actuarial

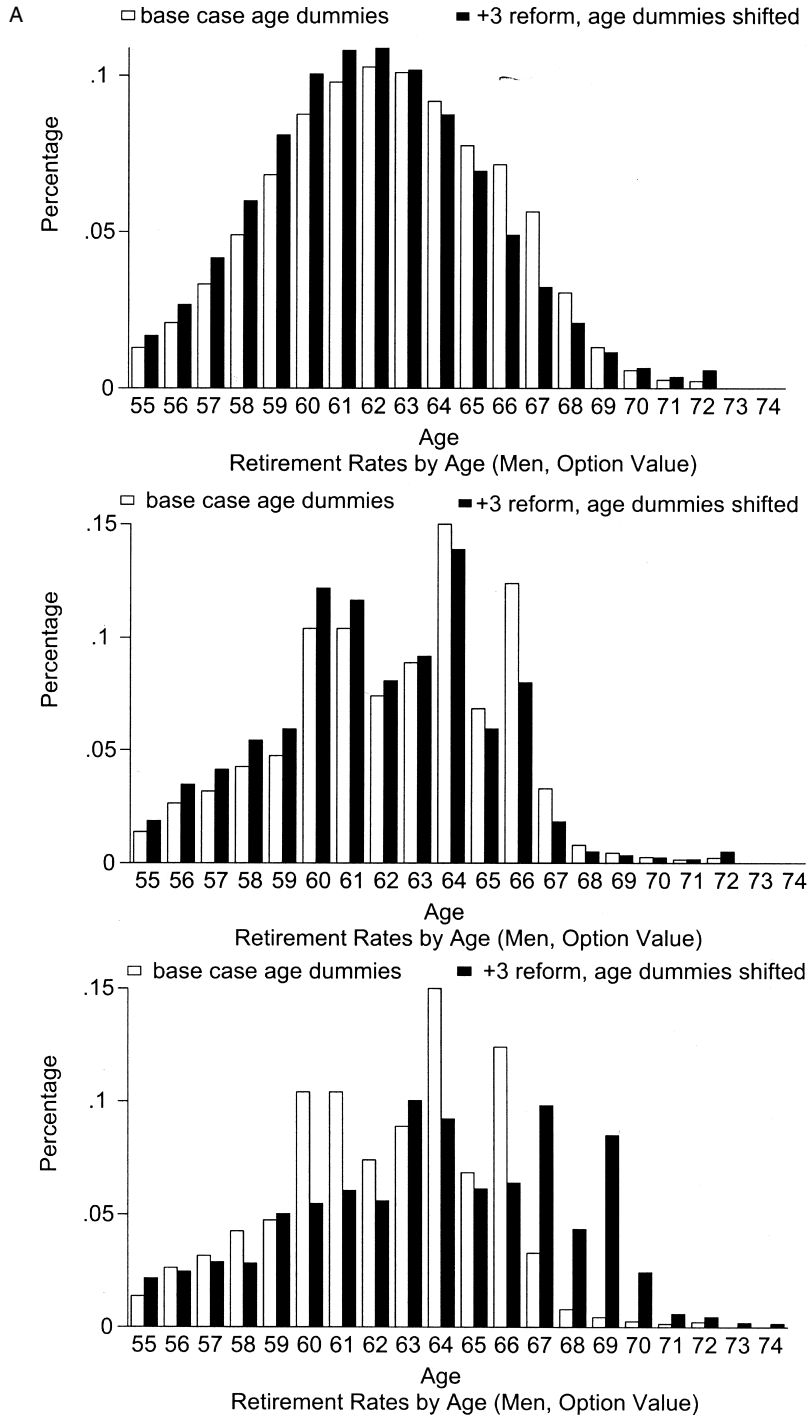
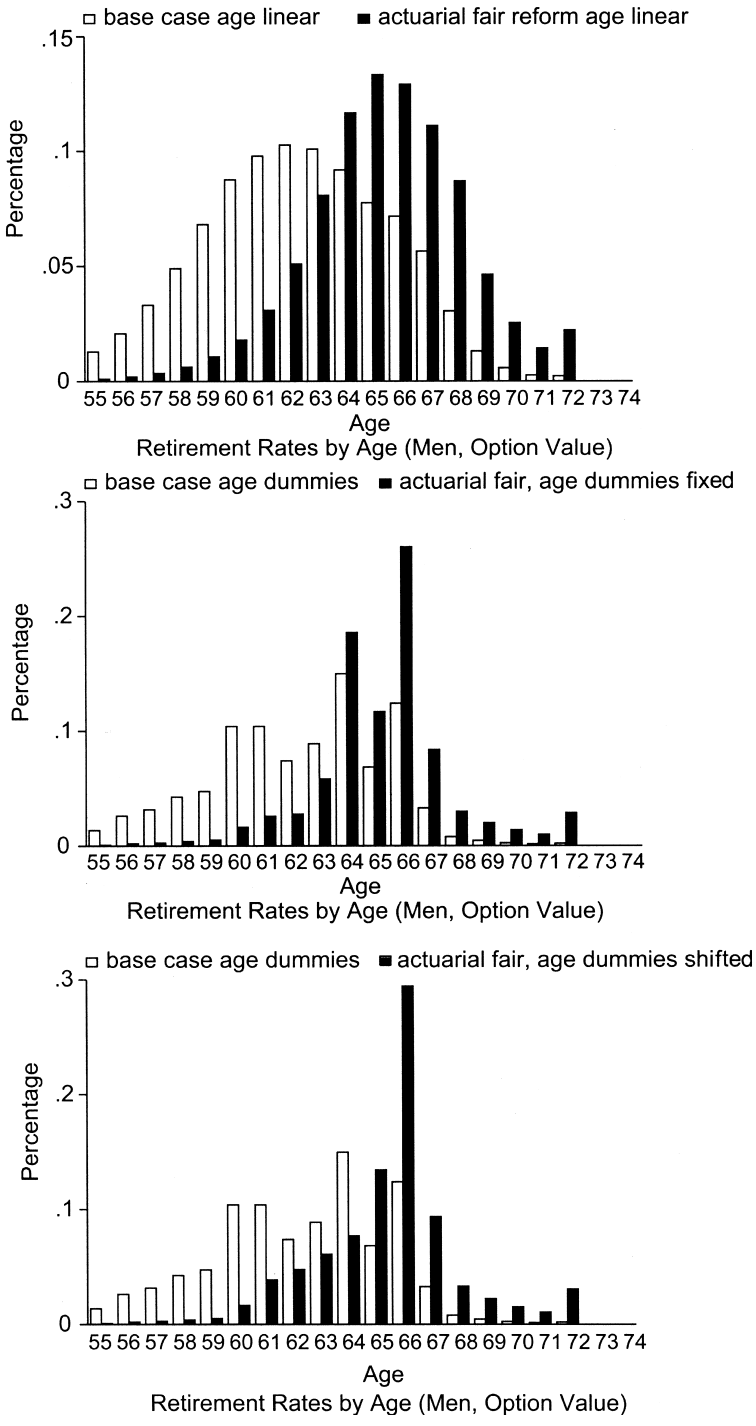


Fig. 5.3 Distribution of retirement rates: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Distribution of retirement rates: Actuarial Reform, peak value; *F,* Common Reform, peak value

B


base case age linear
actuarial fair reform age linear
Percentage
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.1
.05
0
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Retirement Rates by Age (Men, Option Value)
base case age dummies
actuarial fair, age dummies fixed
Percentage
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Age
Retirement Rates by Age (Men, Option Value)
base case age dummies
actuarial fair, age dummies shifted
Percentage
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Age
Retirement Rates by Age (Men, Option Value)

Fig. 5.3 (cont.)

