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# Micro-Modeling of Retirement Behavior in Spain

Michele Boldrin, Sergi Jiménez-Martín,
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## 9.1 Introduction

For the average Spaniard receiving a pension still means receiving a public pension. Among retired individuals, those drawing more than 10 percent of their annual income from a private pension plan are a negligible fraction (less than one percent). The situation, while slowly evolving, will not change substantially for another two decades or more. In 1990, the total number of participants in all kinds of private pension plans was of 600,000—less than 5 percent of total employment at the time. Since then, participation in pension funds has increased rapidly but not exceptionally, reaching a total of 4 million at the end of 1999. This is slightly less than 30 percent of current total employment and is mostly composed of individuals that are at relatively early stages of their working life. It is therefore reasonable to expect that, at least for the next two to three decades, the public pension system will remain the fundamental provider of old age income for Spanish citizens.

Over the course of year 2000, the number of Spanish workers covered by the Social Security Administration (the general regime plus the special regimes) is estimated at around 14.9 million (it was 14.6 million at the end of 1999). Of these, more than 70 percent were covered by the Regimén Gen-

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eral de la Seguridad Social (RGSS) and the rest by the special regimes. This corresponds to the practical totality of Spanish private-sector workforce (see Boldrin, Jiménez-Martín, and Peracchi [2001] for further details). Enrollment in the Spanish social security (SS) programs grew remarkably fast during the last three years, in fact, much faster than actual employment as estimated by the Spanish labor force Survey, Encuesta de Población Activa (EPA; Instituto Nacional de Estadística [INE] 2002). More precisely, the number of individuals enrolled in the SS administration grew at annual rates of 3.5, 5.7, and 6.0 percent in 1997, 1998, and 1999, respectively. The growth rate for 2000 is estimated to be around 3.7 percent. Such exceptional growth in the ranks of the SS administration is only partly explained by the favorable cyclical conditions during the period 1996–2000. A substantial portion of the increase in the number of contributors is likely to reflect a one-time emersion from the underground economy. This should be attributed partly to structural changes in the Spanish labor market and partly to an effort of the current administration to reduce contributive fraud. Hence, we should not extrapolate these growth rates in the future, even assuming that the current growth rate of the economy could be maintained, which, as 2001 and 2002 have shown, it cannot.

The total number of contributive pensions, as of the end of 1999, was 7.6 million. The growth rate in the number of contributive pensions was 2.6 percent in 1996, 1.96 percent in 1997, 1.52 percent in 1998, 1.26 percent in 1999, and 1.24 percent (estimated) in 2000. The functional composition of the stock of contributive pension payments is the following: Retirement pensions are 59 percent of the total, survival pensions 26 percent, disability 11 percent, orphans 3 percent, and those to other family members 1 percent. The division by SS regimes gives 55 percent to the RGSS, followed by the farmers special regime (RETA) with 21 percent, and the self-employed regime (REA) with 11 percent. The other, much smaller, special regimes share the residual 10 percent.

For the year 2000, expenditure on public pensions in Spain is expected to equal PTA9,229.7 billion, approximately 9.5 percent of gross domestic product (GDP). By adding noncontributive and welfare pensions, total pension payments reach about 10.2 percent of GDP. This number is lower than previously forecasted and, in fact, lower than it was in 1996 and 1997. This is due to the strong growth performance of the Spanish economy over the four years from 1997 to 2000, which was continuing on into 2001. SS contributions in 1999 amounted to 9.4 percent of GDP and were expected to remain at about the same percentage level in 2000.

The functional distribution of payments reflects the difference in average pension between old age and other functions. So, expenditure for old age is 68 percent of the total, while survival benefits are 19 percent, and disability is 12 percent of the total. During the year 2000, the total expenditure for contributive pensions amounted to PTA8,300 billion (about US$

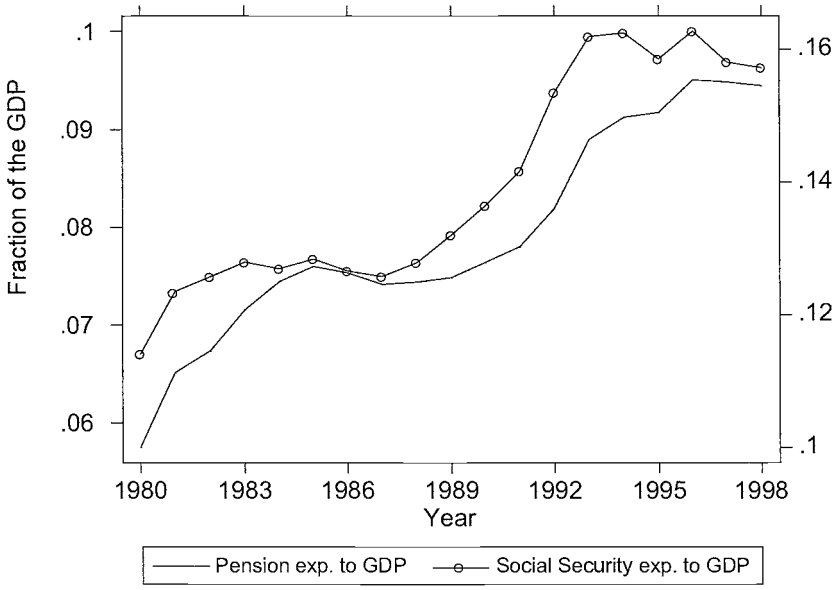


**Fig. 9.1 Social security and pension expenditures and GDP, 1980–1998**

45 billion at the exchange rate of late November 2000), which corresponds to slightly less than 10 percent of Spanish GDP.

Figure 9.1 reports the evolution of the ratio of pension expenditures $P$ to GDP, during the last two decades. We also report, on the right vertical axis, the ratio between total expenditure of the Spanish SS system and GDP. Beside pensions, total expenditure includes expenditure for temporary illness, maternity or paternity, family support, public health services, and social services. Data show that the tendency to grow is not limited to pension expenditures: While the ratio between pension expenditure and GDP grew by 52 percent between 1980 and 1998, the one between total expenditure and GDP grew by 53 percent over the same period. The rule, at least in Spain, seems to be that when pension expenditure accelerates, total expenditure of the SS system accelerates as well.

It is hard to judge whether the recent flattening of the trend line of the $P$-GDP ratio, should be considered as the beginning of a new phase or instead just a cyclical event without substantial long-run implication. The growth rate of the number of pensions does not appear to slow down. The same goes for the size of the average pension. Our analysis leads to the conclusion that the second interpretation is more likely, even if some small structural changes have taken place. Before going on to illustrate the long-run tendencies and their effects, we should briefly mention the steps that were taken in a new direction.

The Spanish labor market is more flexible after the 1997 agreement be-

tween the government and the trade unions. Firing costs are slightly lower, and contracts that allow for dismissal can be signed. This shows positive effects on registered employment, which has been growing at near historical record rates since 1997. Labor force participation rates among women keep increasing. This is strictly linked to the higher school-attendance rates women have experienced since the middle 1980s, which appear to continue. This structural change in educational attainments has become an important factor, which may have a dramatic impact on the Spanish labor market during the next two or three decades. It is likely to increase labor force participation rates at all ages and for women, in particular.

Meanwhile, if legislation is not modified, (which we find unlikely in light of the political-economy mechanism driving public pension systems) by 2005–2010, the number of workers having the right to retire before the age of sixty-five will dwindle to almost zero. Current legislation allows this privilege only to those who started contributing before 1967.[1] Currently this constitutes the bulk of the retirees or near-retirees. Within a decade, this may provide a one-time boost to labor force participation rates for the age group sixty to sixty-five.

For a long time, an alarming feature of the retirement behavior of Spanish workers has been the large fraction retiring and drawing pensions before the normal retirement age of sixty-five (see Boldrin, Jiménez-Martín, and Peracchi 2001 for detailed time series). The percentage of new pensioners strictly younger than sixty-five seems to have peaked at 71.6 percent in 1995, decreasing slowly in subsequent years. It was 68.2 percent in 1998. The percentage of those retiring at sixty may have peaked at 46.5 percent in 1997 and decreased marginally in 1998, the last year for which such data are available. This pattern is linked to the phasing out of the special legislation mentioned in the previous paragraph.

On the other side, there are a number of facts that should make us pause. The large and persistent discrepancies reported between enrollment rates in the SS programs and the employment levels estimated by the EPA suggest that the record increase in SS enrollment is partly due to the emergence of the black labor market. This has two implications. First, it cannot be excluded that in a recession period the same workers would go "underground" again and stop contributing. Secondly, it implies that most of the 1997–2000 growth of employment is actually a statistical artifact. This fits well with the very low growth rate of labor productivity (0.2–0.5 percent)

1. In fact, following a new pact between the government and trade unions, legislation is being modified at the time of last writing (Spring 2002) to extend the right of early retirement at sixty to workers who enrolled in the SS system after 1967. According to the pact, early retirement for workers between the age of sixty and sixty-five will be possible under conditions essentially identical to those reported in the sequel of this paper. This fact vindicates our earlier pessimistic views about early retirement (see, e.g., Boldrin, Jiménez-Martín, and Peracchi 2001).

measured over the last four years. Should this pessimistic interpretation turn out to be correct, we would just be facing a (once-and-for-all) jump in SS enrollment levels.

Furthermore, recent legislation (fall 1999) has once again increased the real value of minimum pensions by about 3 to 5 percentage points. Besides raising the overall pension burden, this policy has negative effects on participation rates. As clearly shown in Boldrin, Jiménez-Martín, and Peracchi (1999), minimum pensions are one of the major determinants of early retirement, especially among low earners. This suggests that the political willingness to increase pension expenditure to please special interest groups and to maintain the distortionary effects of current legislation has not been reduced by the arrival of a new government.

A few other basic structural factors are illustrated next; for detailed statistics about Spanish demographic evolution and labor market, we refer to Boldrin, Jiménez-Martín, and Peracchi (2001).

Table 9.1 presents the evolution of the structure of the Spanish population in the 1950–2050 period. We break down the total population in three representative age groups: zero to fourteen, fifteen to sixty-four, and sixty-five and older. There are two salient features. On the one hand, the young population (zero to fourteen), after peaking in 1970, has steadily decreased. Currently the size of each generation of newborns is half the size of the same generation twenty years ago. On the other hand, the portion of the population sixty-five and older has continuously increased and will

**Table 9.1** **Structure of the Spanish Population and Life Expectancy**

| | | | | Life Expectancy | | | |
|---|---|---|---|---|---|---|---|
| | Structure of the Population | | | At 0 | | At 65 | |
| Year | 0–14 | 15–64 | 65+ | Male | Female | Male | Female |
| 1950 | 26.23 | 66.54 | 7.23 | 59.81 | 64.32 | 11.83 | 13.48 |
| 1970 | 27.79 | 62.54 | 9.67 | 69.17 | 74.69 | 13.25 | 15.89 |
| 1981 | 25.70 | 63.06 | 11.24 | 70.40 | 16.19 | 13.58 | 16.44 |
| 1986 | 22.12 | 65.60 | 13.94 | 73.27 | 79.67 | 15.10 | 18.43 |
| 1991 | 18.63 | 67.43 | 13.94 | 73.40 | 80.49 | 15.53 | 19.17 |
| 1996 | 15.81 | 68.54 | 15.65 | 74.30 | 81.6 | 16.00 | 20.10 |
| 2000 | 14.58 | 68.54 | 16.88 | 75.30 | 82.4 | n.a. | n.a. |
| 2010 | 13.13 | 68.73 | 18.14 | 76.40 | 83.4 | n.a. | n.a. |
| 2020 | 11.16 | 68.23 | 20.61 | 77.20 | 84.0 | n.a. | n.a. |
| 2030 | 12.5 | 62.70 | 24.80 | 77.80 | 84.5 | n.a. | n.a. |
| 2040 | 12.6 | 57.10 | 30.30 | 78.20 | 84.8 | n.a. | n.a. |
| 2050 | 12.8 | 53.90 | 33.30 | 78.50 | 84.9 | n.a. | n.a. |

*Source:* INE (1995) and Cordón (1999).
*Note:* n.a. = not available.

reach 20 percent of the population before 2020. Furthermore, life expectancy at zero and at sixty-five has been growing steadily since 1950 and is expected to grow considerably also in the forthcoming years. In 2020, life expectancy at birth is expected to reach 76.0 and 83.7 for men and women, respectively.

Historically, Spain has an extremely low ratio of contributors to pensioners (oscillating around 2 and equal to 2.02 and 2.06 in 1998 and 1999, respectively). Its long-run value could be somewhat higher for purely compositional reasons, as the ratio for RGSS and RETA was 2.52 and 2.84, respectively, in 1998, while it was well below unity for all other downsizing regimes (from 0.29 for miners to 0.77 for fishermen).

The pattern of labor force participation in Spain is similar, from a qualitative viewpoint, to the rest of continental and non-Scandinavian Europe (France, Italy, Germany, and Belgium). Although Spain has higher unemployment and a lower labor force participation rate (LFPR), especially among females, the dynamics have been very similar since Spain joined the European Union (EU) in 1986. As a matter of fact, recent trends (post-1996) are better than those in the other large European countries; most likely some form of convergence in labor market variables is taking place alongside convergence in per capita GDP and labor productivity. Immigration policies and outcomes are an exception to the former statement: Immigrants flow into Spain at a much lower rate than in the rest of continental Europe, and Spain does not seem to be prone to policies to encourage immigration (recent political debate confirms this posture). This is confirmed by the extremely low number of working permits issued to foreigners over the last five years: 88.620 (1994), 100.290 (1995), 126.407 (1996), 86.841 (1997), and 40.440 (1998). On average this represents about 0.5 percent of the workforce. The remarkable decline in number of working permits since the Popular Party (PP) came to power in 1996, in spite of the increased pressure from illegal immigrants landing on the Spanish coast, is particularly noticeable.

The rest of this paper is organized in seven sections. The next one, section 9.2, provides an overview of the technical rules underlying the Spanish public pension system. Section 9.3 describes our micro-economic data set, illustrates its main limitations, and outlines the steps taken to overcome such limitations. (Additional material complementing sections 9.2 and 9.3 can be found in the appendix.) In section 9.4, we proceed to characterize the sample distribution of earnings and our estimated projections. Section 9.5 uses such projections to compute the various measures of retirement incentives used in this study. Such retirement incentive measures are the inputs for the estimation of the retirement models, which is undertaken in section 9.6. Section 9.7 studies three simple policy reforms and evaluates their differential impact upon the retirement incentives; section 9.8 briefly concludes.

**Table 9.2 Public Programs at Older Ages**

| Age | Unemployment Insurance | Disability Insurance | Private Pension Plan | Social Security Benefits |
|---|---|---|---|---|
| 50 | Cont. from 45+ | Cont./Noncont. | Yes | [a] |
| 52 | Cont. from 52+ | Cont./Noncont. | Yes | [a] |
| 55 | Cont. from 52% | Cont./Noncont. | Yes | [a] |
| 60 | Cont. | Cont./Noncont. | Yes | ER: Cont. |
| 65 | — | — | Yes | NR: Cont./Noncont. |

*Notes:* Cont. = contributory; Noncont. = noncontributory; ER = early retirement; NR = normal retirement; 45+ and 52+ indicate a special UI program for 45+ and 52+ workers enrolled in the RGSS. All public programs provide benefits for dependant. Dashes indicate that data are not relevant.

[a]There are age bonuses for certain professions, allowing for retirement before 60.

## 9.2 Institutional Features

### 9.2.1 Public Programs for Old-Age Workers

Table 9.2 summarizes the programs available after age fifty. Besides private pensions, there are three other public programs that affect the behavior of old age workers: unemployment benefits, disability benefits, and retirement pensions.

Unemployment benefits (UB) are generally conditional on a previous spell of contributions (see appendix) and are available only for workers in the RGSS.[2] There are two continuation programs for those who have exhausted their entitlement to contributory UB: one for those aged forty-five and older (UB45+ program) and another for those aged fifty-two and older (UB52+ program). The latter program is a special subsidy for unemployed people that are older than fifty-two, lack income sources, have contributed to unemployment insurance for at least six years and, except for age, satisfy all requirements for an old age pension. To avoid cluttering the main text, we describe the various provisions of both programs in the appendix.

The SS system provides insurance against both temporary and permanent illness as well as disability. Contributory disability (DI) benefits are far more generous than any other old age program since they are not subject to penalties for young age or insufficient years of contribution.[3] The DI benefits are subject to approval by a medical examiner (the tightness of the

2. People enrolled in RESS have either no access to UB (self-employed and household employees) or have special unemployment (farmers and fishermen).

3. For a discussion of noncontributory disability pensions and other marginal insurance schemes (which are not relevant to the following analysis and have little or no impact on the retirement decisions of the workers we are considering) see Boldrin, Jiménez-Martín, and Peracchi (1999).

admissibility criteria used by examiners varies notoriously both over time and across regions) and, since the early 1990s, they have become harder to obtain at older ages. In fact, and contrary to the practice prevailing during the 1980s, it is now uncommon to access permanent DI benefits after age fifty-five. This has mainly been achieved by extending the disability evaluation process for the temporary illness program, Incapacidad Laboral Transitoria (see the appendix for a description), which, in the past, was most often used as a bridge to retirement.

Both the unemployment and the disability plans offer, as we will argue momentarily, a pathway to early retirement alternate to the normal one (with early retirement at sixty and normal retirement at sixty-five). Such alternative pathways are taken in due account in our estimation and simulation procedures.

The retirement program has two options: early retirement and normal retirement. Early retirement is possible from age sixty, but it only applies to workers who started their contributive career before 1967 (see note 1 and recall that this privilege is soon to be extended also to workers who enrolled after 1967). The normal retirement age is sixty-five, although some special professions have lower normal retirement ages (miners, military personnel, policemen, and fishermen are the main ones). Collective wage settlements often impose mandatory retirement at age sixty-five, facilitate retirement at sixty-four with full benefits, or encourage retirement between sixty and sixty-three through lump-sum amounts.

### 9.2.2 Social Security Regimes and Their Rules

Under current legislation, public contributory pensions are provided by the following programs.

- The general SS scheme, Régimen General de la Seguridad Social (RGSS), and special SS schemes, Regímenes Especiales de la Seguridad Social (RESS), cover all private-sector employees, self-employed workers and professionals, members of cooperative firms, employees of most public administrations, other than the central government, as well as unemployed individuals who comply with the minimum number of contributory years when reaching sixty-five. The RESS include five special schemes:
  1. Régimen Especial de Trabajadores Autónomos (RETA) for the self-employed.
  2. Régimen Especial Agrario (REA) for agricultural workers and small farmers.
  3. Régimen Especial de Empleados de Hogar (REEH) for domestic workers.
  4. Régimen Especial de Trabajadores del Mar (RETM) for sailors.
  5. Régimen Especial de la Minería del Carbón (REMC) for coal miners.

- Government employees scheme, Régimen de Clases Pasivas (RCP) includes public servants employed by the central government and its local branches. In this study, we do not consider this regime. Summary information about its structure and rules are reported later in this section.

Legislation approved by Parliament in 1997 establishes the progressive elimination of all the special regimes by the end of year 2001. Aside from the pension scheme for public employees (RCP), the Spanish SS system will then be structured around only two schemes for the private sector: one for employees and one for the self-employed. It is not clear, at this point, if such reform will be completed on time.[4]

### 9.2.3 The General Regime

This section describes the rules governing old age and survivors' pensions under the general scheme (RGSS) until 1997. The main changes introduced by the 1997 reform will be illustrated as we go along. A summary of the basic technical aspects of the pre- and post-1997 systems can be found in table 9.3. Our focus on the RGSS is justified by the fact that this is the main SS program in Spain and the benchmark for our simulations.

*Financing and Eligibility*

The RGSS is a pure pay-as-you-go scheme. Contributions are a fixed proportion of covered earnings (defined as total earnings and excluding payments for overtime work) between a floor and a ceiling that vary for each of the broadly defined professional categories. Currently, eleven categories are distinguished, each one with its covered-earnings ceiling and floor.

The current RGSS contribution rate is 28.3 percent, of which 23.6 percent is attributed to the employer and the remaining 4.7 percent to the employee. A tax rate of 14 percent is levied on earnings from overtime work.

Entitlement to an old age pension requires at least fifteen years of contributions. As a general rule, recipiency is conditional on having reached age sixty-five and is incompatible with income from any kind of employment requiring affiliation to the SS system.

*Benefit Computation*

If eligibility conditions are met, a worker retiring at age sixty-five receives an initial monthly pension $P_t$ equal to

$$P_t = \alpha_n \mathrm{BR}_t,$$

where the benefit base (*base reguladora*) $\mathrm{BR}_t$ is a weighted average of monthly covered earnings over a reference period that consists of the last eight years before retirement:

4. They have not, at least as of Spring 2002.

**Table 9.3** **Pension Provisions, Institutions, and Systems**

| Institutions | RGSS System after 1985 | RGSS System after 1997 |
|---|---|---|
| | *Provisions Affecting All Individuals* | |
| A. Basic ingredients | | |
| A1. Benefit base formula | $\frac{1}{96}\left(\sum_{j=1}^{24} \mathrm{BC}_{t-j} + \sum_{j=25}^{96} \mathrm{BC}_{t-j}\frac{I_{t-25}}{I_{t-j}}\right)$ | $\frac{1}{180}\left(\sum_{j=1}^{24} \mathrm{BC}_{t-j} + \sum_{j=25}^{180} \mathrm{BC}_{t-j}\frac{I_{t-25}}{I_{t-j}}\right)$ |
| Contribution period | 8 years | 15 years |
| Fraction actualized | 6 years | 13 years |
| A2. Fiscal system | | |
| Income tax | [progressive] | |
| Labor tax | linear (regime specific) | |
| B. Penalties | | |
| Inadequate contribution ($\alpha$) | $\begin{cases} 0 & \text{if } n < 15 \\ .6 + .02(n-15) & \text{if } 15 \le n < 35 \\ 1 & \text{if } 35 \le n \end{cases}$ | $\begin{cases} 0 & \text{if } n < 15 \\ .5 + .03(n-15) & \text{if } 15 \le n < 25 \\ .8 + .02(n-25) & \text{if } 25 \le n < 35 \\ 1 & \text{if } 35 \le n \end{cases}$ |
| | | Changes if $n \ge 40$: |
| Early retirement ($\beta$) | $\begin{cases} 0 & \text{if } a < 60 \\ .6 + .08(a-60) & \text{if } 60 \le a < 65 \\ 1 & \text{if } 65 \le a \end{cases}$ | $\begin{cases} 0 & \text{if } a < 60 \\ .65 + .07(a-60) & \text{if } 60 \le a < 65 \\ 1 & \text{if } 65 \le a \end{cases}$ |
| | *Provisions Affecting Particular Individuals* | |
| C. Income tax exemptions | | |
| Maximum pension exempted | $k_t$ minimum wage | $k_t$ minimum wage |
| Maximum income exempted | $k_t$ minimum wage | $k_t$ minimum wage |
| D. Contributions | | |
| Minimum level of contribution | (specific for 12 group) | |
| Maximum level of contribution | (specific for 12 group) | |
| E. Pensions | | |
| Minimum pension | linked to minimum wage | linked to minimum wage |
| Maximum pension | 4.3 minimum wage (in 1995) | 4.3 times minimum wage |
| F. Age bonuses | Yes (occupation specific) | Yes (occupation specific) |
| G. Survivor benefits | $0.45P_d$ | $0.45P_d$ |

$b_t = \max\{\min\{\tilde{b}_t[n, e, \mathrm{BR}(\mathrm{BC}, I), \bar{b}_t\}, \underline{b}_t\}$, where $\tilde{b}_t$ is the pension in A + B, and $\bar{b}_t$ and $\underline{b}_t$ are respectively the maximum and minimum pension

$$\mathrm{BR}_t = \frac{1}{112}\left(\sum_{j=1}^{24} W_{t-j} + \sum_{j=25}^{96} W_{t-j}\frac{I_{t-25}}{I_{t-j}}\right),$$

where $W_{t-j}$ and $I_{t-j}$ indicate, respectively, earnings and the consumer price index in the $j$-th month before retirement.

The replacement rate $\alpha_n$ depends on the number of contributive years and is equal to

$$\alpha_n = \begin{cases} 0 & \text{if } n < 15 \\ .6 + .02(n - 15) & \text{if } 15 \le n < 35 \\ 1 & \text{if } 35 \le n. \end{cases}$$

It may be further adjusted in the case of early retirement as described later.

Starting from 1997, the number of reference years has been increased by one every year until 2001 and should soon be increased further to fifteen years. Moreover, the formula for computing $\alpha_n$ has been changed to the following.

$$\alpha_n = \begin{cases} 0 & \text{if } n < 15 \\ .5 + .03(n - 15) & \text{if } 15 \le n \le 25 \\ .8 + .02(n - 25) & \text{if } 25 \le n \le 35 \\ 1 & \text{if } 35 \le n. \end{cases}$$

In all of our simulations we use the pre-1997 formula, which was in place over the relevant sample period. We consider the impact of the 1997 reform (R97) when examining alternative policies (see discussion of R97 in section 9.7).

Outstanding pensions are fully indexed to price inflation, as measured by the consumer price index. Until 1986, pensions were also indexed to real wage growth.

*Early Retirement*

The normal retirement age is sixty-five, but early retirement at age sixty is permitted for those who became affiliated to the SS before 1967. The current legislation distinguishes between two cases. The first one, representing the vast majority of those currently retiring between age sixty and sixty-five, is the case of workers who started contributing as dependent employees to some *Mutualidad Laboral* (Workers' Mutual) before 1967. In this case, the replacement rate is reduced by 8 percentage points for each year under age sixty-five. Starting from 1997, workers who retire after the age of sixty with forty or more contributive years are charged a penalty of only 7 percent for each year under age sixty-five.

The second case, representing about 10 percent of the early retirees, is the case of workers with dangerous or unhealthy jobs (e.g., bullfighters, employees of railroads, airlines and public transportation companies, and so forth), or workers who were laid off for industrial restructuring regu-

lated by special legislation. In this case, no reduction applies. Notice that these exemption rights are "portable" in the following sense: They apply to individuals who were previously employed in one of the sectors deemed dangerous or unhealthy, but the minimum retirement age without penalty is proportional to the number of years of work spent in such sectors.

Unless there are collective agreements that prescribe mandatory retirement, individuals may continue working after age sixty-five. In our empirical work, we try to estimate the impact of such special arrangements.

*Maximum and Minimum Pension*

Pensions are subject to an annually legislated ceiling, roughly equal to the ceiling on covered earnings. The 2000 ceiling corresponds to about 4.3 times the minimum wage (*salario mínimo interprofesional;* SMI) and about 1.6 times the average monthly earnings in the manufacturing and service sectors. If the computed old age pension is below a minimum, then a person is paid a annually legislated minimum pension. Other things being equal, minimum pensions are higher for those who are older than sixty-five or have a dependent spouse.

In the last decade, minimum pensions grew at about the same rate as nominal wages, whereas maximum pensions grew at a lower rate that was about equal to the inflation rate. The ratio between the minimum old age pension and the minimum wage has been increasing steadily from the late 1970s (it was 75 percent in 1975) until reaching almost 100 percent in the early 1990s. On the other hand, the percentage of pensioners of the RGSS receiving a minimum pension has been declining steadily, from over 75 percent in the late 1970s to 27 percent in 1995.

*Family Considerations*

A pensioner receives a fixed annual allowance for each dependent child that is younger than eighteen or disabled. In 2000, this allowance is equal to PTA 48,420 for each child under eighteen and to PTA 468,720 (45 percent of the annualized minimum wage) for each disabled child. In addition, the minimum pension is increased by a fixed amount if a pensioner has a dependent spouse.

Survivors (spouses, children, or other relatives) may receive a fraction of the benefit base of the deceased if the latter was a pensioner or died before retirement after contributing for at least 500 days in the last five years. The benefit base is computed differently in the two cases. If the deceased was a pensioner, the benefit base coincides with the pension. If the deceased was working, it is computed as an average of covered earnings over an uninterrupted period of two years chosen by the beneficiary from among the last seven years immediately before death. If death occurred because of a work accident or a professional illness, then the benefit base coincides with the last earnings.

The surviving spouse gets 45 percent of the benefit base of the deceased. In case of divorce, the pension is divided between the various spouses according to the length of their marriage with the deceased. Such a pension is compatible with labor income and any other old age or DI pension, but is lost if the spouse remarries.

Surviving children get 20 percent each of the benefit base of the principal as long as they are less than eighteen or unable to work and stay unmarried. An orphan who is a sole beneficiary may receive up to 65 percent of the benefit base. If there are several surviving children, the sum of the pensions to the surviving spouse (if any) and children cannot exceed 100 percent of the benefit base.

A Spanish peculiarity is the "pension in favor of family members." This pension entitles other surviving relatives (e.g., parents, grandparents, siblings, nephews, and so forth) to 20 percent of the benefit base of the principal if they satisfy certain eligibility conditions (older than forty-five, do not have a spouse, do not have other means of subsistence, and have been living with and depending economically upon the deceased for the last two years). To this pension, one may add the 45 percent survivors' pension if there is no surviving spouse or eligible surviving children.

### 9.2.4 Special Schemes

In this section, we sketch the main differences between the general and the special schemes. Whereas rules and regulations for sailors and coal miners are very similar to the ones for the general scheme, special rules apply to self-employed, farmers, agricultural workers, domestic helpers, and a few other categories not discussed here, such as part-time workers, artists, traveling salespeople, and bullfighters. Beside differences in the SS tax rate and the definition of covered earnings, an important difference is the fact that those affiliated with the special schemes have no early retirement option (although exception is made for miners and sailors).

The rest of this section focuses on the special schemes for self-employed workers (RETA) and farmers (REA), which together represent 93 percent of those affiliated with the special schemes and 86 percent of the pensions that are paid out.

#### *Self-Employed*

While the SS tax rate is the same for the RETA and the general scheme (28.3 percent in 2000), covered earnings are computed differently, as the self-employed are essentially free to choose their covered earnings between a floor and a annually legislated ceiling. Not surprisingly in the light of the strong progressivity of Spanish personal income taxes, a suspiciously large proportion of self-employed workers report earnings equal to the legislated floor.

In 2000, the floor and the ceiling were equal to PTA 116,160 and PTA

407,790 per month, respectively, corresponding in annualized terms to 1.4 and 5 times the minimum wage, and 0.5 and 1.9 times the average earnings in manufacturing and services. For a self-employed aged fifty and older, the ceiling was only about half—PTA 219,000 per month—which was about equal to the average monthly earnings.

A crucial difference with respect to the general scheme is that, under the RETA, recipiency of an old age pension is compatible with maintaining the self-employed status. The implications of this provision for the retirement behavior of self-employed workers are discussed later.

Some other important provisions are the following. In order to qualify for survivors' pensions, RETA only requires at least five years of contribution in the ten years immediately before the death of the principal. Under RETA, the latter is 50 percent of the benefit base. If the principal was not a pensioner at time of death, the benefit base is computed as the average of covered earnings over an uninterrupted period of five years chosen by the beneficiary among the last ten years before the death of the principal.

*Farmers*

In this case, both the SS tax rate and the covered earnings differ with respect to the general scheme. Self-employed farmers pay 19.75 percent of a tax base that is legislated annually and is unrelated to actual earnings. In 2000, this is equal to PTA 91,740 per month, corresponding to 1.24 times the minimum wage and about 40 percent of the average monthly earnings in the manufacturing and service sectors.

Farm employees, instead, pay 11.5 percent of a monthly base that depends on their professional category and is legislated yearly. In addition, for each day of work, their employer must pay 15.5 percent of a daily base that also varies by professional category and is legislated annually.

### 9.2.5 Government Employees

We now describe briefly the main differences between the general scheme and the RCP, the pension fund for the employees of the central government.