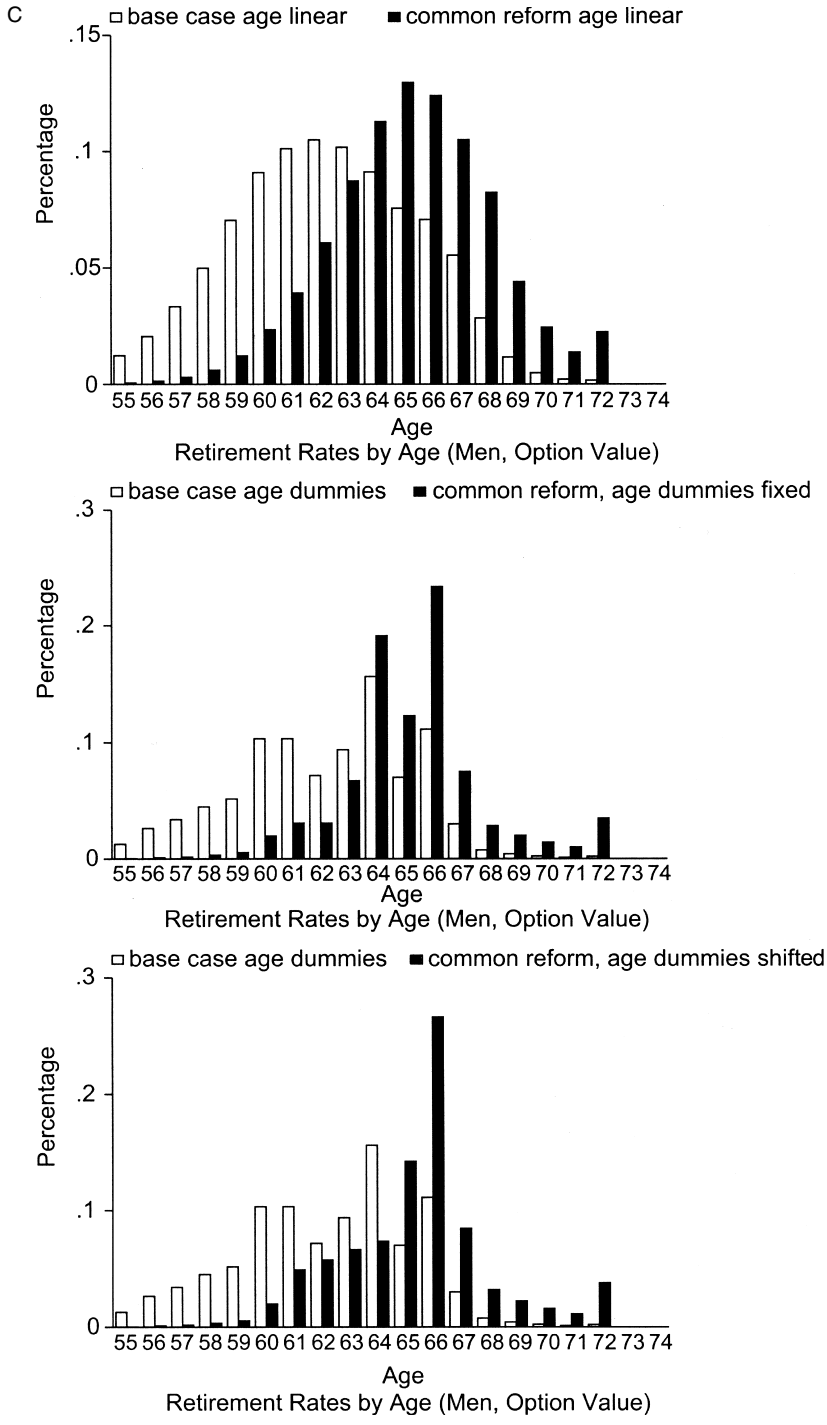
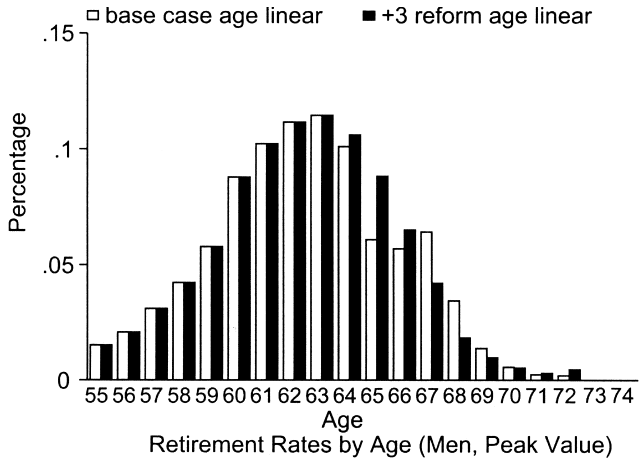


Fig. 5.3 (cont.) Distribution of retirement rates: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Distribution of retirement rates: Actuarial Reform, peak value; *F,* Common Reform, peak value

D


base case age linear
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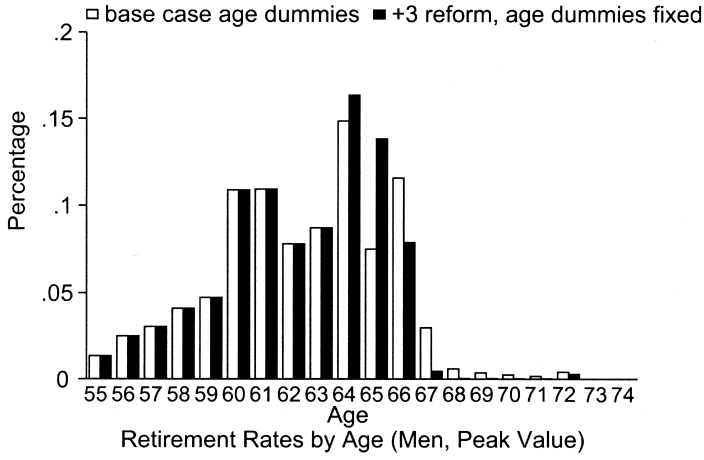
Age
Retirement Rates by Age (Men, Peak Value)


base case age dummies
+3 reform, age dummies fixed
Percentage
.2
.15
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0
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Retirement Rates by Age (Men, Peak Value)


base case age dummies
+3 reform, age dummies shifted
Percentage
.15
.1
.05
0
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Retirement Rates by Age (Men, Peak Value)

Fig. 5.3 (cont.)