Public servants are divided into five categories, labeled from (a) to (e), corresponding loosely to decreasing schooling levels: (a) for college graduates (*doctor, licenciado, arquitecto o equivalente*), (b) for people holding certain kinds of college diplomas (*ingeniero técnico, diplomado,* and so forth), (c) for high school graduates (*bachiller o equivalente*), (d) for junior high school diplomas (*graduado escolar o equivalente*), and (e) for individuals with lower education levels (*certificad o de escolaridad*). For each of these categories, the budget law defines every year a theoretical SS wage (*haber regulador*), which is used to compute SS contributions and pensions. The implied wage scale has remained relatively constant since 1985. The top to bottom ratio never exceeded 2.5.

Social security contributions are the sum of three parts, each proportional to the legislated covered wage, according to proportionality factors legislated annually: (a) *derechos pasivos* (currently 3.86 percent), (b) *cuota mensual de mutualidades* (monthly mutual premium; 1.89 percent), and (c) *aportacion del estado* (paid by the government, it varies between 6 and 10 percent depending on the sector of the administration). To parallel this three-part contribution structure, actual pensions are computed by adding up three sources of benefits: (a) the basic pension (*derechos pasivos*), (b) a portion directed to the pensioner's family (*ayuda familiar*), and (c) a complementary portion coming from the various *mutualidades*—Instituto Sociale de las Fuerzas Armadas (ISFAS), Mutualidad Funcianarios de la Administración Central del Estado (MUFACE), and Mutualidad general de Empleados de la administración Judicial (MUGEJU).

The basic monthly pension of a public servant who retires in month $t$ after contributing for $n$ years to RCP is computed as $P_t = \alpha_n \mathrm{BR}_t$, where the dependence of $\alpha_n$ upon the numbers of years worked has changed frequently over time. For $n \geq 15$, the last table of proportionality factors, legislated in 1990, can be reasonably (but not exactly) approximated by

$$\alpha_n = \min[1, 1 - .0366(35 - n)].$$

The differences with respect to the general scheme are various. First, while the entitlement to a pension still requires at least fifteen years of contributions, the replacement rate (the ratio of the pension to the benefit base) increases somewhat irregularly with seniority, up to 100 percent after thirty-five years. So, for example, fifteen years of service gives pension rights equal to only 26.92 percent of the benefit base, against 60 percent of the general scheme. After thirty years the same ratio has increased to 81.73 percent, against 90 percent for the general scheme.

Second, the benefit base is computed as a weighted average of covered earnings (to which the worker paid contributions) with weights equal to the percentage of the career spent at each level; that is,

$$\mathrm{BR}_t = \sum_t p_i H_{it},$$

where $p_i$ is the fraction of the career spent on level $i$ and $H_{it}$ are the covered earnings corresponding to level $i$, as determined by the current law at time $t$.

Third, unlike the general scheme, the RCP imposes mandatory retirement at age sixty-five. Exceptions are made for a few special categories, such as university professors and judges. On the other hand, the RCP allows for early retirement at the age of sixty, without any penalty for public servants with at least thirty years of service (twenty years for military personnel).

A fourth important difference with respect to the general scheme is compatibility between RCP pensions receipt and income from continued work.

**Table 9.4** Pathways to Retirement

| Pathway | RGSS and Assimilates | RETA | RCP (Public Employees) |
|---|---|---|---|
| 1. NR at 65 | ✓ | ✓ | ✓ |
| 2. ER at 60 | ✓ | ✓ | ✓ (Without penalty with 35 years service) |
| 3. UB then ER | ✓ | | Not relevant |
| 4. ER through DI | ✓ | ✓ | ✓ |

*Note:* See text for explanation of abbreviations.

In a number of special cases, RCP pensioners are allowed to keep a public-sector occupation, as long as this does not provide them with a regular flow of income (for example, the case of members of legislative bodies). More importantly, the legislation allows RCP pensions to be cumulated with earnings from employment in the private sector.

When a public servant is dismissed because of disability (and therefore starts drawing a DI pension) or dies (and the survivors are therefore entitled to a pension), the missing years between the person's age at death and sixty-five are counted as actual years of service in the computation of either the DI or the survivors' pension. Should the disability be caused by an accident while on duty, the DI pension is doubled.

### 9.2.6 Pathways to Retirement

This brief illustration of the public pension system clarifies that more than one pathway to retirement is available to Spanish workers. We have identified four of them in more detail: early retirement, normal retirement, temporary illness or disability and the UB program (specifically, UB52+). In table 9.4 we provide a brief listing of which programs are available according to the SS regime in which one is enrolled.

## 9.3 Data Description

### 9.3.1 The Main Data Set

Our main micro-economic data set is based on administrative records from the Spanish SS administration (*Historiales Laborales de la Seguridad Social;* HLSS). The sample consists of 250,000 individual work histories randomly drawn from the historical files of SS affiliates (*Fichero Histórico de Afiliados;* FHA). The sample includes only individuals aged forty and older on 31 July 1998, the date at which the files were prepared. The sample contains individuals from the RGSS and the five special regimes—RETA, REA, REEH, RTMC and RTMAR. As we mentioned above, civil servants and other central government employees are not covered by the SS administration and are not considered in this study.

The data set consists of three files. The first file, the "history file" (H file),

contains the work history of the individuals in the sample. Each record in this file describes a single employment spell of the individual. As we argue later, the work histories are very accurate for employment spells that began after the mid-1960s. The second file, the "covered earnings file" (CE file), contains annual averages of covered earnings (*bases de cotización*) from 1986 to 1995. The third file, the "benefits file" (B file), contains information on the lifetime SS benefits received by the individuals in the sample. Benefits are classified by function (retirement, disability, survival, and so forth) and initial amount received. To be more precise, the B file contains the initial benefit amount and the length of the period during which the benefit was received. A fourth file, the "relatives file" (R file), is also available; it reports some benefits paid to relatives who were members of the individual's household.

For each individual in the sample who contributed to SS during the 1986–1995 period, the CE file reports the annual average of covered earnings together with the contributions paid. For individuals enrolled in either the RGSS or the RTMC, covered earnings are a version of earnings that are doubly censored (from above and below). What this means is that covered earnings have both ceilings and floors: Contributions must be paid over some legislated minimum wage, no matter what actual earnings are. Furthermore, earnings above certain legislated ceilings are not covered; that is, they do not generate any future right and, as such, are not reported in the SS administration files. Notice, although, that they are taxed for contributions, which matter for retirement incentives. For people enrolled in SS regimes other than RGSS and RTMC, covered earnings are chosen by the individual within given ceilings and floors (see section 9.2 for details) and, consequently, there is no clear link between covered and actual earnings in this case.

For each employment spell in the H file, we know age, sex, and marital status of the person, the duration of the spell (in days), the type of contract (in particular, we can distinguish between part-time and full-time contracts), the social security regime, the contributive group, the cause for the termination of the spell, the sector of employment (four-digit standard industrial classification [SIC]), and the region of residence (fifty-two Spanish provinces). For each individual in the H file who has received some benefits at any point in time, we know most of the information that the SS administration uses to compute the monthly benefits to be paid. In particular, we know the initial and current pension, the benefit base (*base reguladora*), the number of contributive years, the current integration toward the minimum pension (*complementos por el mínimo*), the date pension was claimed, the date it was awarded, the type of benefits, and so on.

We refer to Martínez (1999) for a detailed description of the variables and for summary statistics of the history, covered earnings, and benefits files. The distribution of the HLSS sample, by activity, regime and status of the individuals therein recorded is summarized in table 9.5.

**Table 9.5 Distribution of Sample, by Activities in 1997**

| Age and Gender | Activity Status: Working Full-Time | Working Part-Time | Not Working | Temporary Illness | Died While Active | Out of LF | Total |
|---|---|---|---|---|---|---|---|
| | | | *All the Regimes* | | | | |
| Male | | | | | | | |
| 50–54 | 72.74 | 0.99 | 4.16 | 1.79 | 1.82 | 18.50 | 20794 |
| 55–59 | 69.76 | 0.52 | 2.89 | 1.49 | 2.49 | 22.85 | 20878 |
| 60–65 | 39.72 | 0.31 | 1.23 | 1.51 | 3.54 | 53.68 | 22813 |
| 65–69 | 5.22 | 0.07 | 0.21 | 1.80 | 4.12 | 88.58 | 19304 |
| Female | | | | | | | |
| 50–54 | 57.56 | 5.54 | 3.51 | 3.85 | 0.58 | 28.95 | 12409 |
| 55–59 | 56.32 | 4.21 | 2.40 | 4.01 | 0.85 | 32.21 | 9385 |
| 60–65 | 45.72 | 2.45 | 1.22 | 3.12 | 1.44 | 46.05 | 9237 |
| 65–69 | 12.97 | 0.48 | 0.28 | 2.69 | 1.53 | 82.06 | 7142 |
| | | | *RGSS* | | | | |
| Male | | | | | | | |
| 50–54 | 71.47 | 1.44 | 4.80 | 2.50 | 1.67 | 18.13 | 14222 |
| 55–59 | 68.73 | 0.78 | 3.49 | 2.02 | 2.32 | 22.66 | 13887 |
| 60–65 | 35.78 | 0.49 | 1.61 | 2.08 | 3.16 | 56.88 | 14327 |
| 65–69 | 3.10 | 0.13 | 0.27 | 2.60 | 3.90 | 90.00 | 11127 |
| Female | | | | | | | |
| 50–54 | 46.41 | 10.47 | 4.96 | 7.00 | 0.66 | 30.51 | 6555 |
| 55–59 | 46.07 | 8.94 | 3.35 | 7.63 | 0.95 | 33.05 | 4417 |
| 60–65 | 34.88 | 5.85 | 2.02 | 6.24 | 1.16 | 49.86 | 3865 |
| 65–69 | 6.54 | 1.30 | 0.27 | 6.27 | 1.26 | 84.37 | 2616 |
| | | | *RETA* | | | | |
| Male | | | | | | | |
| 50–54 | 77.21 | — | 3.05 | 0.11 | 1.38 | 18.25 | 3770 |
| 55–59 | 72.72 | — | 2.21 | 0.09 | 2.64 | 22.34 | 3442 |
| 60–65 | 52.23 | — | 1.17 | 0.22 | 4.68 | 41.70 | 3163 |
| 65–69 | 8.03 | — | 0.24 | 0.00 | 5.27 | 86.46 | 2466 |
| Female | | | | | | | |
| 50–54 | 60.08 | — | 3.00 | 0.11 | 0.37 | 36.43 | 2698 |
| 55–59 | 53.99 | — | 2.47 | 0.43 | 0.66 | 42.45 | 2106 |
| 60–65 | 45.39 | — | 0.91 | 0.40 | 1.82 | 51.47 | 1976 |
| 65–69 | 15.24 | — | 0.53 | 0.07 | 1.72 | 82.44 | 1509 |
| | | | *RETA* | | | | |
| Male | | | | | | | |
| 50–54 | 58.80 | 0.62 | 34.13 | 0.00 | 0.34 | 6.11 | 3847 |
| 55–59 | 40.02 | 0.25 | 49.43 | 0.00 | 2.43 | 7.86 | 4770 |
| 60–65 | 15.32 | 0.15 | 22.59 | 8.27 | 46.71 | 6.97 | 12246 |
| 65–69 | 10.31 | 0.06 | 0.09 | 20.15 | 62.11 | 7.29 | 17100 |
| Female | | | | | | | |
| 50–54 | 80.68 | 5.12 | 11.72 | 0.00 | 0.03 | 2.45 | 3593 |
| 55–59 | 66.66 | 8.34 | 20.64 | 0.00 | 0.36 | 4.00 | 3023 |
| 60–65 | 41.02 | 10.04 | 21.77 | 7.45 | 14.81 | 4.91 | 4254 |
| 65–69 | 21.28 | 6.98 | 0.14 | 22.97 | 44.36 | 4.28 | 5861 |

**Table 9.5** (continued)

| | Benefits (as a fraction of people out of the LF) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Without SS Benefits | Survival | DI | Retirement After DI | Retirement | Died While Receiving | Total |
| | | | | *All the Regimes* | | | |
| Male | | | | | | | |
| 50–54 | 58.80 | 0.62 | 34.13 | 0.00 | 0.34 | 6.11 | 3847 |
| 55–59 | 40.02 | 0.25 | 49.43 | 0.00 | 2.43 | 7.86 | 4770 |
| 60–65 | 15.32 | 0.15 | 22.59 | 8.27 | 46.71 | 6.97 | 12246 |
| 65–69 | 10.31 | 0.06 | 0.09 | 20.15 | 62.11 | 7.29 | 17100 |
| Female | | | | | | | |
| 50–54 | 80.68 | 5.12 | 11.72 | 0.00 | 0.03 | 2.45 | 3593 |
| 55–59 | 66.66 | 8.34 | 20.64 | 0.00 | 0.36 | 4.00 | 3023 |
| 60–65 | 41.02 | 10.04 | 21.77 | 7.45 | 14.81 | 4.91 | 4254 |
| 65–69 | 21.28 | 6.98 | 0.14 | 22.97 | 44.36 | 4.28 | 5861 |
| | | | | *RGSS* | | | |
| Male | | | | | | | |
| 50–54 | 56.25 | 0.74 | 35.61 | 0.00 | 0.19 | 7.21 | 2578 |
| 55–59 | 40.48 | 0.29 | 47.63 | 0.00 | 3.18 | 8.42 | 3147 |
| 60–65 | 14.48 | 0.11 | 19.45 | 6.87 | 51.74 | 7.35 | 8149 |
| 65–69 | 10.66 | 0.06 | 0.12 | 17.39 | 64.20 | 7.58 | 10059 |
| Female | | | | | | | |
| 50–54 | 81.70 | 5.30 | 10.10 | 0.00 | 0.05 | 2.85 | 2000 |
| 55–59 | 67.81 | 9.38 | 17.19 | 0.00 | 0.68 | 4.93 | 1460 |
| 60–65 | 39.91 | 10.02 | 16.97 | 5.35 | 21.90 | 5.86 | 1927 |
| 65–69 | 23.02 | 7.16 | 0.09 | 17.72 | 47.30 | 4.71 | 2207 |
| | | | | *RETA* | | | |
| Male | | | | | | | |
| 50–54 | 72.82 | 0.73 | 23.29 | 0.00 | 0.15 | 3.05 | 688 |
| 55–59 | 52.28 | 0.26 | 42.13 | 0.00 | 0.91 | 4.42 | 769 |
| 60–65 | 26.91 | 0.45 | 26.91 | 9.40 | 31.24 | 5.08 | 1319 |
| 65–69 | 12.90 | 0.14 | 0.09 | 18.15 | 62.24 | 6.47 | 2132 |
| Female | | | | | | | |
| 50–54 | 86.78 | 4.48 | 7.53 | 0.00 | 0.00 | 1.22 | 983 |
| 55–59 | 78.64 | 7.72 | 12.75 | 0.00 | 0.00 | 0.89 | 894 |
| 60–65 | 57.23 | 12.29 | 14.85 | 4.42 | 8.85 | 2.36 | 1017 |
| 65–69 | 31.67 | 10.29 | 0.08 | 14.95 | 39.07 | 3.94 | 1244 |

*Note:* Dashes indicate that data is not relevant.

### 9.3.2 Data Problems in Historiales Laborales de la Seguridad Social (HLSS)

We face several problems with the HLSS files, most of which are inherent to the structure of the Spanish SS record-keeping procedures. We shall illustrate some of the problems we encountered by comparing sample statistics from the HLSS with those obtained from other data sources that are,

presumably, more representative of the working population under study, at least along the dimensions considered here.

- *Overrepresentation of some regions or sectors:* The proportion of individuals from some geographical regions or industrial sectors is much larger in our file than in either the census or the EPA labor force survey. Carrying out inference conditional on region and industrial sector is therefore essential.
- *Mortality data:* We have limited information on mortality. In principle, information for those who are active is good enough in the sense that the data report whether or not a person is alive or dead and, if dead, when the event occurred. However, information for the retirees is incomplete, since we only know whether a person is still alive at the reference date (31 July 1998). In other words, for those in the B file, we know if they stopped receiving benefits because of death before 31 July 1998, but not the exact date when this happened.
- *Left-censored histories:* Early spells (those which started before the mid-1960s) are very poorly recorded because the current structure of the Spanish SS administration was set up only in the second half of the 1960s. Hence, we have incomplete records of the work histories of individuals older than fifty-five or sixty. This is a major problem for our computation of expected pensions, since the current system establishes a clear formula to impute years of contribution before 1967, specifically,

$$\text{IDC} = [1967 - (y_b + 210)] \times 250,$$

  where IDC stands for imputed days of contribution, and $y_b$ stands for the year of birth. For each individual, the IDC is then compared with the actual days of contribution before 1967 as reported in the H file. The largest of these quantities is chosen as the individual's contributive history before 1967.
- *Marital status:* This variable is very poorly recorded, especially for individuals who are still active. The reason is that marital status does not affect contribution rates but may affect SS benefits. Hence, individuals have no incentive to adjust their records while active. They do so only when pressured, which is not frequent, or when they change jobs. Most often, people adjust their marital status in the SS records at the time of retirement in order to draw benefits for the spouse. Information on marital status is therefore incorrect for many individuals (in 1997, only 27.50 and 10.31 percent of men and women, respectively, report to be married). To fill in the gap we use the EPA. From this survey, we can extract the following information:

  1. Working men are married with women three years younger, whereas working women are married with men four years older.

2. Male workers are very likely to be married. The fraction of working males who are married, from EPA, is 95.10, 94.6, and 92.7 percent for males aged fifty to fifty-four, fifty-five to fifty-nine, and sixty to sixty-four, respectively. Female workers are less likely to be married (between 60 and 70 percent) and more likely to be widowed (between 10 and 20 percent), depending on the level of education.

3. For low-educated male workers fifty-five and older, the fraction of working spouses is very low (less than 15 percent) and decreases with age; whereas for highly educated male workers, the fraction of working spouses is much higher (35 percent).

4. For low-educated female workers fifty-five and older, the fraction of working spouses is low (less than 35 percent for age group fifty-five to fifty-nine and 25 percent for the age group sixty to sixty-four. For highly educated female workers, the fraction of working spouses is also much higher (45 percent and 30 percent, respectively, for the age groups fifty-five to fifty-nine and sixty to sixty-four).

- *Family data:* There is no information on family size or its structure. The Spanish SS simply does not keep this kind of records because family size does not affect either contribution rates (like marital status) or pensions (as marital status does).

### 9.3.3 Sample Selection Rules

We distinguish between a "wage sample," used to study earnings dynamics, and a "participation sample," used to study labor force participation and exit into retirement. In either case, the analysis is carried out separately for men and women born between 1916 and 1958 (about 160,000 men and 84,000 women). In figure 9.2, we show the distribution of the sample by sex and year of birth. Note the upward jump between 1918 and 1919 and the reduction during 1938 and 1939 followed by a spike in 1940, which was a direct consequence of the Spanish Civil War.

While we place practically no restrictions on the H-file derived participation sample, which covers all the Spanish SS regimes (see table 9.6 for a

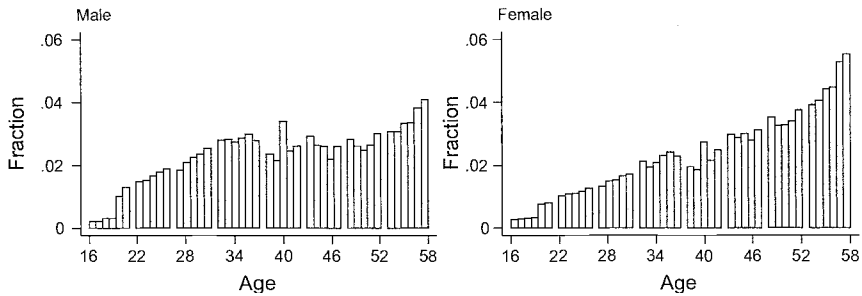


**Fig. 9.2 Distribution of the participation sample by birthdate and sex**

**Table 9.6** Distribution of the Participation Sample, by Regime

| Year | RGSS | RETA | REA | RTMAR | RTMC | REEH | *N* |
|---|---|---|---|---|---|---|---|
| 1985 | 59.66 | 15.98 | 18.48 | 2.97 | 0.07 | 2.87 | 213,238 |
| 1989 | 61.36 | 16.97 | 16.24 | 3.08 | 0.07 | 2.28 | 196,254 |
| 1993 | 63.43 | 17.01 | 14.32 | 3.40 | 0.07 | 1.77 | 168,560 |
| 1997 | 62.00 | 17.58 | 14.93 | 3.90 | 0.08 | 1.51 | 132,587 |

*Notes:* $N$ = number of observations. See text for explanation of abbreviations.

description of the sample distribution by regime), the CE-file wage sample is restricted to individuals in the RGSS, the RTMC, or RETA. We have excluded individuals enrolled in the REA, RTMAR, or REEH because of their discontinuous careers and very low reliability of the earnings reported.

### 9.3.4 Key Elements in Data Handling

*Definition of Retirement*

In any given year $t$, being retired can be characterized by a number of different events. Correspondingly, we have the following four different definitions of retirement, of which the first is the broadest, while the others cannot be directly compared.

1. Not having an open spell after year $t$
2. In addition to 1, not contributing in years $t + k$, $k > 0$
3. In addition to 1, a retirement recorded in the entry "cause of termination of the spell"
4. In addition to 1, a retirement or termination by temporary illness recorded in the entry "cause of termination of the spell"

In our sample, we obtain practically the same fraction of retired people under either definition 1 or 2. More precisely, 99.15 percent of males retired under definition 1 are also retired under definition 2. Likewise, 96.01 percent of females retired under definition 1 are retired under definition 2. The definitions using the cause for the termination of the last employment spell (either definitions 3 or 4) are much stricter and probably too much so. Only a fraction of those considered retired under definition 1 are as such under either definitions 3 or 4 (48.82 and 30.82 of the male and female sample, respectively). This lack of coincidence is sharply reduced when considering individuals aged sixty to sixty-four, but is still very important (well above 40 percent in both cases). Most likely, this large discrepancy is due to omission of the cause for termination of spell and does not reflect a different status.

A number of other technical details should be kept in mind.

1. *Eligibility:* The early retirement age in Spain is sixty (see section 9.2 for a description of restrictions and related penalties). Some exceptions are

still possible at age fifty-eight for workers of distressed firms. We can follow individuals from either age or even earlier when appropriate.

2. *Transition from unemployment to retirement:* This is an option open to workers older than fifty-two who are eligible for a special kind of UB. This special kind of UB is not reported in the current version of our data set. Still, we need to consider that, for individuals older than fifty-two, this is a possible path to retirement. In particular, we must decide whether or not unemployed people older than fifty-two should be considered in or out of the labor force. In this work, we have decided that a worker is in the labor force as long as they are contributing to the SS administration.

3. *Transition to and from disability:* These transitions are hard to capture using the available data. Considerations similar to those developed for the case of transition from unemployment apply to working histories involving disability or long-term illness. In order to classify people, we follow the criteria just outlined for those unemployed: A worker in the temporary illness program is in the labor force as long as they keep contributing to the SS.

*Demographic Characteristics of the Sample*

Our sample reports information on age, sex, contributive group (from which we can extract a proxy of the level of education), marital status (very imprecise, as mentioned earlier), sector of employment (four-digit SIC classification), and province of residence. Other available information is part-time work and length of tenure in the current job and in the labor market.

*Education and Participation (RGSS)*

No direct measure of educational attainment is available. For individuals enrolled in the RGSS, a good proxy for the level of education may be constructed using the information on the contributive group of the subject since, for these workers, a variety of labor market regulations force a close relationship between educational level and contributive group.

The criteria we adopted are the following. All individuals in contributive group 1 were assigned to the college level of the educational variable. Individuals in contributive groups 2, 3, and 4 were assigned to the high school (*diploma*) level. People in all other contributive groups were assigned to a generic class labeled as "less than high school."

Table 9.7 compares the resulting distribution of educational levels in the HLSS sample in 1997 with the corresponding distribution obtained from the EPA, which reports educational levels directly. Results are mixed. If we take the EPA as a correct estimate of the population distribution, then our sample overestimates the number of educated men (summing together those at the college and diploma levels) and underestimate the proportion of educated women. This is not altogether surprising. We are inferring the

**Table 9.7** **Distribution by Education in HLSS and EPA in 1997 (employed individuals, born 1916–58, enrolled in the RGSS)**

| | HLSS Sample | | | EPA IV | | |
|---|---|---|---|---|---|---|
| Education | Male | Female | Total | Male | Female | Total |
| College | 9.55 | 6.38 | 8.58 | 7.99 | 7.48 | 7.82 |
| Diploma | 10.18 | 10.51 | 10.28 | 6.81 | 14.27 | 9.22 |
| Other | 80.27 | 83.11 | 81.13 | 85.20 | 78.25 | 82.96 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

educational level from the professional rank in which individuals are classified for contributive purposes. The Spanish labor market is notoriously characterized by a substantial amount of discrimination by sex. This forces a large fraction of working women into occupational profiles lower than those of men with similar educational attainment and qualification. Various empirical studies have documented this fact, which is clearly reflected also in the SS administrative records that we use.

The bottom panels of figure 9.3 show the pattern of participation by educational level and age for individuals enrolled in the RGSS. The large variations in the participation rate of women with either a college degree or a diploma at ages higher than fifty should be interpreted as noise generated by the very limited number of observations available for female in those age groups.

The table confirms the well-documented finding that, for both men and women, higher education is associated with higher participation rates in general and at older ages, in particular. Notice also how retirement patterns for individuals with high education are much more sharply defined: Hazard rates before the normal retirement age of sixty-five are lower than for the rest of the labor force, while they become much higher at the normal retirement age.

*Economic Characteristics of the Sample*

In table 9.8 we show, for selected years, the sample distribution by contributive groups of workers enrolled in the RGSS and the RTMC. As mentioned earlier, the contributive group may be regarded as a combination of education, skills, and type of contract. The distribution by contributive groups in our sample seems quite stable over the whole period, except for blue-collars. The fraction of skilled blue-collars increases (from 21.6 to 25.4 percent), whereas the fraction of semiskilled and unskilled decreases. These findings reflect accepted modifications in the skill distribution of the Spanish labor force over the sample period.

Table 9.9 shows the sample distribution of workers in the RGSS by broad industry categorization (1-digit SIC classification). For both men and

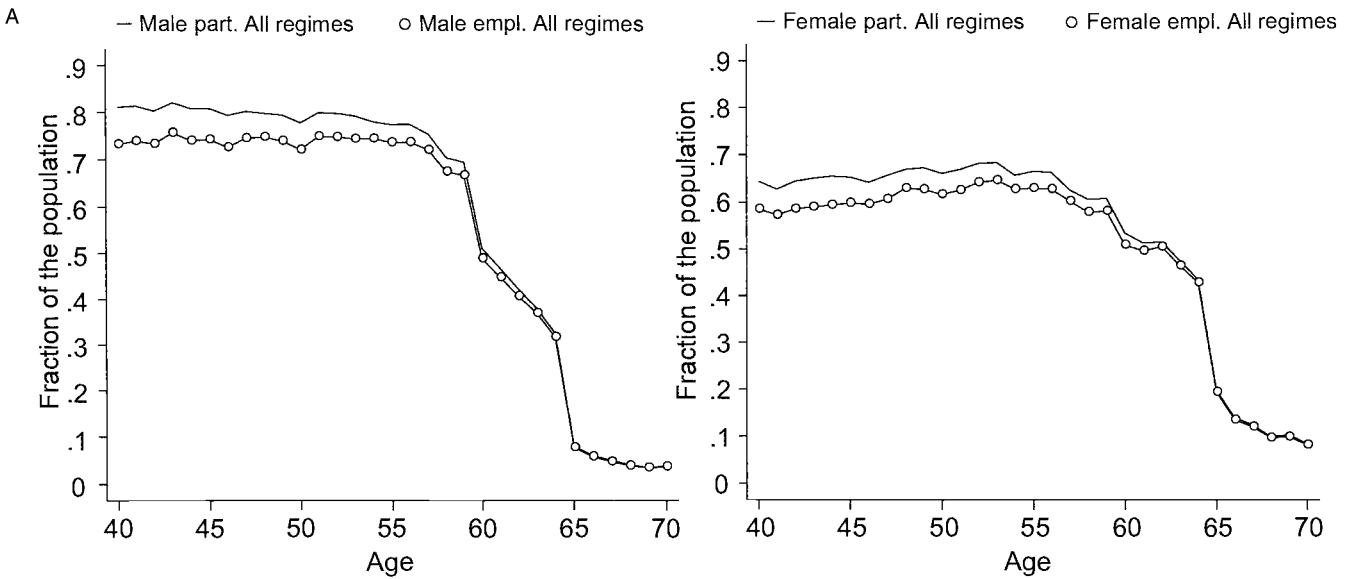


**Fig. 9.3 Participation, employment, and education level, all regimes**

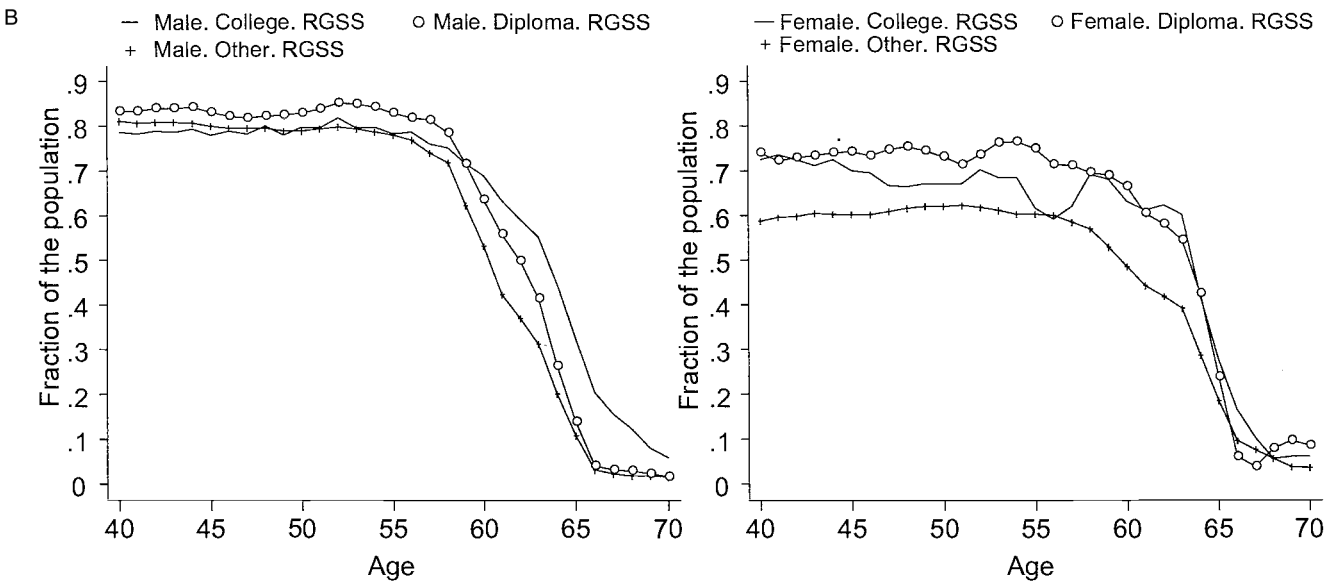


**Fig. 9.3 (cont.) Participation, employment, and education level, all regimes**

**Table 9.8** **Distribution of the RGSS Plus the RTMC Sample, by Group of Contribution**

| Group of Contribution | Year | | | |
|---|---|---|---|---|
| | 1985 | 1989 | 1993 | 1997 |
| *White-collar* | | | | |
| 1. Engineer and College | 6.08 | 7.10 | 7.75 | 7.75 |
| 2. Technical engineer | 4.34 | 4.68 | 5.11 | 5.87 |
| 3. Supervisor and foreman | 3.97 | 4.53 | 5.13 | 5.36 |
| 4. Assistant without grade | 3.39 | 3.70 | 3.91 | 4.09 |
| 5. Clerk | 9.35 | 9.68 | 10.13 | 10.70 |
| 6. Janitor | 5.73 | 5.87 | 6.21 | 6.70 |
| 7. Clerk assistant | 7.04 | 6.58 | 6.67 | 7.08 |
| *Blue-collar* | | | | |
| 8. Skilled (1st and 2nd class) | 21.57 | 24.05 | 24.89 | 25.42 |
| 9. Semiskilled (3rd and specialized) | 14.43 | 12.97 | 11.43 | 10.26 |
| 10. Unskilled | 20.83 | 20.13 | 18.50 | 16.58 |
| 11. Worker (17 yrs old) | 0.29 | 0.16 | 0.09 | 0.04 |
| 12. Worker (16 yrs old) | 0.16 | 0.07 | 0.01 | 0.00 |
| 13. Other | 2.81 | 0.38 | 0.17 | 0.16 |
| Total | 127,356 | 120,568 | 107,032 | 82,313 |