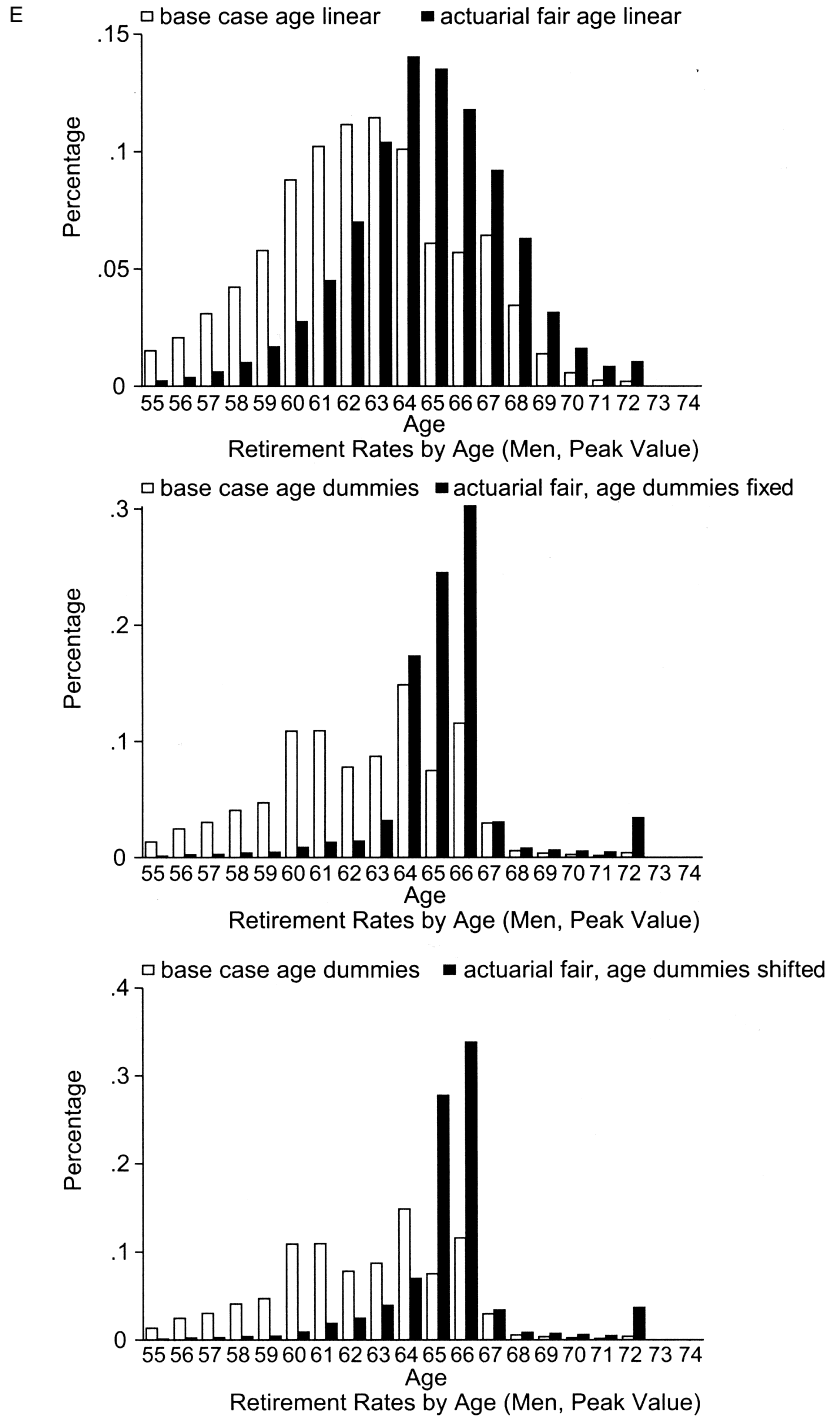
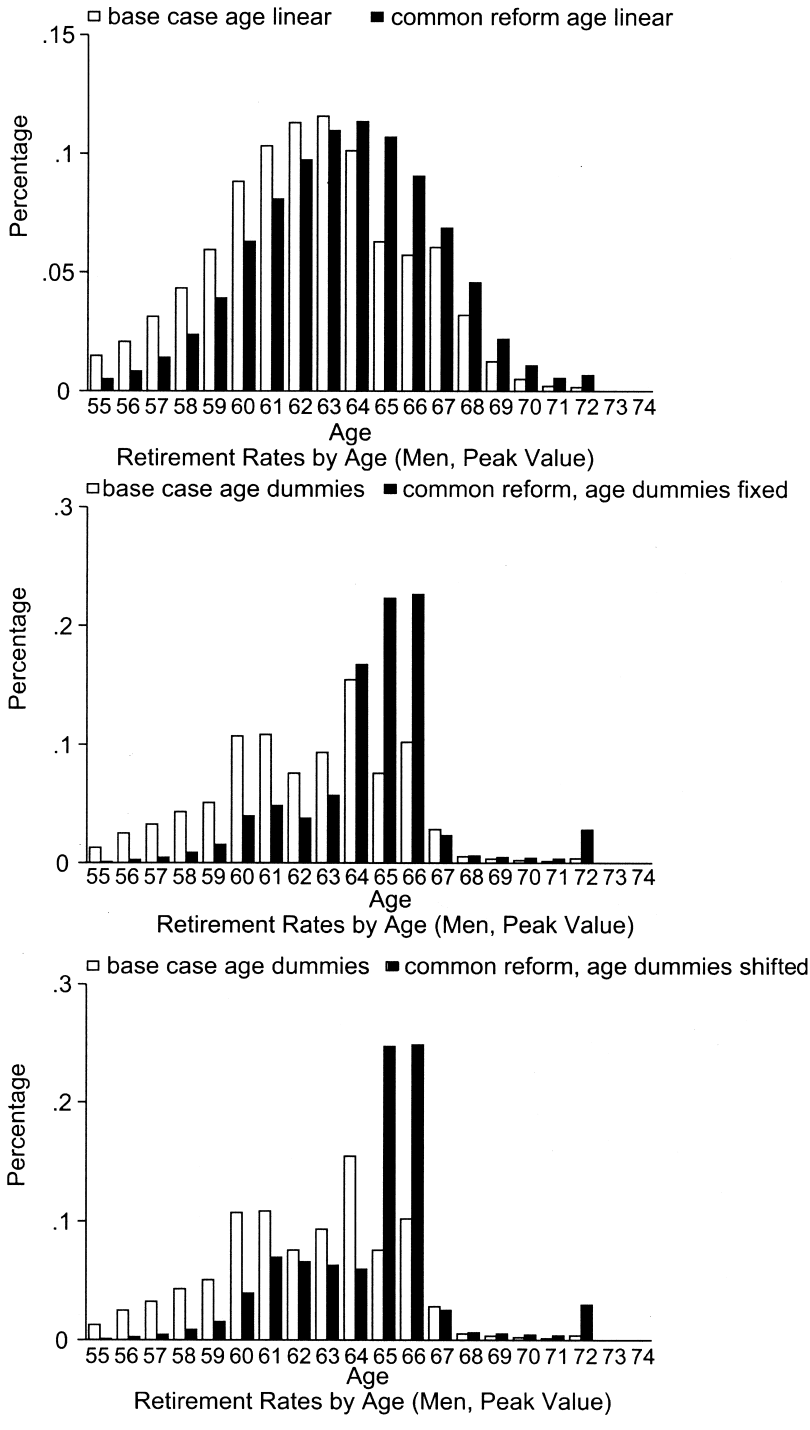


Fig. 5.3 (cont.) Distribution of retirement rates: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Distribution of retirement rates: Actuarial Reform, peak value; *F,* Common Reform, peak value

F


base case age linear
common reform age linear
Percentage
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.1
.05
0
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Age
Retirement Rates by Age (Men, Peak Value)
base case age dummies
common reform, age dummies fixed
Percentage
.3
.2
.1
0
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Retirement Rates by Age (Men, Peak Value)
base case age dummies
common reform, age dummies shifted
Percentage
.3
.2
.1
0
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Retirement Rates by Age (Men, Peak Value)

Fig. 5.3 (cont.)

Reform and the Common Reform, which are quite similar. Modal retirement age increases by four years in the linear specifications and by about two years in the dummy-variable specifications. Note that early retirement before age 63 is greatly reduced due to the actuarial adjustment.

Figure 3, panels *D–F* repeat the exercise, using the peak value estimates rather than the option value estimates. The estimated behavioral effects are qualitatively similar but somewhat smaller than in the option value model.

5.5.3 Budget Effects

Together with the mechanical effects of the reforms, the changing retirement patterns have substantial budget effects. Table 5.6 shows how they emerge.

The Three-Year Reform eliminates the incentives to retire at age 66 and 67, thereby very slightly reducing benefits (except panel B). Through the induced earlier retirement age, work-related taxes and contributions also decrease by about 8 percent according to the option value model, and between 1 and 2 percent in the peak value model. If we enforce a shift in the entire retirement distribution (panels C and F) in the shifted-dummies specification, benefits decrease a bit more, but the main budget effect is created by a substantial increase in taxes and contributions of about 25 percent.

The Actuarial Reform and the Common Reform postpone retirement by two to four years. This reduces benefits and increases taxes and contributions in a similar fashion as the Three-Year Reform in the dummies-shifted specification (benefits by some 10 percent, taxes and contribution by some 30 percent). While the behavioral effects are similar for the Actuarial Reform and the Common Reform (see figure 5.3), the additional mechanical effect of reducing the replacement rate in the Common Reform reduces benefits quite dramatically, by more than 30 percent.

Table 5.7 decomposes the budget effect into mechanical and behavioral effects. Note that the denominator of the percentage change in the last row of each panel is now the baseline PDV of benefits. The introduction of a 6 percent per year actuarial adjustment in the Actuarial Reform implies a reduction of pension expenditures for our 1942 cohort by 18 percent in direct benefit reductions and by an additional 26 percent through labor supply responses. The introduction of the hypothetical common pension system, used as a yardstick in all country chapters of this volume, which features an early retirement age of 60 years, a normal retirement age of 65 years, a 60 percent replacement rate at age 65, and a 6 percent per year actuarial adjustment, pivoted at age 65, will reduce pension expenditures by 37 percent directly and by about 26 percent through labor supply responses, relative to the pre-1992 system in Germany. This system has a steeper actuarial adjustment and a deeper pension cut than introduced by the actual 1992 and 2001 reforms.

Figure 5.4 converts these percent changes relative to baseline benefits

Table 5.6 **Fiscal impact of pension reform (euros per worker)**

	Present discounted value				Change relative to base (%)		
	Base	Three-Year	Actuarial	Common	Three-Year	Actuarial	Common
			Option value—S1				
Benefits	203.542	203.013	184.237	140.221	–0.3	–9.5	–31.1
Contributions	45.609	42.067	62.541	61.185	–7.8	37.1	34.2
Income taxes	63.409	58.750	86.109	84.432	–7.3	35.8	33.2
Other social security	59.407	55.232	78.786	76.504	–7.0	32.6	28.8
VAT	37.892	35.260	49.861	48.222	–6.9	31.6	27.3
Taxes: Total	206.317	191.309	277.297	270.343	–7.3	34.4	31.0
			Option value—S2				
Benefits	203.207	203.708	184.495	140.645	0.2	–9.2	–30.8
Contributions	45.229	41.050	62.245	60.999	–9.2	37.6	34.9
Income taxes	62.920	57.412	85.729	84.209	–8.8	36.3	33.8
Other social security	58.959	54.029	78.428	76.278	–8.4	33.0	29.4
VAT	37.607	34.501	49.632	48.073	–8.3	32.0	27.8
Taxes: Total	204.715	186.992	276.034	269.559	–8.7	34.8	31.7
			Option value—S3				
Benefits	203.207	184.914	184.829	140.763	–9.0	–9.0	–30.7
Contributions	45.229	57.782	62.788	61.471	27.8	38.8	35.9
Income taxes	62.920	79.596	86.413	84.807	26.5	37.3	34.8
Other social security	58.959	73.672	79.057	76.831	25.0	34.1	30.3
VAT	37.607	46.823	50.032	48.426	24.5	33.0	28.8
Taxes: Total	204.715	257.873	278.289	271.535	26.0	35.9	32.6