**Table 9.9** **Sample Distribution in 1985 and 1997, by Sector (RGSS and RTMC)**

| Sector | 1985 | | | 1997 | | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total |
| Agriculture, fishing | 0.32 | 0.23 | 0.30 | 0.26 | 0.16 | 0.23 |
| Energy | 2.29 | 0.50 | 1.79 | 1.99 | 0.34 | 1.51 |
| Minerals, chemical | 7.12 | 1.75 | 5.61 | 4.78 | 1.25 | 3.75 |
| Mechanical, engineering | 10.52 | 2.29 | 8.21 | 6.94 | 1.54 | 5.36 |
| Other manufacturing | 11.19 | 8.58 | 10.46 | 7.67 | 5.32 | 6.98 |
| Industry | | | | | | |
| Construction | 11.35 | 1.93 | 8.71 | 10.30 | 1.18 | 7.63 |
| Retail | 14.65 | 19.51 | 16.01 | 13.50 | 15.99 | 14.23 |
| Transportation | 7.15 | 2.81 | 5.93 | 7.15 | 2.71 | 5.85 |
| Communication and financial | 8.16 | 6.72 | 7.75 | 8.26 | 7.14 | 7.94 |
| Other services | 6.08 | 16.37 | 8.97 | 9.19 | 24.85 | 13.74 |
| Administration | 8.92 | 23.74 | 13.08 | 10.23 | 20.47 | 13.23 |
| Code 9130 | 2.76 | 5.17 | 3.44 | 9.89 | 10.03 | 9.93 |
| Temporary illness | 8.66 | 8.97 | 8.75 | 8.10 | 8.01 | 8.08 |
| Other (Codes 0000 & 9990) | 0.79 | 1.42 | 0.97 | 1.75 | 1.00 | 1.54 |
| Total | 69,682 | 27,219 | 96,901 | 53,134 | 22,006 | 75,140 |

**Table 9.10** Length of Firm and Market Tenure, by Years

| | All SS Regimes | | | | RGSS and RTMC | | | |
|---|---|---|---|---|---|---|---|---|
| | Spell | | Experience | | Spell | | Experience | |
| Year | Male | Female | Male | Female | Male | Female | Male | Female |
| 1985 | 8.3 | 5.0 | 16.3 | 8.1 | 6.5 | 4.7 | 16.7 | 10.1 |
| 1988 | 7.7 | 4.8 | 16.0 | 8.1 | 5.9 | 4.4 | 16.2 | 9.9 |
| 1991 | 7.4 | 4.6 | 15.9 | 7.9 | 5.7 | 4.2 | 16.2 | 9.7 |
| 1994 | 7.2 | 4.5 | 15.8 | 7.9 | 5.9 | 4.4 | 16.2 | 9.9 |
| 1997 | 6.8 | 4.4 | 15.3 | 7.9 | 5.8 | 4.5 | 15.9 | 10.1 |

*Note:* History spell is uncorrected for left-censored histories.

women, the most important sector of employment is administration and other services, followed by retail services. Note also the important fraction of men in a condition of temporary illness. We do not report the distribution for individuals enrolled in the RESS (RETA, REA, or REEH) because the data set does not indicate the industry in which they should be classified.

In table 9.10, we present the average length of the last spell of work (a good proxy for the length of tenure with the current firm) and the average work history (a good proxy for labor market tenure). Notice that both measures remain fairly stable during the sample period and that, for obvious reasons, work spells with a firm are much longer for self-employed than for employees. Both firm and market tenures are much longer for men than for women.

## 9.4 Earnings Distribution, Earnings Histories, and Projections

As commented in section 9.3.1, we do not observe earnings directly, but instead only use covered earnings. Covered earnings are a doubly censored version of earnings for workers in the RGSS or RTMC, and they are very weakly related to true earnings for workers in the RESS because of the presence of both legislated tariffs and widespread tax fraud.

### 9.4.1 RGSS and RTMC

In figure 9.4 we present the distribution of the log of real covered earnings for workers enrolled in the RGSS or RTMC for the years 1986 (top panels) and 1995 (bottom panels), respectively. We distinguish by sex and report only two contributive groups (1 and 8). Two patterns arise. First, the increase over time in the fraction of top-censored observations for both the first (workers with college degrees) and the eighth (skilled workers) contributive group. For both men and women, the increase is quite pronounced for the first group, which corresponds to the highest wages. In the

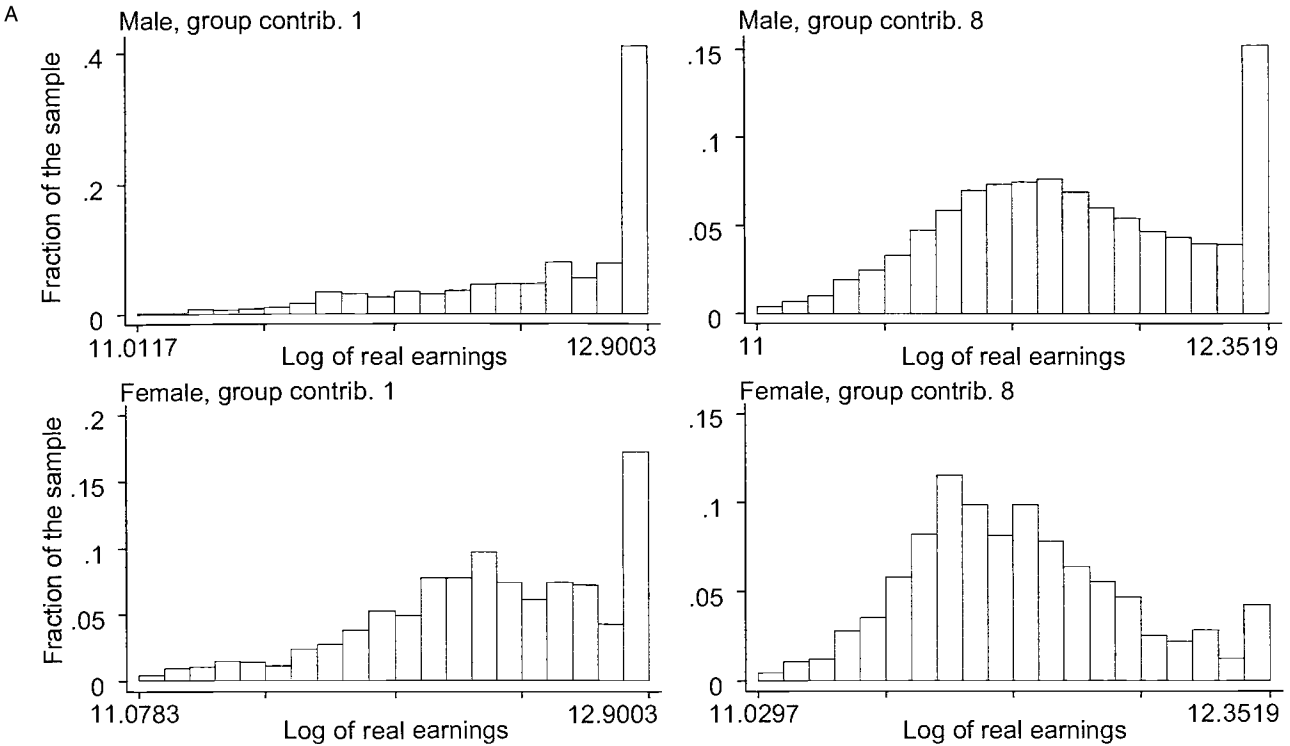


**Fig. 9.4 Distribution of covered earnings, RGSS by sex and group of contribution: *A*, 1986; *B*, 1995**

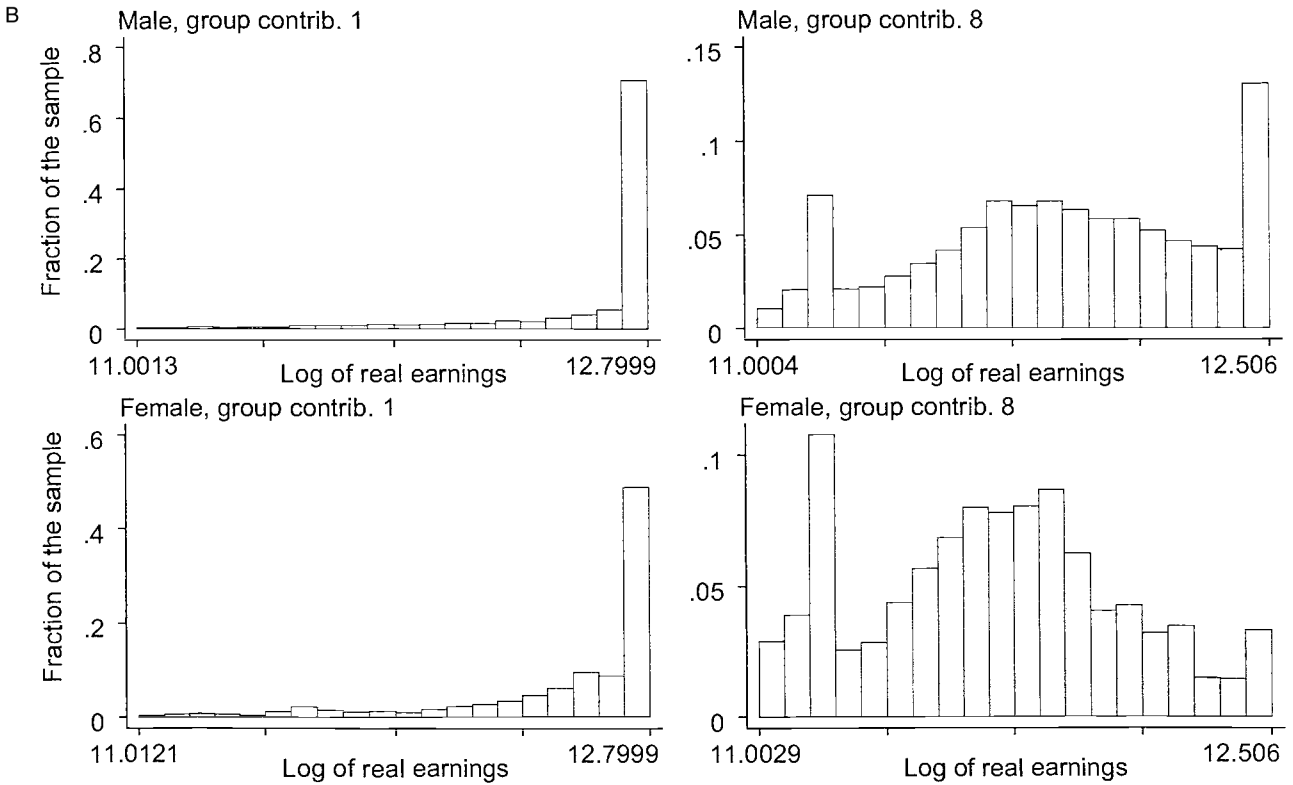


**Fig. 9.4 (cont.) Distribution of covered earnings, RGSS by sex and group of contribution: *A*, 1986; *B*, 1995**

other group, which corresponds to median and below-median wages, it is relevant only for men and not for women. This asymmetry suggests that the gender bias characterizing the Spanish labor market is actually weaker or weakening in the top segments of the wage distribution but is still quite strong in the lower ones. The presence of increasing top censoring is also evidence of the inability of legislated ceilings to keep up with real wage dynamics: Ceilings on covered earnings are adjusted only to price inflation and do not track growth in real wages. The second important observation is that bottom censoring also increases in the eighth contributive group for both men and women, which is quite surprising. This suggests that the wage distribution has become more spread out over time. Notice that the Spanish government has also followed the policy of progressively reducing the relative size of the floor-to-ceiling bands by increasing the floor faster than the ceiling, which helps explaining the increasing number of bottom-censored individuals.

Overall the evidence reported suggests that we should invest a considerable effort in recovering true earnings from covered earnings for people enrolled in the RGSS or RTMC. Also, given the purpose for which we need to uncover true earnings, eliminating the effect of top censoring is the important goal. In our analysis, true earnings are used to project or forecast future wages for workers (sixty-five years or older) that are making the choice between retiring and continuing to work. In any given contributive group, it is most unlikely that such workers would be at the bottom of the wage distribution and would look forward to an ever-decreasing salary if they kept working. Both, the skill-acquisition process and the existence of seniority pay (still important in Spain) suggest that old workers should be found in the upper tail of the distribution of salaries.

This intuition is confirmed, but only partially, by the data. In table 9.11, we report the percentage of workers, men or women, that are forty or older and are either at the bottom or at the top of the distribution of covered earnings for each one of the ten contributive groups. As expected, the frequency of observations in the bottom-censored groups is substantially lower than at the top-censored groups. Still, it is higher than one would expect, especially for people in the contributive groups with lower salaries (7 and higher-index numbers), and it does not seem to decrease with age. These anomalies in the data notwithstanding, we find it rather unlikely for the near retirees to be found in any significant proportion at the bottom of the distribution of wages and looking forward to further decreases in the wage itself. Hence, we have elected not to bother getting rid of the bottom censoring and to concentrate on the top-censoring problem.

To deal with the top-censoring problem, we proceed as follows. First we estimate a tobit model for covered earnings. Then we use the estimated parameters to impute the earnings of the censored observations and estimate an earning function using imputed earnings for those affected by the ceil-

**Table 9.11** **Relevance of Floors and Ceilings in Covered Earnings (RGSS, RTMC, and RETA)**

| | | 1986 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | | | | | Female | | | | |
| Group | Censored | 40–54 | 55–59 | 60–64 | 65+ | Total | 40–54 | 55–59 | 60–64 | 65+ | Total |
| | | | | | *RGSS and RTMC* | | | | | | |
| 1 | B | 5.5 | 5.0 | 5.4 | 19.4 | 5.6 | 9.0 | 11.1 | 0.0 | 0.0 | 8.5 |
| | A | 37.9 | 33.2 | 30.4 | 25.8 | 36.6 | 14.6 | 5.6 | 13.3 | 0.0 | 13.8 |
| 2 | B | 1.4 | 4.1 | 3.3 | 9.5 | 1.9 | 3.1 | 6.5 | 5.3 | 0.0 | 3.6 |
| | A | 37.8 | 22.1 | 21.3 | 9.5 | 34.8 | 4.8 | 4.8 | 0.0 | 11.1 | 4.6 |
| 3 | B | 1.2 | 1.6 | 1.9 | 4.8 | 1.3 | 5.1 | 5.3 | 0.0 | 0.0 | 4.7 |
| | A | 34.8 | 32.3 | 25.0 | 14.3 | 33.5 | 18.2 | 10.5 | 10.0 | 25.0 | 17.1 |
| 4 | B | 0.6 | 0.9 | 0.9 | 0.0 | 0.7 | 1.8 | 7.1 | 0.0 | — | 2.3 |
| | A | 34.1 | 20.3 | 19.7 | 13.3 | 31.3 | 14.5 | 0.0 | 12.5 | — | 12.9 |
| 5 | B | 1.2 | 2.2 | 0.4 | 0.0 | 1.3 | 3.2 | 2.7 | 4.0 | 0.0 | 3.2 |
| | A | 37.0 | 36.1 | 30.0 | 22.9 | 36.3 | 22.2 | 20.5 | 12.0 | 33.3 | 21.7 |
| 6 | B | 2.8 | 2.8 | 3.1 | 10.2 | 3.0 | 6.9 | 9.8 | 11.6 | 0.0 | 7.7 |
| | A | 17.6 | 12.8 | 8.2 | 6.8 | 14.8 | 3.1 | 2.5 | 5.8 | 11.1 | 3.3 |
| 7 | B | 8.6 | 10.5 | 10.3 | 5.6 | 8.9 | 9.1 | 12.3 | 3.1 | 100. | 9.2 |
| | A | 25.2 | 18.8 | 10.3 | 5.6 | 22.6 | 12.1 | 7.0 | 3.1 | 0.0 | 10.9 |
| 8 | B | 3.2 | 3.3 | 2.2 | 2.9 | 3.1 | 5.1 | 9.3 | 3.8 | 0.0 | 5.7 |
| | A | 13.2 | 15.1 | 10.8 | 0.0 | 13.3 | 4.4 | 2.8 | 1.9 | 0.0 | 3.9 |
| 9 | B | 2.3 | 2.8 | 3.1 | 17.1 | 2.5 | 15.8 | 13.2 | 13.5 | 11.1 | 15.3 |
| | A | 14.8 | 11.2 | 8.9 | 0.0 | 13.8 | 3.8 | 3.6 | 1.9 | 0.0 | 3.6 |
| 10 | B | 12.7 | 16.5 | 10.1 | 21.7 | 13.3 | 24.3 | 19.9 | 22.9 | 39.3 | 23.5 |
| | A | 9.6 | 4.9 | 6.0 | 8.3 | 8.2 | 3.1 | 2.2 | 0.9 | 0.0 | 2.7 |
| | | | | | *RETA* | | | | | | |
| | B | 93.2 | 90.8 | 83.8 | 83.6 | 91.6 | 97.6 | 96.3 | 93.3 | 93.6 | 96.5 |
| | A | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

ings. Finally, we generate "true earnings" for all the individuals in the top-censored groups by using the estimated regression function and adding an individual random noise component. The first two steps of the above procedure are detailed in the appendix, the latter is described in section 9.4.1.

From the individual profile of covered earnings $c_t$ between year $T-k$ and year $T$, we impute the individual profile of real true earnings ($w_t$, $t = T-k$, . . . , $T$). Given this information, we project earnings forward and backward in the following way:

- Forward: (zero real growth) $\hat{w}_{T+m} = \hat{w}_t$ for $m = 1, \ldots, M$;
- Backward: $\hat{w}_{T-k-\ell} = w_{T-k} + g(a_{T-k})$ for $\ell = 1, \ldots, L$. The function $g(\cdot)$ corrects for the growth of earnings imputable to age $a$ and is defined as

$$g(a_{T-k-\ell}) = \beta_1 \cdot a_{T-k-\ell} + \beta_2 \cdot a^2_{T-k-\ell} - \beta_1 \cdot a_{T-k} - \beta_2 \cdot a^2_{T-k}.$$

The βs are the estimated coefficients from a fixed-effects earnings equation, the details of which are available upon request. The correction is specific for each combination of sex and contributive group.

**Table 9.11** (continued)

| | | 1995 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | | | | | Female | | | | |
| Group | Censored | 40–54 | 55–59 | 60–64 | 65+ | Total | 40–54 | 55–59 | 60–64 | 65+ | Total |
| | | | | | *RGSS and RTMC* | | | | | | |
| 1 | B | 3.8 | 3.7 | 4.0 | 7.8 | 3.9 | 9.6 | 7.2 | 8.0 | 0.0 | 9.2 |
| | A | 54.6 | 54.2 | 48.1 | 39.2 | 53.5 | 31.7 | 39.1 | 44.0 | 15.4 | 32.6 |
| 2 | B | 2.8 | 4.9 | 4.1 | 3.0 | 3.2 | 3.8 | 5.5 | 5.3 | 17.6 | 4.2 |
| | A | 36.9 | 39.1 | 25.1 | 18.2 | 36.0 | 5.2 | 5.5 | 7.4 | 0.0 | 5.3 |
| 3 | B | 3.0 | 6.0 | 5.5 | 6.8 | 3.9 | 4.3 | 8.9 | 7.7 | 12.5 | 5.2 |
| | A | 33.6 | 29.1 | 20.9 | 25.0 | 31.4 | 14.4 | 8.9 | 0.0 | 12.5 | 12.8 |
| 4 | B | 2.6 | 8.4 | 7.7 | 15.2 | 4.4 | 16.1 | 9.1 | 18.2 | 16.7 | 15.4 |
| | A | 20.5 | 15.4 | 11.6 | 12.1 | 18.5 | 5.9 | 5.5 | 9.1 | 0.0 | 6.0 |
| 5 | B | 4.4 | 9.6 | 6.2 | 8.7 | 5.5 | 12.5 | 15.0 | 16.3 | 16.0 | 13.0 |
| | A | 35.1 | 29.9 | 23.5 | 11.6 | 32.7 | 19.8 | 13.1 | 14.1 | 4.0 | 18.5 |
| 6 | B | 5.0 | 9.0 | 6.2 | 5.8 | 6.1 | 11.4 | 14.6 | 11.8 | 13.5 | 11.9 |
| | A | 18.6 | 11.7 | 4.8 | 4.3 | 14.4 | 5.3 | 5.1 | 0.8 | 0.0 | 4.7 |
| 7 | B | 10.8 | 12.0 | 16.1 | 34.6 | 12.3 | 21.8 | 30.1 | 20.2 | 28.6 | 22.6 |
| | A | 19.1 | 19.5 | 13.5 | 1.9 | 18.0 | 5.0 | 2.8 | 3.2 | 0.0 | 4.7 |
| 8 | B | 9.8 | 18.5 | 14.3 | 18.3 | 12.1 | 27.2 | 27.2 | 23.4 | 53.3 | 27.3 |
| | A | 9.4 | 9.1 | 5.5 | 2.4 | 8.9 | 2.0 | 2.5 | 0.0 | 0.0 | 1.8 |
| 9 | B | 10.1 | 16.3 | 18.4 | 23.6 | 12.7 | 36.9 | 39.6 | 38.0 | 29.6 | 37.2 |
| | A | 8.3 | 8.1 | 3.5 | 0.0 | 7.6 | 1.9 | 1.3 | 0.5 | 0.0 | 1.7 |
| 10 | B | 25.8 | 41.5 | 39.5 | 58.2 | 32.3 | 49.3 | 45.2 | 41.0 | 42.5 | 47.6 |
| | A | 2.9 | 3.2 | 2.1 | 0.7 | 2.8 | 0.8 | 0.5 | 1.0 | 2.1 | 0.8 |
| | | | | | *RETA* | | | | | | |
| | B | 91.9 | 85.6 | 80.8 | 83.9 | 89.1 | 96.5 | 95.6 | 94.9 | 93.9 | 96.0 |
| | A | 0.1 | 0.3 | 0.4 | 0.7 | 0.2 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 |

*Note:* A = above; B = below.

### 9.4.2 RESS

As already pointed out, for individuals enrolled in the RESS, covered earnings are very weakly related to true earnings. In particular, the self-employed are free to choose their benefit base between an annual floor and a ceiling. Practically all of them choose the floor, as confirmed by table 9.11, which displays the fraction of self-employed contributing the minimum (censored from below) or the maximum (censored from above) for the years 1986 and 1995, respectively. This implies that there is no way in which true earnings for the self-employed can be recovered from the HLSS data set. We have therefore assumed that the earnings and the contributive profile coincide.[5] Thus, we project (real) earnings given the observed profile of (real) contributions.

5. An alternative solution to this problem is to impute to self-employed an average earnings profile obtained from alternative sources (the recent European Community Household Panel [ECHP] constitutes an excellent example; see Peracchi 2002 for a description).

- Backward: $w_{t-k-\ell} = c_{t-k}$, for $\ell = 1, \ldots, L$
- Forward: $w_{t+m} = c_t(1 + g)^m$, for $m = 1, \ldots, M$ with $g = 0.005$

In other words, we assume that contributions were constant up to the first time they are observed, while they grow at a constant annual rate of 0.5 percent thereafter.

It is important to recall, from section 9.2, that current Spanish legislation allows the self-employed to begin drawing retirement pensions without retiring, at least as long as they keep managing their own business. Hence, in the dynamic choice of the self-employed, the opportunity cost of retiring is not measured by the loss of future earnings but, instead, by the fact that contributions cannot longer be accumulated to increase future pensions and that marginal income taxes must be paid on pensions. This implies that, for the self-employed, maximization of the (net of taxes) SS payoff is a very reasonable objective function.

## 9.5 Evaluation of Social Security Incentives

### 9.5.1 Assumptions Made in the Computations

For every male worker in the wage sample enrolled in either the RGSS or the RETA we assume that (a) he is married to a nonworking spouse, (b) his wife is three years younger, and (c) his mortality corresponds to the baseline male mortality from the most recent available life tables (INE 1995).

For every female in the wage sample, we assume that (a) she is married to either a retiree or a worker entitled to retirement benefits, (b) her husband is four years older, and (c) her mortality is the baseline female mortality from the most recent available life tables (INE 1995).

For both men and women we further assume that, starting at age fifty-five and until a person reaches age sixty-five, there are three pathways to retirement: the UB52+ program, DI benefits, and early retirement. At each age, an individual has an age-specific probability of entering retirement using any of these three programs. However, we must take into account the following restrictions.

1. No person has access to early retirement before age sixty
2. After age sixty, a person cannot claim UB52+ and can only claim early retirement or DI benefits
3. A self-employed person enrolled in RETA can never claim UB52+ benefits

### 9.5.2 Calculating Social Security (SS) Incentives

For a worker of age $a$, we define social security wealth (SSW) in case of retirement at age $h \geq a$ as the expected present value of future pension benefits

$$\mathrm{SSW}_h = \sum_{s=h+1}^{S} \rho_s B_s(h).$$

Here, $S$ is the age of certain death, $\rho_s = \beta^{s-a}\pi_s$, with $\beta$ denoting the pure time-discount factor, $\pi_s$ is the conditional survival probability at age $s$ for an individual alive at age $a$, and $B_s(h)$ the pension expected at age $s \geq h + 1$ in case of retirement at age $h$. Given SSW, we define three incentive variables for a worker of age $a$.

1. *Social security accrual* (SSA) is the difference in SSW from postponing retirement from age $a$ to age $a + 1$:

$$\mathrm{SSA}_a = \mathrm{SSW}_{a+1} - \mathrm{SSW}_a = \sum_{s=a+2}^{S} \rho_s[B_s(a+1) - B_s(a)] - \rho_{a+1}B_{a+1}(a)$$

The SSA is positive if the expected present value $\Sigma_{s=a+2}^{S}\rho_s[B_s(a+1) - B_s(a)]$ of the increment in the flow of pension benefits is greater than the expected present value $\rho_{a+1}B_{a+1}(a)$ of the pension benefit foregone by postponing retirement. If the increments $B_s(a+1) - B_s(a)$ are small, as it is usually the case, then the SSA is negative. The rescaled negative accrual $\tau_a = -\mathrm{SSA}/W_{a+1}$, where $W_{a+1}$ equals expected net earnings at age $a + 1$ based on the information available up to age $a$, is called the implicit tax or subsidy on postponing retirement from age $a$ to age $a + 1$.

2. *Peak value* $\mathrm{PV}_a = \max_h(\mathrm{SSW}_h - \mathrm{SSW}_a)$, $h = a + 1, \ldots, R$, where $R$ is a mandatory retirement age (which, strictly speaking, does not exist in Spain; given the retirement evidence we find it reasonable to assume $R$ equals 70). Thus, the peak value is the maximum difference in SSW between retiring at any future age and retiring at age $a$.

3. *Option value* $\mathrm{OV}_a = \max_h(V_h - V_a)$, $h = a + 1, \ldots, R$, where

$$V_a = \sum_{s=a+1}^{S} \rho_s[kB_s(h)]^{\gamma}$$

is the total expected utility of retiring at age $a$, and

$$V_h = \sum_{s=a+1}^{h} \rho_s W_s^{\gamma} + \sum_{s=h+1}^{S} \rho_s[kB_s(h)]^{\gamma}$$

is the total expected utility of retiring at age $h > a$. Thus, the option value is the maximum utility difference between retiring at any future age and retiring at age $a$. We parameterize the model by assuming $\beta$ equals 0.97, $\gamma$ equals 1, and $k$ equals 1.25. Under our assumptions, $V_a$ equals 1.25 $\mathrm{SSW}_a$ and

$$V_h = \sum_{s=a+1}^{h} \rho_s W_s + 1.25\mathrm{SSW}_h.$$

If expected earnings are constant at $W_a$ (as assumed by our earnings model), then

$$V_h - V_a = W_a \sum_{s=a+1}^{h} \rho_s + 1.25(\mathrm{SSW}_h - \mathrm{SSW}_a),$$

**Table 9.12** Unconditional Disability Take-Ups, by Regime, Sex, and Age (1985–94)

| | RGSS | | RETA | |
|---|---|---|---|---|
| Age | Male | Female | Male | Female |
| 55 | 1.26 | 0.87 | 0.83 | 0.75 |
| 56 | 1.40 | 1.17 | 1.21 | 0.92 |
| 57 | 1.41 | 1.34 | 1.31 | 1.08 |
| 58 | 1.60 | 1.40 | 1.56 | 1.29 |
| 59 | 1.61 | 1.15 | 1.64 | 1.43 |
| 60 | 1.92 | 1.74 | 2.22 | 1.65 |
| 61 | 2.00 | 2.21 | 2.08 | 1.29 |
| 62 | 1.96 | 1.89 | 2.32 | 2.05 |
| 63 | 1.99 | 2.18 | 2.27 | 2.10 |
| 64 | 1.61 | 2.81 | 2.75 | 2.01 |
| 65 | 1.10 | 1.87 | 1.15 | 1.88 |
| 66 | 1.61 | 1.08 | 1.65 | 2.39 |
| 67 | 1.34 | 3.10 | 2.66 | 2.20 |
| 68 | 1.65 | 2.14 | 1.26 | 1.37 |
| 69 | 2.21 | 3.61 | 1.69 | 2.26 |
| 70 | 2.25 | 0.00 | 0.81 | 1.65 |

that is, the peak value and the option value are proportional to each other except for the effect due to the term $\Sigma_{s=a+1}^{h}\rho_s$.

The restrictions embodied in the fourth assumption require us to combine the incentive measures $I_j$ from the various programs ($j$ = UB, DI, R, where UB denotes unemployment benefits; DI, disability benefits; and R, the retirement programs) as follows:

$$I = \begin{cases} I_{\mathrm{DI}} p_a^{\mathrm{DI}} + I_{\mathrm{UB}}(1 - p_a^{\mathrm{DI}}) & \text{if } 55 \le a \le 60 \\ I_{\mathrm{DI}} p_a^{\mathrm{DI}} + I_{\mathrm{R}}(1 - p_a^{\mathrm{DI}}) & \text{if } 60 \le a \le 65 \\ I & \text{if } 65 \ge a, \end{cases}$$

where $p_a^{\mathrm{DI}}$ denotes the probability of observing a transition from employment into disability at age $a$. Since the self-employed have no access to UB52+ benefits, the combined incentives from age fifty-five to age fifty-nine for members of this group change to

$$I = I_{\mathrm{DI}} p_a^{\mathrm{DI}} + I_{\mathrm{R}}(1 - p_a^{\mathrm{DI}}), \quad 55 \le a \le 59.$$

We follow a regression-based approach to compute the unconditional probability of qualifying for a disability pension (see table 9.12 for summary statistics by regime, sex, and age).[6] The model is estimated, separately

6. We decided to model the unconditional probability of qualifying for a disability pension because it is the option that best captures the tightness of the SS system in the concession of disability pensions.