(*continued*)

Table 5.6 (continued)

	Present discounted value				Change relative to base (%)		
	Base	Three-Year	Actuarial	Common	Three-Year	Actuarial	Common
			Peak value—S1				
Benefits	203.287	200.521	175.487	133.037	–1.4	–13.7	–34.6
Contributions	46.138	45.646	54.481	52.863	–1.1	18.1	14.6
Income taxes	64.668	64.014	75.940	74.182	–1.0	17.4	14.7
Other social security	60.508	59.907	69.590	67.265	–1.0	15.0	11.2
VAT	38.579	38.197	44.043	42.383	–1.0	14.2	9.9
Taxes: Total	209.894	207.764	244.054	236.693	–1.0	16.3	12.8
			Peak value—S2				
Benefits	203.452	202.119	181.720	138.116	–0.7	–10.7	–32.1
Contributions	45.176	44.185	59.208	57.553	–2.2	31.1	27.4
Income taxes	63.601	62.234	82.362	80.648	–2.1	29.5	26.8
Other social security	59.535	58.293	75.331	73.061	–2.1	26.5	22.7
VAT	37.961	37.174	47.658	46.038	–2.1	25.5	21.3
Taxes: Total	206.273	201.886	264.559	257.300	–2.1	28.3	24.7
			Peak value—S3				
Benefits	203.452	184.376	181.658	137.851	–9.4	–10.7	–32.2
Contributions	45.176	58.734	59.325	57.465	30.0	31.3	27.2
Income taxes	63.601	81.656	82.502	80.520	28.4	29.7	26.6
Other social security	59.535	75.470	75.466	72.956	26.8	26.8	22.5
VAT	37.961	47.945	47.747	45.974	26.3	25.8	21.1
Taxes: Total	206.273	263.804	265.042	256.915	27.9	28.5	24.6

Note: "Other social security" includes health insurance, long-term care insurance, and unemployment insurance.

Table 5.7 **Decomposition of the total impact (euros per worker)**

	Change in present discounted value								
	Three-Year Reform			Actuarial Reform			Common Reform		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
				Option value—S1					
Benefits	–3.299	2.770	–528	–39.947	20.643	–19.304	–78.912	15.592	–63.320
Taxes and contributions	–0.018	–11.448	–11.466	–1.867	55.915	54.048	–3.420	51.870	48.450
Net change	–3.281	17.761	14.479	–38.080	–52.205	–90.284	–75.493	–51.853	–127.346
Change as % of base benefits	–1.61	8.73	7.11	–18.71	–25.65	–44.36	–37.09	–25.48	–62.56
				Option value—S2					
Benefits	–2.543	3.044	501	–39.590	20.878	–18.712	–78.560	15.998	–62.563
Taxes and contributions	–0.010	–13.534	–13.544	–1.871	56.175	54.303	–3.431	52.505	49.074
Net change	–2.532	20.757	18.225	–37.719	–52.312	–90.031	–75.129	–52.278	–127.407
Change as % of base benefits	–1.25	10.21	8.97	–18.56	–25.74	–44.30	–36.97	–25.73	–62.70
				Option value—S3					
Benefits	–15.856	–2.437	–18.293	–39.590	21.212	–18.378	–78.560	16.116	–62.444
Taxes and contributions	–0.467	41.071	40.604	–1.871	57.887	56.015	–3.431	54.010	50.578
Net change	–15.389	–56.061	–71.450	–37.719	–54.233	–91.952	–75.129	–54.135	–129.264
Change as % of base benefits	–7.57	–27.59	–35.68	–18.56	–26.69	–45.25	–36.97	–26.64	–63.61
				Peak value—S1					
Benefits	–3.382	616	–2.766	–39.290	11.490	–27.800	–77.864	7.614	–70.250
Taxes and contributions	–0.019	–1.618	–1.637	–1.871	27.688	25.817	–3.369	23.443	20.074
Net change	–3.363	2.726	–637	–37.419	–24.541	–61.961	–74.495	–22.554	–97.049
Change as % of base benefits	–1.65	1.34	–0.31	–18.41	–12.07	–30.48	–36.65	–11.09	–47.74

(*continued*)

Table 5.7 (continued)

	Change in present discounted value								
	Three-Year Reform			Actuarial Reform			Common Reform		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
				Peak value—S2					
Benefits	–2.350	1.017	–1.332	–40.063	18.331	–21.732	–78.398	13.062	–65.336
Taxes and contributions	–0.010	–3.385	–3.396	–1.870	46.124	44.254	–3.366	42.016	38.650
Net change	–2.339	5.393	3.054	–38.193	–41.826	–80.019	–75.032	–41.331	–116.363
Change as % of base benefits	–1.15	2.65	1.50	–18.77	–20.56	–39.33	–36.88	–20.32	–57.19
				Peak value—S3					
Benefits	–15.858	–3.218	–19.076	–40.063	18.269	–21.794	–78.398	12.797	–65.601
Taxes and contributions	–0.467	44.439	43.973	–1.870	46.490	44.620	–3.366	41.719	38.353
Net change	–15.391	–61.216	–76.607	–38.193	–42.370	–80.563	–75032	–41.211	–116.243
Change as % of base benefits	–7.57	–30.09	–38.32	–18.77	–20.83	–39.60	–36.88	–20.26	–57.14

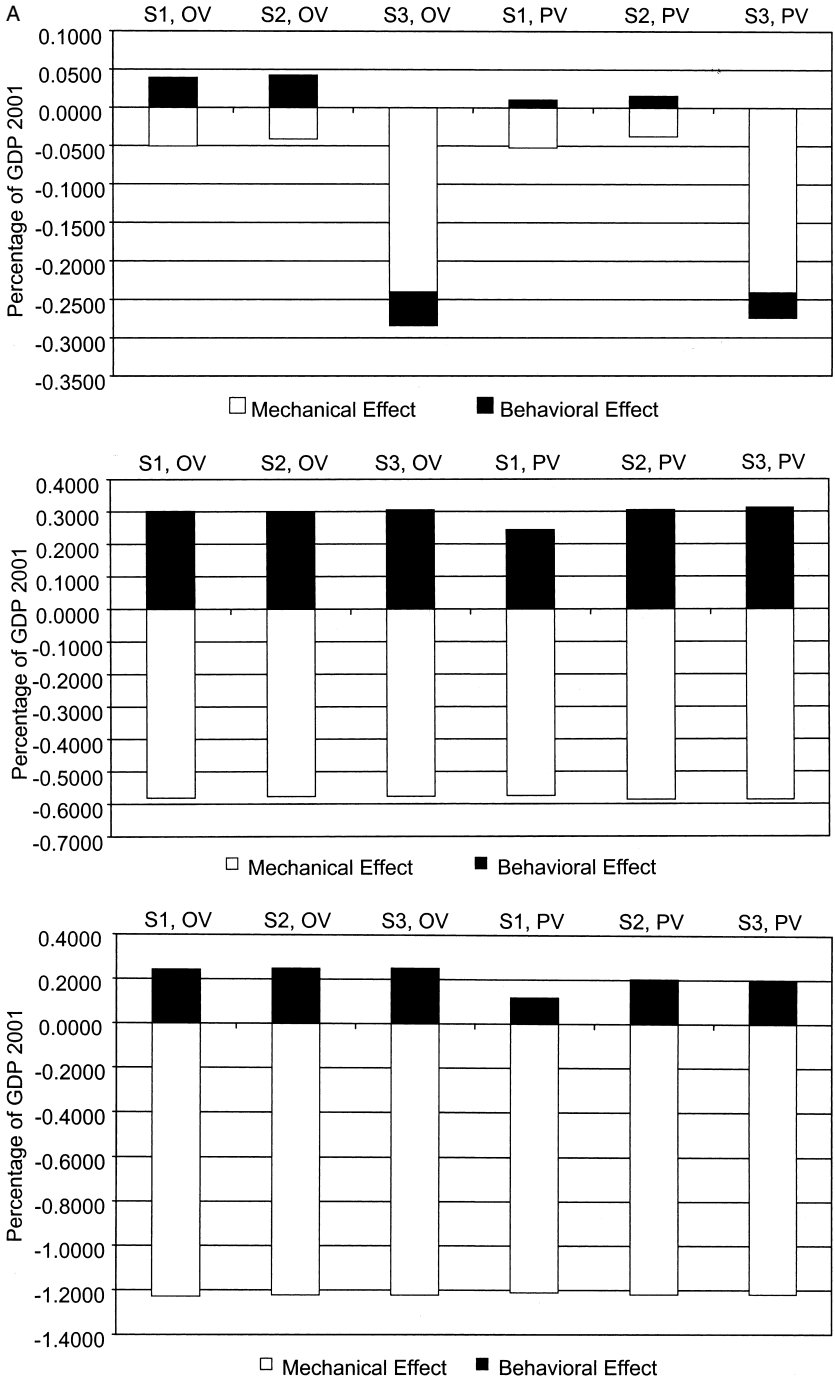


Fig. 5.4 Behavioral, mechanical, and total budget impact of pension reform: *A*, Gross Benefits; *B*, Benefits net of taxes and contributions

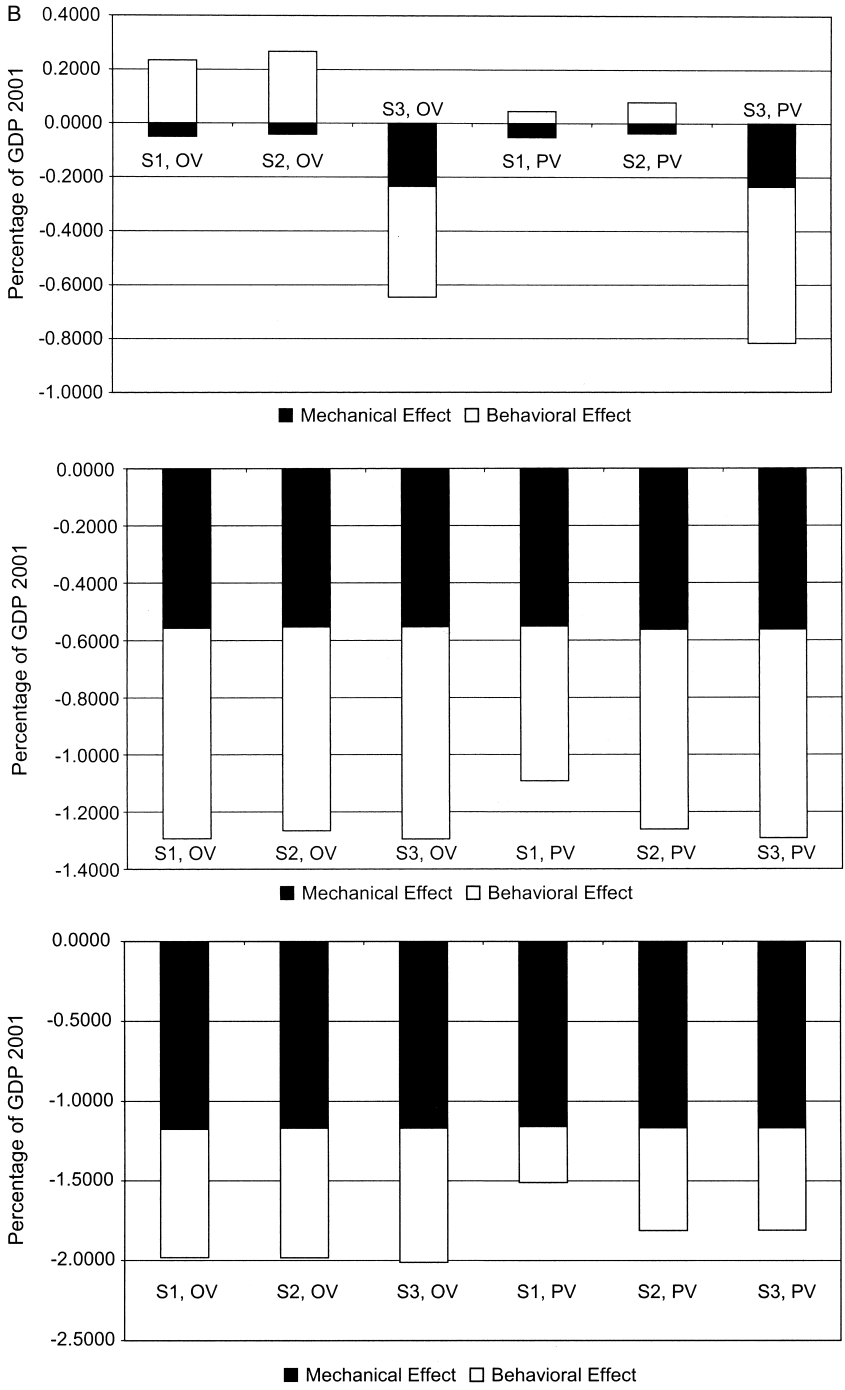


Fig. 5.4 (cont.) Behavioral, mechanical, and total budget impact of pension reform: *A,* Gross Benefits; *B,* Benefits net of taxes and contributions

into percent of GDP. Panel A of figure 5.4 only looks at changes in pension benefits, while panel B adds changes in taxes and contributions. The largest effect occurs, as we have seen, in the common form, which combines a replacement rate cut with a later retirement age and saves pension expenditures of up to 2 percent of GDP.

Finally, we disaggregate the total effect by age of entry into retirement. This is shown in figures 5.5 and 5.6. Figure 5.5 shows the total effect, while figure 5.6 looks only at benefits. Note that the amount of taxes and contributions collected for a given age of retirement remains unchanged, due to the static definition of our hypothetical reforms. Of course, the total amount of taxes and contributions changes considerably under the reforms, because the weight for each retirement age is changed. All figures relate to the option value estimation with linear age dummies.

Figures 5.5 and 5.6 show that the Three-Year Reform has very little impact, and only on retirement around age 67 and 68, due to the somewhat awkward jump in the replacement rate at ages 66 and 67, which is shifted by the reform to ages 69 and 70. Note the scale: the effects are relatively small.

The Actuarial Reform and the Common Reform have a clear-cut pattern: negative effects for early retirement (before age 65), and positive effects for late retirement. Since the latter are smaller in the aggregate than the former, the overall effect is a reduction in the budget, as we have seen earlier.

5.5.4 Distributional Considerations

Tables 5.8 and 5.9 show the financial implications of the reforms by quintiles of lifetime earnings. Lifetime earnings are defined on a family basis and incorporate the forty highest income years of both spouses. We chose cutoff points for married and single persons separately such that the lowest quintile, for example, contains 20 percent of the poorest couples and 20 percent of the poorest singles. The figures shown correspond to the 1942 cohort.

The first column of each table displays the net present value of benefits, contributions, and taxes paid by the ith quintile. The lowest earnings group makes up approximately 7.5 percent of the entire net PDV, while the highest earnings group covers around 33.5 to 34 percent.

The second column reports the percentage changes in the net PDV of the social security wealth (SSW) by quintile: $(\Sigma_{i \in \text{quintile}} SSW_i(R) - \Sigma_{i \in \text{quintile}} SSW_i(BC))/\Sigma_{i \in \text{quintile}} SSW_i(BC)$ where R stands for reform and BC for base case.

In all three reforms, the percentage change from the base case is negative for all quintiles, except for the Three-Year Reform in the constant dummies specification, where the reform, as we have emphasized earlier, is essentially ineffective. In every quintile, pension expenditure decreases.