**Table 9.13** **SSW, Accrual, and Tax Incentive Measures (1985 system, 1995 sample; in 1995 US$)**

| Age | *N* | Median SSW | SSA | | | | Median of Tax | |
|---|---|---|---|---|---|---|---|---|
| | | | P10 | Median | P90 | SD | Sample | Simulated |
| | | | | *RGSS Male Sample* | | | | |
| 55 | 2,609 | 95,311 | –3,538 | –3,265 | 15,466 | 7,231 | 26.8 | 21.6 |
| 56 | 1,593 | 95,005 | –3,553 | –2,120 | 15,674 | 7,626 | 19.3 | 10.8 |
| 57 | 1,772 | 95,980 | –3,525 | 1,420 | 13,418 | 7,294 | –10.9 | 15.3 |
| 58 | 1,981 | 100,033 | –3,526 | 2,363 | 13,282 | 7,334 | –23.6 | 36.2 |
| 59 | 1,975 | 104,421 | –3,513 | 3,507 | 13,552 | 7,369 | –36.0 | 28.6 |
| 60 | 1,734 | 112,619 | –4,527 | 5,910 | 13,619 | 9,102 | –47.4 | –14.9 |
| 61 | 1,166 | 126,567 | –4,449 | 6,559 | 12,995 | 8,385 | –50.4 | –12.0 |
| 62 | 1,063 | 130,285 | –4,462 | 5,289 | 11,806 | 8,098 | –42.2 | –11.0 |
| 63 | 969 | 134,383 | –4,464 | 3,876 | 10,090 | 7,111 | –33.9 | 4.6 |
| 64 | 717 | 134,735 | –5,023 | 2,797 | 9,321 | 7,046 | –25.8 | 16.0 |
| 65 | 512 | 131,576 | –14,917 | –5,437 | –879 | 7,622 | 61.9 | 77.5 |
| 69 | 12 | 117,295 | –10,582 | –5,174 | –1,721 | 4,312 | 60.4 | 70.0 |
| | | | | *RETA Male Sample* | | | | |
| 55 | 563 | 77,772 | –24 | –14 | –3 | 1,670 | 0.3 | 41.6 |
| 56 | 414 | 80,379 | –29 | –22 | –13 | 1,320 | 0.4 | 40.1 |
| 57 | 416 | 82,930 | –40 | –26 | –12 | 2,446 | 0.5 | 39.0 |
| 58 | 430 | 85,611 | –36 | –33 | 4 | 2,269 | 0.6 | 37.7 |
| 59 | 467 | 88,307 | –43 | –38 | 67 | 2,165 | 0.7 | 35.3 |
| 60 | 422 | 91,132 | –4,388 | –4,345 | –4,178 | 4,598 | 83.9 | 106.5 |
| 61 | 374 | 89,514 | –4,381 | –4,308 | 7,726 | 6,859 | 83.1 | 94.5 |
| 62 | 346 | 87,907 | –4,360 | –3,925 | 8,339 | 5,616 | 75.7 | 48.7 |
| 63 | 299 | 86,471 | –4,371 | –1,279 | 3,529 | 5,769 | 24.7 | 15.3 |
| 64 | 283 | 84,836 | –4,907 | 2,610 | 5,006 | 3,995 | –50.4 | 26.8 |
| 65 | 219 | 87,132 | –4,967 | –2,277 | –971 | 2,229 | 43.9 | 100.7 |
| 69 | 15 | 76,862 | –4,976 | –2,791 | –2,791 | 1,053 | 53.9 | 95.2 |

(*continued*)

by sex and regime, using the data from the HLSS for the period 1985–1994. The set of regressors include age and region dummies and a cubic time trend for all the regimes. For people in RGSS we also consider industry and group of contribution dummies.

### 9.5.3 Results under the 1985 System

Tables 9.13 and 9.14 present the estimates of SS incentives by age (omitting ages sixty-six to sixty-eight) for the combined set of options (UB, DI, or R) described earlier. Incentives are computed separately by sex, and earnings projections are based on the methodology and the assumptions described in section 9.4.1.

Table 9.13 presents median values for SSW, SSA, and the implicit tax or subsidy to work, as well as the first and ninth decile and the standard deviation of the accrual. For comparison purposes, the column labeled "simulated" reports the age profiles of the implicit tax constructed for synthetic

**Table 9.13** (continued)

| Age | *N* | Median SSW | SSA | | | | Median of Tax | |
|---|---|---|---|---|---|---|---|---|
| | | | P10 | Median | P90 | SD | Sample | Simulated |
| | | | | *RGSS Female Sample* | | | | |
| 55 | 569 | 75,376 | –3,469 | –3,440 | 8,564 | 4,953 | 37.9 | 43.2 |
| 56 | 346 | 74,441 | –3,469 | –3,430 | 8,285 | 5,083 | 37.2 | 41.9 |
| 57 | 375 | 73,605 | –3,479 | –3,404 | 8,268 | 5,159 | 32.1 | 40.9 |
| 58 | 445 | 79,449 | –3,466 | –3,262 | 9,245 | 5,661 | 31.5 | 39.5 |
| 59 | 409 | 82,798 | –3,457 | –2,739 | 9,692 | 5,615 | 23.6 | 29.4 |
| 60 | 381 | 83,095 | –18,703 | –1,305 | 13,096 | 12,674 | 14.7 | –4.3 |
| 61 | 311 | 98,829 | –18,666 | 5,388 | 13,557 | 14,004 | –52.8 | –55.9 |
| 62 | 294 | 96,258 | –3,803 | 5,501 | 12,800 | 10,339 | –54.6 | –27.2 |
| 63 | 276 | 96,240 | –3,797 | 5,226 | 10,295 | 9,034 | –54.1 | –8.9 |
| 64 | 194 | 104,197 | –4,300 | 3,858 | 9,749 | 12,840 | –41.5 | –0.3 |
| 65 | 167 | 95,158 | –9,839 | –3,340 | 1,075 | 6,041 | 48.5 | 78.7 |
| 69 | 14 | 65,969 | –9,099 | –4,003 | –2,358 | 2,212 | 65.7 | 69.9 |
| | | | | *RETA Female Sample* | | | | |
| 55 | 240 | 59,685 | –32 | –5 | –2 | 1,318 | 0.1 | 41.8 |
| 56 | 158 | 61,714 | –25 | –8 | –3 | 1,494 | 0.2 | 40.5 |
| 57 | 168 | 63,756 | –46 | –12 | –5 | 1,039 | 0.2 | 39.7 |
| 58 | 182 | 65,883 | –45 | –17 | –7 | 885 | 0.3 | 38.5 |
| 59 | 209 | 68,081 | –53 | –23 | –10 | 1,158 | 0.4 | 36.4 |
| 60 | 207 | 70,532 | –3,782 | –3,698 | –3,107 | 7,198 | 71.4 | 97.1 |
| 61 | 165 | 68,662 | –18,358 | –3,722 | –858 | 11,749 | 71.8 | 92.8 |
| 62 | 137 | 67,369 | –3,745 | –3,425 | 3,918 | 10,440 | 66.1 | 81.4 |
| 63 | 177 | 65,788 | –3,745 | –2,289 | 5,866 | 7,640 | 44.2 | –23.5 |
| 64 | 122 | 64,202 | –4,193 | 1,932 | 5,466 | 9,036 | –37.3 | –14.6 |
| 65 | 110 | 66,026 | –4,214 | –56 | 164 | 4,571 | 1.1 | 68.3 |
| 69 | 28 | 58,198 | –2,255 | –742 | –552 | 2,261 | 14.3 | 76.4 |

*Note: N* = number of observations; P10 = tenth percentile; P90 = ninetieth percentile; SD = standard deviation.

individuals using the criteria described in Boldrin, Jiménez-Martín, and Peracchi (1999). More precisely, we consider the following cases.

1. Male in RGGS: base case as in Boldrin, Jiménez-Martín, and Peracchi (1999, 338)
2. Male in RETA: same as above, but with thirty-two years of contributions at age sixty and contributing to the minimum
3. Female in RGSS: twenty years of contributions at age sixty, without dependent spouse and receiving 60 percent of the sample average wage
4. Female in RETA: same as above, but with twenty-two years of contribution at age sixty, without a dependent spouse, and always having contributed to the minimum

For men in the RGSS, the SSW starts off at $95,311 (1995 exchange rate) and peaks between sixty-three and sixty-four years of age at $134,735. The

**Table 9.14 Peak and Option Value Incentive Measures (1985 System, in 1995 US$)**

| | | Peak Value | | | | Option Value | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age | *N* | P10 | P50 | P90 | SD | P10 | P50 | P90 | SD |
| | | | | *RGSS Male Sample* | | | | | |
| 55 | 2,609 | –3,529 | 18,384 | 86,697 | 35,220 | 3,319 | 124,264 | 311,883 | 119,742 |
| 56 | 1,563 | –3,546 | 18,228 | 75,456 | 31,228 | 2,690 | 111,068 | 284,558 | 109,823 |
| 57 | 1,772 | –3,518 | 19,871 | 60,505 | 25,333 | 2,049 | 103,772 | 245,406 | 91,044 |
| 58 | 1,981 | –3,525 | 15,379 | 50,096 | 21,085 | 1,382 | 85,871 | 215,663 | 80,676 |
| 59 | 1,975 | –3,513 | 13,827 | 41,647 | 18,759 | 702 | 73,011 | 187,562 | 70,260 |
| 60 | 1,734 | –4,508 | 13,384 | 35,447 | 16,834 | 0 | 65,032 | 162,590 | 59,415 |
| 61 | 1,166 | –4,439 | 12,949 | 28,876 | 14,286 | 4,023 | 58,829 | 143,823 | 49,550 |
| 62 | 1,063 | –4,453 | 9,800 | 23,764 | 12,001 | 3,337 | 46,348 | 116,935 | 40,827 |
| 63 | 969 | –4,458 | 6,511 | 17,902 | 9,459 | 593 | 33,269 | 82,473 | 31,124 |
| 64 | 717 | –5,023 | 2,806 | 9,798 | 7,815 | 0 | 19,916 | 67,644 | 29,071 |
| 65 | 512 | –14,710 | –5,388 | –687 | 7,745 | 0 | 3,567 | 39,548 | 21,755 |
| 69 | 12 | –10,582 | –5,174 | –1,721 | 4,312 | 0 | 2,432 | 12,755 | 7,527 |
| | | | | *RETA Male Sample* | | | | | |
| 55 | 563 | –4 | 1 | 48 | 12,234 | 31,203 | 38,383 | 40,927 | 28,280 |
| 56 | 414 | –20 | –14 | 6 | 9,960 | 23,017 | 33,906 | 34,129 | 23,042 |
| 57 | 416 | –29 | –25 | 217 | 12,207 | 21,707 | 29,294 | 35,741 | 27,015 |
| 58 | 430 | –35 | –33 | 964 | 10,878 | 14,391 | 24,528 | 34,185 | 23,836 |
| 59 | 467 | –42 | –38 | 8,023 | 10,760 | 10,433 | 19,715 | 45,954 | 23,273 |
| 60 | 422 | –4,388 | –4,345 | 2,920 | 10,031 | 5,272 | 14,216 | 31,141 | 18,699 |
| 61 | 374 | –4,378 | –4,307 | 19,124 | 13,007 | 5,460 | 13,947 | 52,692 | 22,595 |
| 62 | 346 | –4,360 | –1,112 | 18,030 | 9,728 | 4,308 | 13,413 | 49,320 | 18,960 |
| 63 | 299 | –4,365 | 1,312 | 6,235 | 7,506 | 2,058 | 11,824 | 23,436 | 14,432 |
| 64 | 283 | –4,907 | 2,610 | 5,006 | 4,371 | 2,693 | 10,449 | 20,114 | 10,981 |
| 65 | 219 | –4,967 | –2,277 | –971 | 2,365 | 90 | 4,184 | 8,863 | 6,352 |
| 69 | 15 | –4,976 | –2,791 | –2,791 | 1,053 | 34 | 1,693 | 1,693 | 889 |

(*continued*)

tenth percentile of the accrual is negative at all ages. The median accrual is negative until age fifty-six, becomes positive between fifty-seven and sixty-four, and then negative at older ages. Notice that, except after age sixty-five, there is little agreement between our median or average tax rate and the simulated base case in Boldrin, Jiménez-Martín, and Peracchi (1999).

Part of this discrepancy is due to a technical correction in the set of assumptions made in the computation of incentives before normal retirement age. In Boldrin, Jiménez-Martín, and Peracchi (1999), we assumed that when a person stops working between age fifty-five and fifty-nine, their pension is computed considering earnings until that age, even if they start receiving the pension only at age sixty. In this present matter, for an individual aged between fifty-five and fifty-nine, we assume instead that

- They receive unemployment benefits until age sixty and retirement benefits thereafter; and

**Table 9.14** (continued)

| | | Peak Value | | | | Option Value | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age | *N* | P10 | P50 | P90 | SD | P10 | P50 | P90 | SD |
| | | | | *RGSS Female Sample* | | | | | |
| 55 | 569 | –3,460 | 4,363 | 64,805 | 28,777 | 1,283 | 90,648 | 233,563 | 91,939 |
| 56 | 346 | –3,465 | –745 | 59,539 | 26,634 | 4,007 | 80,670 | 207,748 | 83,268 |
| 57 | 375 | –3,464 | 12,030 | 49,515 | 22,512 | 0 | 93,303 | 171,444 | 71,615 |
| 58 | 445 | –3,456 | 11,121 | 49,837 | 21,830 | 0 | 74,859 | 177,974 | 74,338 |
| 59 | 409 | –3,451 | 16,531 | 41,702 | 19,911 | 781 | 78,794 | 142,584 | 60,987 |
| 60 | 381 | –18,654 | 13,871 | 39,334 | 21,953 | 0 | 62,281 | 128,809 | 55,387 |
| 61 | 311 | –18,585 | 13,840 | 36,439 | 22,330 | 1 | 56,892 | 118,919 | 51,049 |
| 62 | 294 | –3,794 | 11,547 | 28,191 | 16,147 | 0 | 46,127 | 93,063 | 39,942 |
| 63 | 276 | –3,790 | 9,757 | 19,173 | 12,009 | 294 | 34,382 | 65,189 | 28,377 |
| 64 | 194 | –4,300 | 3,858 | 10,509 | 12,910 | 0 | 18,913 | 49,401 | 28,260 |
| 65 | 167 | –9,135 | –3,294 | 1,586 | 7,266 | 0 | 6,217 | 37,962 | 18,361 |
| 69 | 14 | –9,099 | –4,003 | –2,358 | 2,212 | 0 | 1,372 | 6,180 | 2,845 |
| | | | | *RETA Female Sample* | | | | | |
| 55 | 240 | –28 | 180 | 8,934 | 10,398 | 36,029 | 44,058 | 55,356 | 22,158 |
| 56 | 158 | –25 | –8 | 8,756 | 11,312 | 31,578 | 39,105 | 51,242 | 23,707 |
| 57 | 168 | –46 | –12 | 8,431 | 7,212 | 26,115 | 34,216 | 46,872 | 15,544 |
| 58 | 182 | –45 | –9 | 8,117 | 7,047 | 10,167 | 32,113 | 42,401 | 16,533 |
| 59 | 209 | –45 | –23 | 7,810 | 6,295 | 5,273 | 26,156 | 37,817 | 14,472 |
| 60 | 207 | –3,769 | –2,564 | 7,104 | 12,086 | 12,670 | 22,642 | 32,810 | 17,505 |
| 61 | 165 | –18,358 | –2,423 | 9,862 | 14,296 | 113 | 20,000 | 31,882 | 10,470 |
| 62 | 137 | –3,745 | 2,411 | 11,686 | 13,087 | 10,576 | 22,058 | 29,615 | 12,153 |
| 63 | 177 | –3,742 | 2,805 | 10,293 | 9,122 | 8,647 | 20,497 | 26,610 | 7,544 |
| 64 | 122 | –4,193 | 2,011 | 5,466 | 9,106 | 10,341 | 17,729 | 21,394 | 6,350 |
| 65 | 110 | –4,214 | –56 | 164 | 4,646 | 6,422 | 13,573 | 15,823 | 5,399 |
| 69 | 28 | –2,255 | –742 | –552 | 2,261 | 2,364 | 4,255 | 4,493 | 1,197 |

*Note:* See table 9.13.

- The pension is computed at age sixty. From age *a* to age sixty, the individual contributes the mandatory minimum level of contributions to their pension.

For the median worker, this modification introduces incentives to keep working until the early retirement age. However, for the seventy-fifth percentile or higher, we still find strong incentives to stop working.