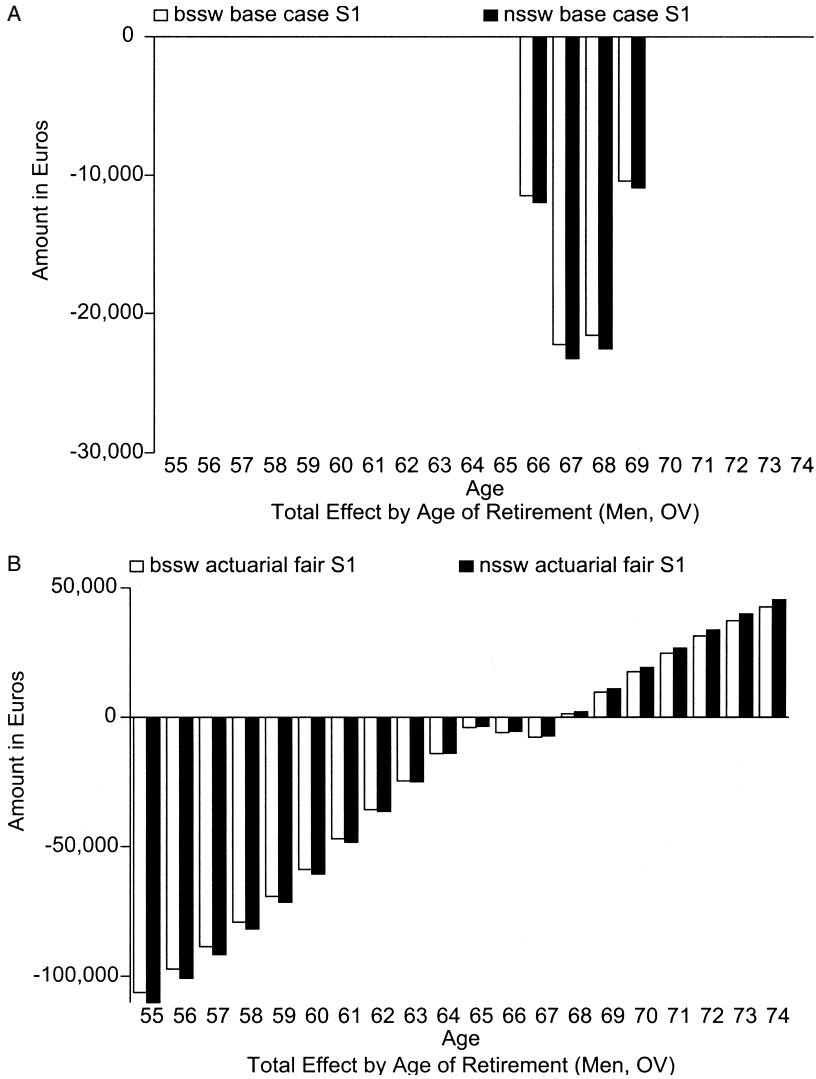
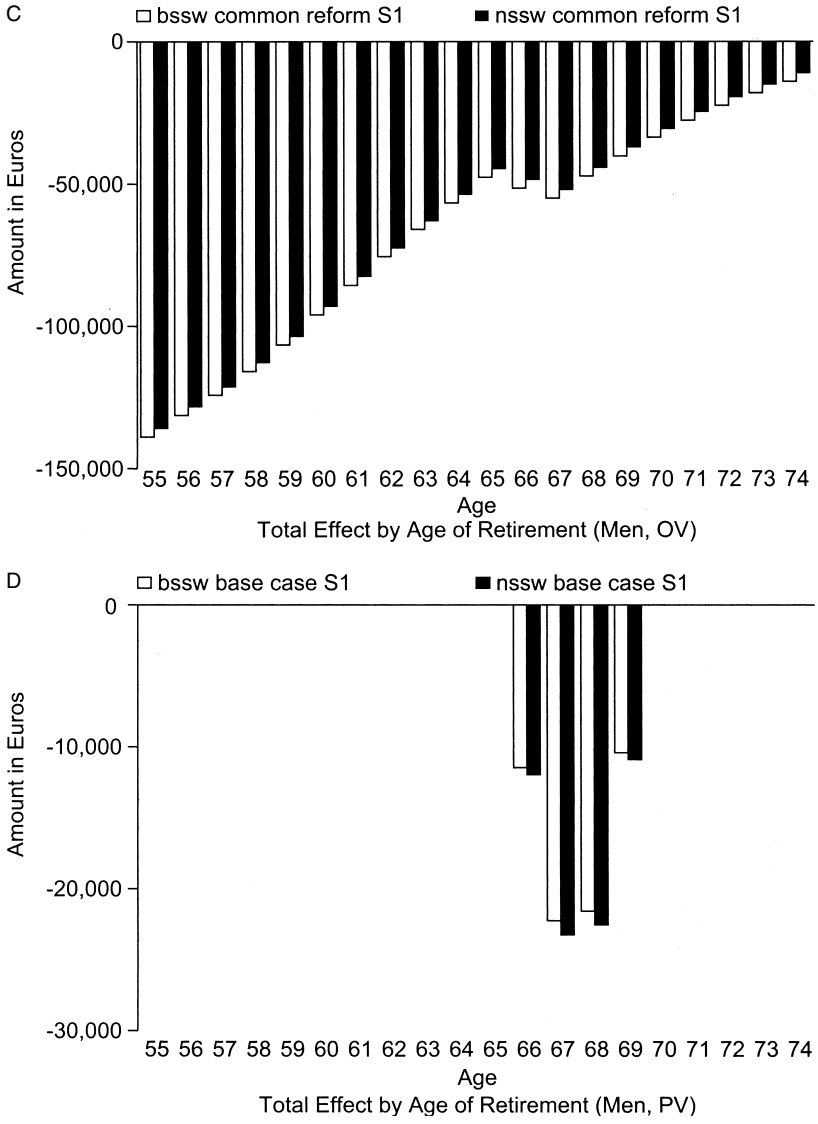


Fig. 5.5 Fiscal impact of total effects: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Actuarial Reform, peak value; *F,* Common Reform, peak value.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nssw common reform S1
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-50,000
-100,000
-150,000
Amount in Euros
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Total Effect by Age of Retirement (Men, OV)
D
bssw base case S1
nssw base case S1
0
-10,000
-20,000
-30,000
Amount in Euros
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
Total Effect by Age of Retirement (Men, PV)

Fig. 5.5 (cont.)

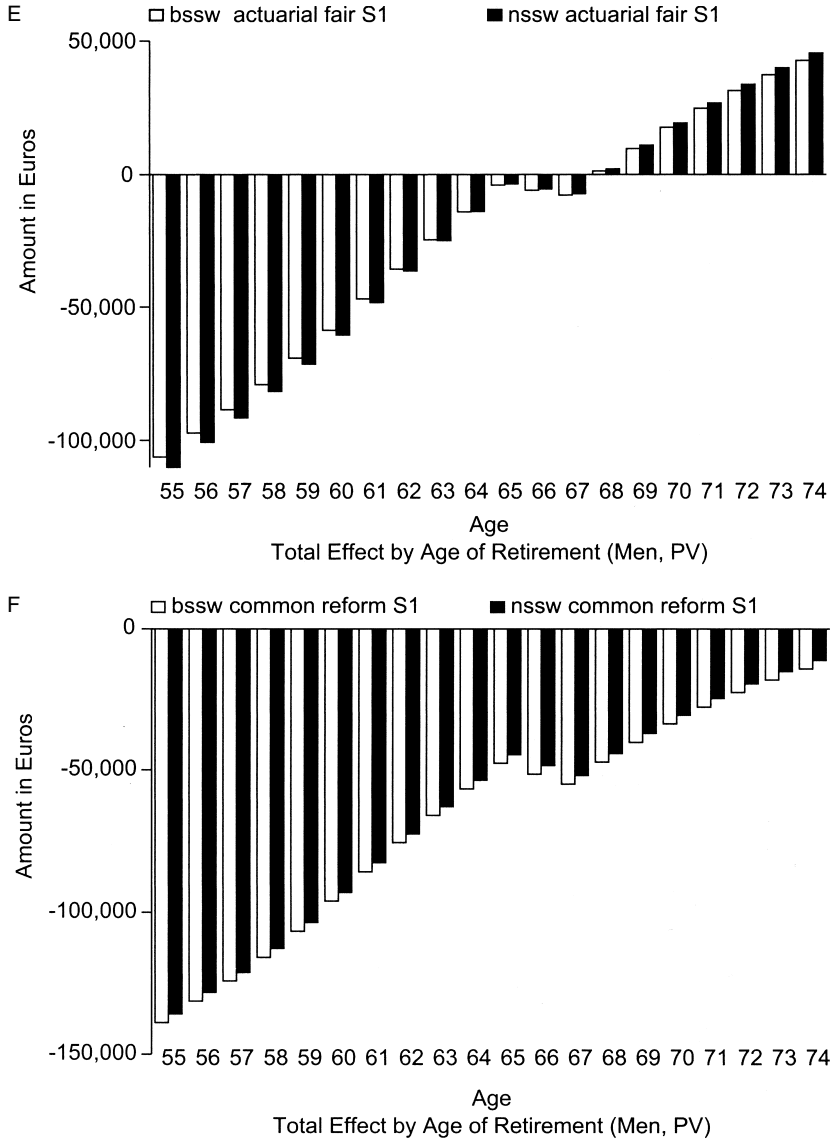


Fig. 5.5 (cont.) Fiscal impact of total effects: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Actuarial Reform, peak value; *F,* Common Reform, peak value.

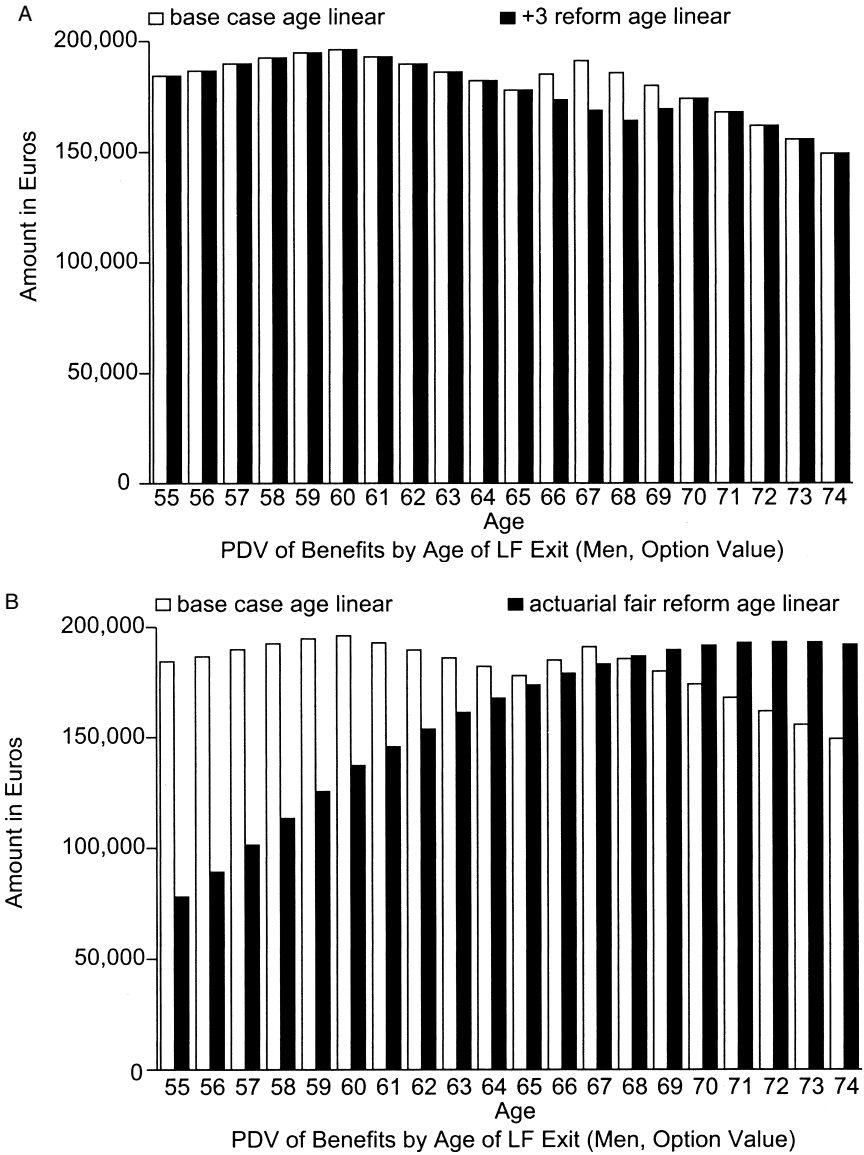


Fig. 5.6 Present discounted value of social security wealth benefits: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Actuarial Reform, peak value; *F,* Common Reform, peak value

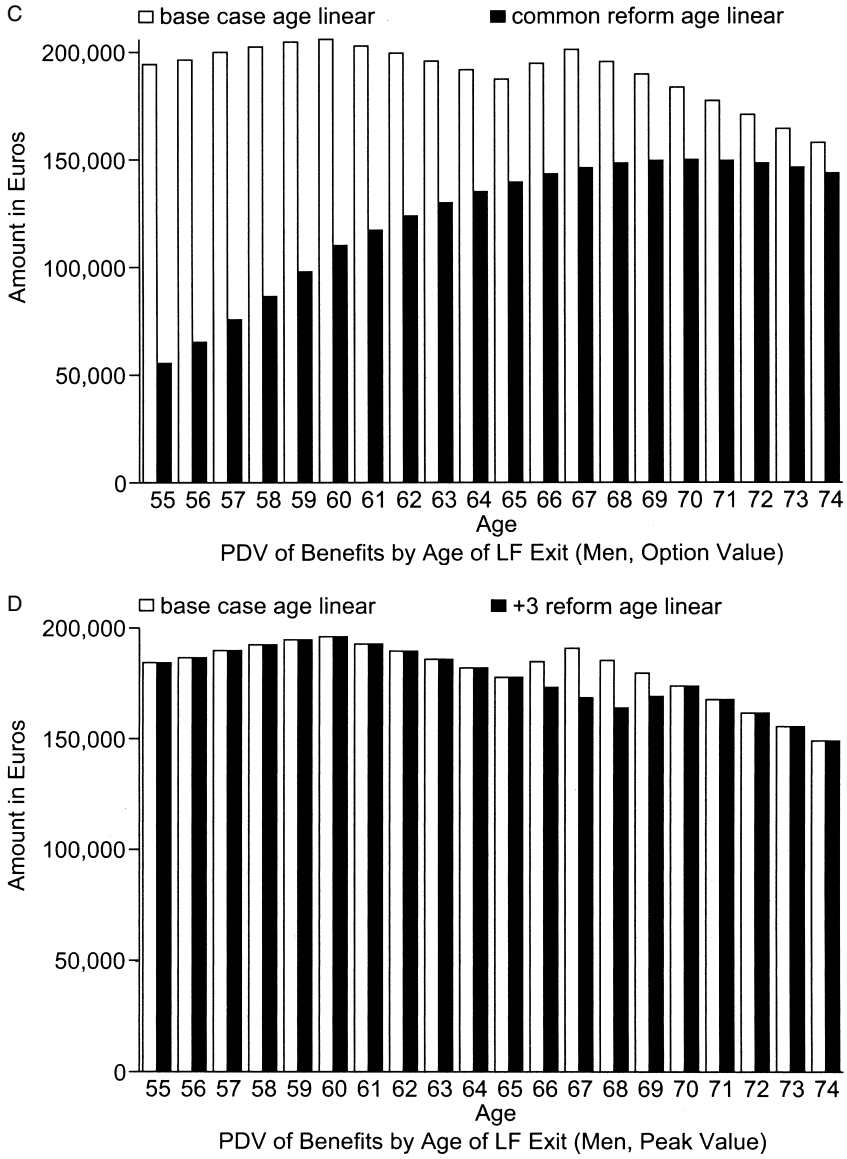
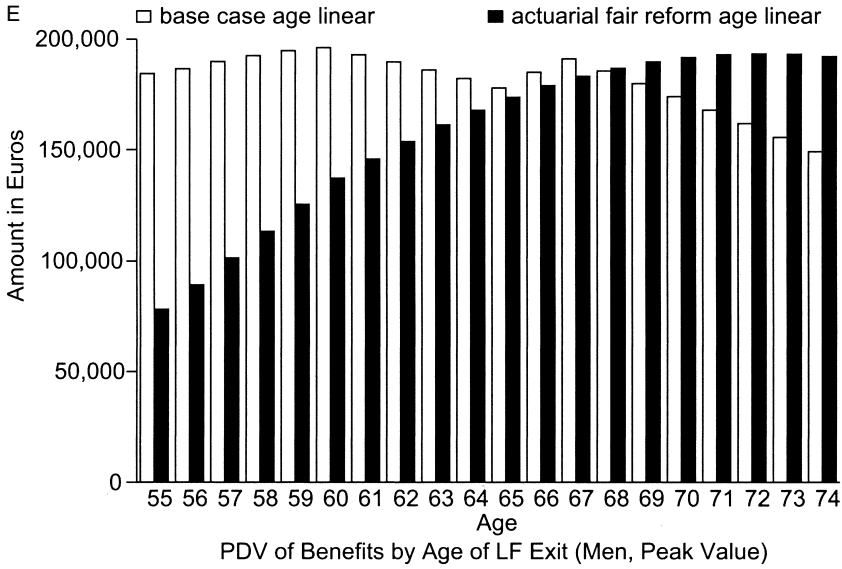


Fig. 5.6 (cont.) Present discounted value of social security wealth benefits: *A,* Three-Year Reform, option value; *B,* Actuarial Reform, option value; *C,* Common Reform, option value; *D,* Three-Year Reform, peak value; *E,* Actuarial Reform, peak value; *F,* Common Reform, peak value


E
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actuarial fair reform age linear
200,000
150,000
100,000
50,000
0
Amount in Euros
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
PDV of Benefits by Age of LF Exit (Men, Peak Value)

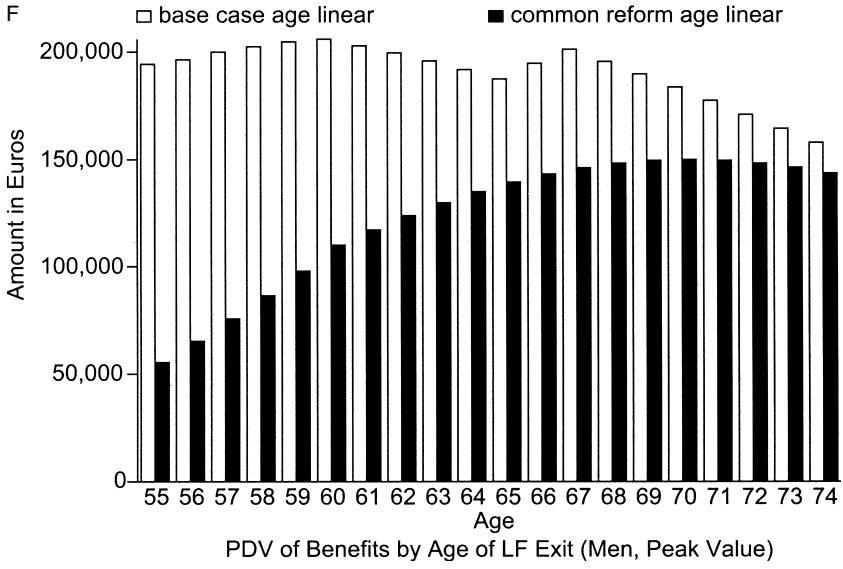
F
base case age linear
common reform age linear
200,000
150,000
100,000
50,000
0
Amount in Euros
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Age
PDV of Benefits by Age of LF Exit (Men, Peak Value)

Fig. 5.6 (cont.)

Table 5.8 **Distributional analysis (Option value—S1, euros per worker)**

	Present discounted value				Change relative to base PDV		
	Base case	Three-Year	Actuarial	Common	Three-Year	Actuarial	Common
			Highest quintile (1)				
Benefits	339.019	337.415	311.220	288.080	–1.605	–27.799	–50.939
Contributions	72.908	68.089	104.617	101.175	–4.819	31.709	28.267
Tax	121.125	114.185	170.295	165.723	–6.940	49.170	44.598
Insurance	116.403	110.204	158.165	152.042	–6.199	41.762	35.638
VAT	74.666	70.762	100.403	96.019	–3.903	25.737	21.354
Net change					20.257	–176.177	–180.797
Percent change					6.0	–52.0	–53.3
			Quintile 2				
Benefits	271.570	271.382	250.790	182.445	–.212	–20.780	–89.124
Contributions	61.374	54.789	85.157	83.306	–6.585	23.783	21.932
Tax	81.766	73.337	111.829	109.691	–8.429	30.063	27.925
Insurance	75.589	68.017	101.483	98.885	–7.572	25.894	23.296
VAT	48.158	43.380	64.214	62.400	–4.779	16.056	14.242
Net change					27.577	–116.576	–176.518
Percent change					10.2	–42.9	–65.0
			Quintile 3				
Benefits	220.432	219.935	197.471	137.570	–.497	–22.960	–82.862
Contributions	48.763	44.954	65.843	64.866	–3.809	17.080	16.103
Tax	64.430	59.528	86.201	85.059	–4.902	21.771	20.629
Insurance	63.134	58.735	81.188	78.632	–4.399	18.054	15.498
VAT	40.656	37.881	51.663	49.657	–2.775	11.007	9.001
Net change					15.389	–90.872	–144.092
Percent change					7.0	–41.2	–65.4

			Quintile 4				
Benefits	173.751	173.325	157.046	108.488	–.426	–16.705	–65.263
Contributions	37.623	34.571	51.503	50.249	–3.052	13.879	12.626
Tax	49.464	45.515	67.210	65.656	–3.949	17.746	16.192
Insurance	45.119	41.583	60.486	58.670	–3.536	15.367	13.551
VAT	28.615	26.287	38.166	36.911	–2.228	9.550	8.296
Net change					12.339	–73.247	–115.927
Percent change					7.1	–42.2	–66.7
			Lowest quintile (5)				
Benefits	110.112	109.509	97.764	75.875	–.603	–12.347	–34.237
Contributions	27.211	25.800	35.558	35.460	–1.411	8.347	8.249
Tax	36.292	34.424	47.236	47.140	–1.868	10.944	10.848
Insurance	32.456	30.787	41.958	41.815	–1.669	9.501	9.358
VAT	20.432	19.380	26.343	26.238	–1.052	5.911	5.807
Net change					5.396	–47.052	–68.500
Percent change					4.9	–42.7	–62.2

Table 5.9 **Distributional analysis (Option value—S3, euros per worker)**

	Present discounted value				Change relative to base PDV		
	Base case	Three-Year	Actuarial	Common	Three-Year	Actuarial	Common
			Highest quintile (1)				
Benefits	338.753	309.298	311.182	288.236	–29.455	–27.571	–50.517
Contributions	71.597	91.278	104.435	100.898	19.682	32.838	29.301
Tax	119.194	149.559	169.853	165.253	30.365	50.660	46.059
Insurance	114.657	141.152	157.790	151.610	26.495	43.133	36.952
VAT	73.561	90.081	100.172	95.745	16.520	26.610	22.184
Net change					–122.517	–180.813	–185.013
Percent change					–36.2	–53.4	–54.6
			Quintile 2				
Benefits	281.063	246.935	251.012	182.817	–24.129	–20.051	–88.246
Contributions	60.850	76.918	85.100	83.411	16.067	24.249	22.561
Tax	81.163	101.545	111.765	109.854	20.382	30.602	28.690
Insurance	75.028	93.099	101.427	99.023	18.071	26.399	23.995
VAT	47.499	59.142	64.179	62.485	11.343	16.380	14.686
Net change					–89.992	–117.682	–178.178
Percent change					–33.2	–43.4	–65.7
			Quintile 3				
Benefits	219.984	199.587	198.203	138.214	–20.397	–21.781	–81.770
Contributions	48.633	61.471	66.191	65.353	12.838	17.558	16.720
Tax	64.293	80.649	86.648	85.693	16.356	22.355	21.399
Insurance	63.003	77.264	81.589	79.197	14.262	18.586	16.194
VAT	40.571	49.460	51.916	50.012	8.890	11.345	9.441
Net change					–72.742	–91.626	–145.525
Percent change					–33.1	–41.7	–66.2

			Quintile 4				
Benefits	173.385	157.748	157.743	109.088	–15.637	–15.642	–64.297
Contributions	37.432	48.435	51.883	50.646	11.002	14.451	13.213
Tax	49.245	63.232	67.717	66.188	13.987	18.472	16.943
Insurance	44.914	57.395	60.934	59.139	12.481	16.020	14.226
VAT	28.484	36.339	38.446	37.206	7.855	9.963	8.722
Net change					–60.962	–74.547	–117.401
Percent change					–35.2	–43.0	–67.7
			Lowest quintile (5)				
Benefits	109.905	99.878	98.363	76.386	–10.027	–11.543	–33.519
Contributions	26.969	34.829	35.764	35.740	7.860	8.794	8.771
Tax	35.994	46.234	47.522	47.527	10.240	11.528	11.533
Insurance	32.187	41.310	42.208	42.152	9.123	10.021	9.965
VAT	20.261	26.000	26.500	26.449	5.738	6.238	6.187
Net change					–42.988	–48.125	–69.976
Percent change					–39.1	–43.8	–63.7

Moreover, the absolute magnitude of the change increases with increasing quintiles.

5.6 Conclusions

This chapter shows that the very large public pension budget in Germany can be reduced significantly by neutralizing its strong incentives to retire early. Our simulations show a large response of old-age labor force participation to two reforms, the introduction of an actuarial adjustment (Actuarial Reform) and the introduction of a system with an early retirement age of 60 years, a normal retirement age of 65 years, a 60 percent replacement rate at age 65, and a 6 percent per year actuarial adjustment, pivoted at age 65 (Common Reform). These reforms combine elements of the actual 1992 and 2001 reforms in Germany. However, both hypothetical reforms have steeper actuarial adjustments than introduced by the actual 1992 reform, and the Common Reform has a deeper pension cut than introduced by 2001 reform.

Mean retirement age will increase by between two and four years in both reform scenarios. And since the German system is far from actuarially fair, these labor supply responses translate into large fiscal effects. These effects are augmented by the mechanical effects when the eligibility age for pension benefits is changed.

The introduction of a 6 percent per year actuarial adjustment implies a reduction of pension expenditures for a typical cohort born in 1942 (and thus still mainly governed by the pre-1992 pension rules) by 18 percent in direct benefit reductions and by an additional 26 percent through labor-supply responses. The introduction of the hypothetical common pension system, used as a yardstick in all country chapters of this volume, which features an early retirement age of 60 years, a normal retirement age of 65 years, a 60 percent replacement rate at age 65, and a 6 percent per year actuarial adjustment, pivoted at age 65, will reduce pension expenditures by 37 percent directly and by about 26 percent through labor-supply responses, relative to the pre-1992 system in Germany.

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