For men in RETA, the SSW reaches a peak ($91,132) at sixty but is flat between fifty-nine and sixty-five. The median accrual is negative at all ages except age sixty-four, whereas the opposite occurs with the median implicit tax. The age-incentive profiles for women in the RGSS or the RETA are similar to those for men, although the median values of our incentive measure are higher than those for men in the age range sixty to sixty-four. This is because women have shorter careers and, on average (or at the median), do not qualify for a full pension in that age range.

Table 9.14 presents the age profile of the median, tenth percentile, and

ninetieth percentile and the standard deviation of the peak and option values for men and women in the RGSS and the RETA. In all the cases considered, the peak value and the accrual (presented in the previous table) show very similar profiles. However, from age fifty-five to age sixty-four, the median peak value is much higher, thus reinforcing retention incentives in that age range. From age sixty-five, they are identical in practically all the cases.

The option value of retiring starts at a very high level for individuals enrolled in the RGSS and decreases continuously with age. Note that the tenth percentile is close to zero at practically all ages, revealing strong retirement incentives for those people. For the individuals in the RETA, the fact that we have used the contributive profile to approximate earnings explains why the option value of retirement is very low at all ages compared to that of people from RGSS. Furthermore, the fact that most of the people enrolled in the RETA contribute the minimum amount explains why the tenth and ninetieth percentiles of the option value are very similar.[7]

## 9.6 Retirement Models for the Year 1995

This section investigates the explanatory power of our incentive measures (accrual, peak value, and option value) for retirement behavior. Before presenting the estimates of our model for the probability of retirement, we review the available sample evidence for the RGSS (including RMTC) and the RETA.

### 9.6.1 Sample Evidence

Figure 9.5 shows the patterns of retirement in 1995. The top panels show the age profile of the exit rate from the labor force by sex and SS regime (RGSS and RETA on the top-left and top-right panel, respectively). For men in the RGSS, the age profile of exit rates shows two peaks, at age sixty and sixty-five (respectively, the early and normal retirement ages), whereas for women in the RGSS and both men and women in the RETA, only the peak at age sixty-five is evident.

The bottom-left panel plots, for those enrolled in the RGSS, the exit rate from the labor force at the early retirement age of sixty against the quantiles of expected earnings at the same age (in 1995 pesetas). Who is leaving the labor force at age sixty? The answer, especially for men, is clear from the figure: those with relatively low wages, in particular, those with wages below the twenty-fifth percentile. As shown in Jiménez-Martín and Sánchez (2000), the main cause of retirement for this group is the interaction between age, the penalties for insufficient contributions, and the minimum pension provision. In addition, it can be shown that exit rates from the labor force for women with relatively low earnings are

7. We must also take into account our lack of information about true earnings for people enrolle d in RETA. To compute the option value, we instead used information on contributions.

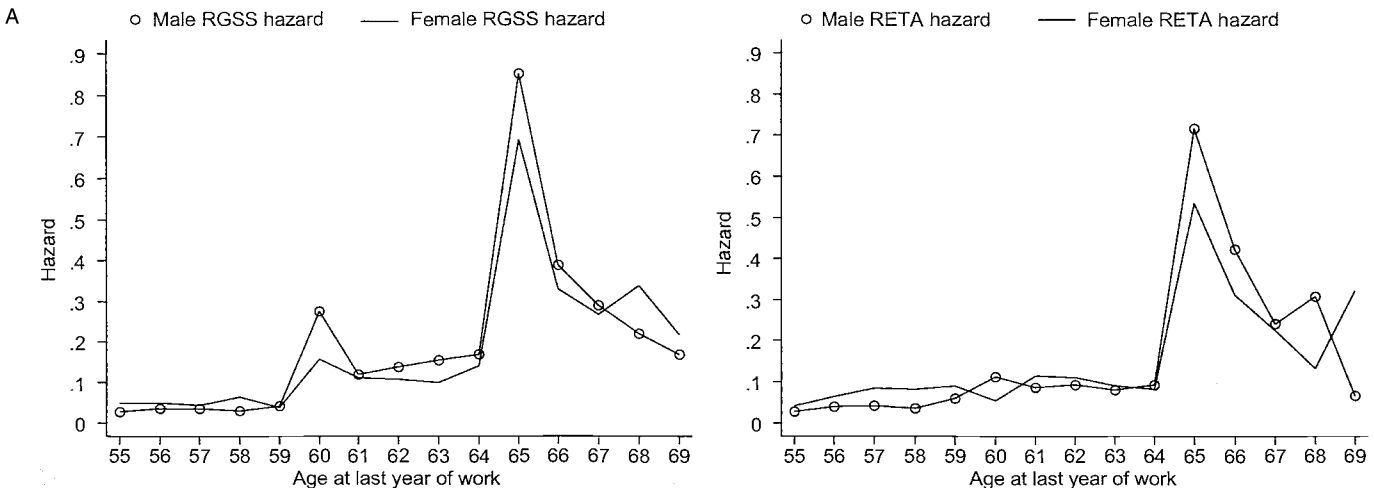


**Fig. 9.5 Retirement patterns by sex, age, and expected wage, 1995**

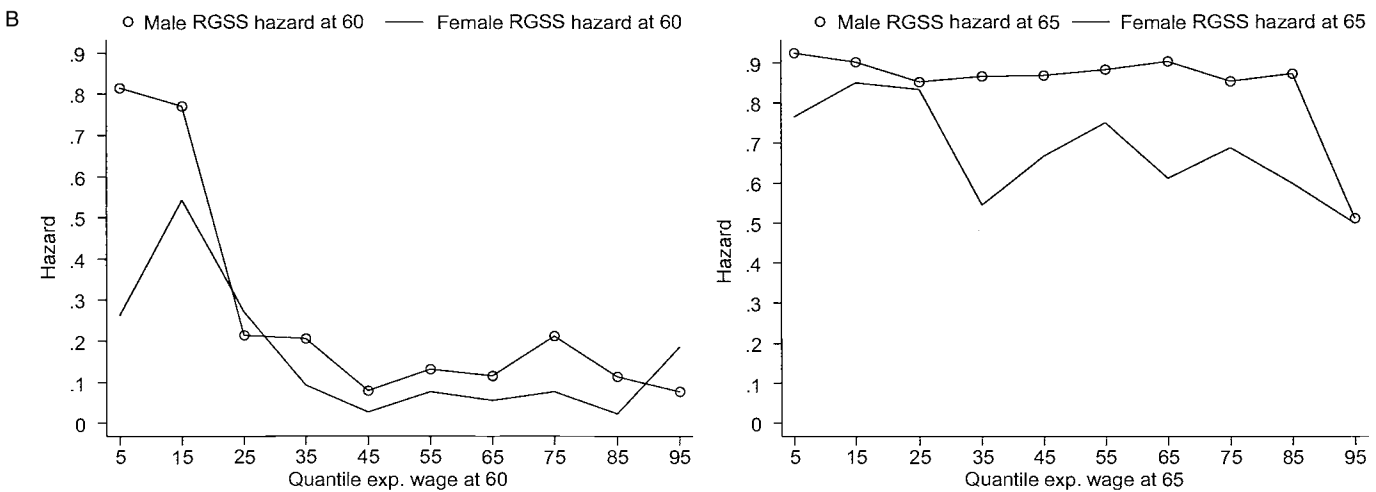
B
Male RGSS hazard at 60
Female RGSS hazard at 60
Hazard
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
5
15
25
35
45
55
65
75
85
95
Quantile exp. wage at 60
Male RGSS hazard at 65
Female RGSS hazard at 65
Hazard
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
5
15
25
35
45
55
65
75
85
95
Quantile exp. wage at 65

**Fig. 9.5 (cont.)**

already nonnegligible at age fifty-five. Finally, the right-side panel plots the exit rate at the normal retirement age of sixty-five. It is evident that exit rates at this age are largely independent of expected wages.

### 9.6.2 Retirement Models

We follow a regression-based approach to model the effect of SSW, incentive measure (either accrual, peak value, or option value), and individual demographic characteristics on the decision to retire in year 1995 conditional on being active at the end of 1994. Retirement probabilities are assumed to have the probit form

$$\Pr(R_i = 1) = \Phi(\delta_1 \mathrm{SSW}_i + \delta_2 I_i + \delta_3' \mathbf{X}_i),$$

where $R$ is a binary indicator of retirement, $\Phi$ is the distribution function of a standard normal, $I$ denotes the incentive measure, and $\mathbf{X}$ is a vector of predictors that include individual earnings and sociodemographic characteristics.[8]

For each incentive measure we present, separately by sex and SS regime, the results obtained for the following specifications.

- M1 is basic specification and includes three sets of predictors.
  M1A includes the incentive measure (accrual, peak value, or option value), an eligibility dummy for attainment of a minimum of fifteen years of contributions, and three industry-specific variables—the fraction of collective wage settlements having a clause favoring early retirement, the presence of rules permitting retirement at age sixty-four without any age penalty, and the existence of mandatory retirement at age sixty-five (see the appendix for a brief description of the data source).
  M1B includes a linear age trend, the length of the current employment spell and its square, the number of years of contribution and its square, the number of years of potential experience, dummies for schooling level and the contributive group (only for people in the RGSS), and dummies for part-time work and the sector of occupation (only for people in the RGSS).
  M1C includes controls for earnings (expected wage, pension, and average lifetime income and their squares) and the net present value of expected wages until the year in which either the peak value or the option value reach their maximum.
- M2 is the same as M1 but age dummies replace the linear age trend.

In table 9.15, we present the main results obtained by fitting our two models to the observed transitions between 1994 and 1995. We show, for

8. The socioeconomic and earnings information is richer for the RGSS. Results for the RETA should be taken with caution.

**Table 9.15** **Probit Models of the 1995 Retirement Rates**

| | Accrual | | | | Peak Value | | | | Option Value | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M1 | | M2 | | M1 | | M2 | | M1 | | M2 | |
| | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| *Male RGSS (16,191 observations)* | | | | | | | | | | | | |
| SSW | .00344 | .00128 | .00749 | .00152 | .00871 | .00149 | .01387 | .00170 | .01080 | .00165 | .01627 | .00186 |
| Marginal effect | .00033 | .00012 | .00071 | .00012 | .00087 | .00015 | .00136 | .00017 | .00109 | .00017 | .00161 | .00018 |
| Incentive | –.00906 | .00430 | –.00130 | .00489 | .00147 | .00245 | .00448 | .00254 | .00884 | .00111 | .01032 | .00115 |
| Marginal effect | –.00088 | .00042 | –.00012 | .00046 | .00015 | .00024 | .00044 | .00025 | .00089 | .00011 | .00102 | .00011 |
| Constant | –1.642 | .50046 | –1.197 | .53053 | –1.495 | .49230 | –1.273 | .52863 | –1.360 | .49665 | –1.262 | .53657 |
| $R^2$ | .336 | | .373 | | .341 | | .380 | | .342 | | .381 | |
| Log-likelihood | –3,791 | | –3,579 | | –3,766 | | –3,544 | | –3,758 | | –3,534 | |
| *Female RGSS (3,852 observations)* | | | | | | | | | | | | |
| SSW | .00970 | .00325 | .01812 | .00419 | .01138 | .00345 | .02022 | .00438 | .01176 | .00381 | .02175 | .00477 |
| Marginal effect | .00090 | .00030 | .00162 | .00038 | .00107 | .00033 | .00185,00040 | | .00111 | .00036 | .00199 | .00044 |
| Incentive | –.0092 | .00710 | –.00580 | .00755 | .00135 | .00490 | .00393 | .00527 | .00247 | .00202 | .00361 | .00210 |
| Marginal effect | –.00086 | .00066 | –.00053 | .00068 | .00013 | .00046 | .00036 | .00048 | .00023 | .00019 | .00033 | .00019 |
| Constant | –.4766 | .64579 | –.2204 | .74217 | –.3112 | .64244 | –.2072 | .74880 | –.3301 | .64892 | –.3375 | .75922 |
| $R^2$ | .327 | | .355 | | .327 | | .356 | | .326 | | .356 | |
| Log-likelihood | –897.8 | | –.860.1 | | –897.7 | | –858.5 | | –897.9 | | –858.5 | |

(*continued*)

**Table 9.15** (continued)

| | Accrual | | | | Peak Value | | | | Option Value | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M1 | | M2 | | M1 | | M2 | | M1 | | M2 | |
| | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| *Male RETA (4,355 observations)* | | | | | | | | | | | | |
| SSW | .00870 | .00496 | .00726 | .01174 | –.00068 | .00695 | .00992 | .01238 | .00757 | .00938 | .00501 | .01451 |
| Marginal effect | .00117 | .00067 | .00096 | .00155 | –.00009 | .00092 | .00131 | .00163 | .00100 | .00124 | .00066 | .00191 |
| Incentive | –.04703 | .01212 | .01050 | .01440 | –.02915 | .00900 | .01432 | .01056 | –.00920 | .00729 | .00187 | .00758 |
| Marginal effect | –.00630 | .00162 | .00138 | .00190 | –.00385 | .00119 | .00188 | .00139 | –.00122 | .00097 | .00025 | .00100 |
| Constant | –2.079 | .68022 | –1.542 | 1.2772 | –1.848 | .72708 | –1.6444 | 1.2819 | –2.107 | .70436 | –1.324 | 1.283 |
| $R^2$ | .168 | | .252 | | .166 | | .253 | | .167 | | .253 | |
| Log-likelihood | –1201. | | –1079. | | –1203. | | –1078. | | –1202. | | –1079. | |
| *Female RETA (2,051 observations)* | | | | | | | | | | | | |
| SSW | .00316 | .00643 | –.00176 | .01113 | .00188 | .00732 | –.00248 | .01119 | .00342 | .01334 | –.01475 | .01781 |
| Marginal effect | .00047 | .00095 | –.00025 | .00156 | .00018 | .00108 | –.00035 | .00157 | .00051 | .00199 | –.00207 | .00250 |
| Incentive | .01813 | .01096 | .02538 | .01207 | .00849 | .00979 | .01824 | .01039 | .00241 | .01448 | .00739 | .01736 |
| Marginal effect | .00268 | .00162 | .00355 | .00169 | .00126 | .00145 | .00256 | .00146 | .00036 | .00215 | .00104 | .00244 |
| Constant | –3.358 | 3.5687 | –3.678 | 3.7786 | –3.175 | 3.5836 | –2.457 | 3.8070 | –3.259 | 3.6326 | –1.876 | 3.9571 |
| $R^2$ | .142 | | .197 | | .141 | | .196 | | .140 | | .195 | |
| Log-likelihood | –638.5 | | –597.9 | | –639.4 | | –598.5 | | –639.8 | | –598.9 | |

*Note:* SE = standard error.

each combination of sex and regime, the estimates of the probit coefficients, their estimated standard errors, and the implied probability effect. Complete definitions, data sources, as well as summary statistics for all variables employed are presented in the appendix. Since we report the results from a large number of models, we concentrate on the variables of interest. The complete set of results is available from the authors upon request.

On the one hand, we find that the basic specification with only demographic and earnings controls (M1) explains, in the case of the RGSS, an important fraction of the retirement peaks at the early and normal retirement ages. In contrast, this specification seems to be unable to capture the retirement peak at age sixty-five for workers in the RETA. This is partly due to the fact that the socioeconomic information for individuals enrolled in the RETA is poorer than for people enrolled in the RGSS. The SSW term is positive and significant in all cases. Contradictory results are obtained instead for the incentive variable. In fact, while the accrual usually shows the expected (negative) sign, both the peak and the option value show the wrong (positive) sign. Alternatively, neither SSW nor the incentive variables are significant for people enrolled in RETA, indicating that the SSW and the financial variables do not capture retirement incentives for individual enrolled in RETA.

On the other hand, the introduction of age dummies (specification M2) always increases the coefficient of both the SSW and the incentive variables and substantially improves the fit of the model. For men in the RGSS, for example, the pseudo $= R^2$ for the model with the accrual as the incentive variable goes from 33.6 percent (model M1) to 37.3 percent (model M2). For men in RETA, the pseudo-$R^2$ goes from 16.8 to 37.3 percent. The pattern for the other incentive variables (accrual, peak value, or option value) is very similar.

Figure 9.6 compares the age profile of the empirical hazard rate with those of the coefficients on the age dummies for the three versions of model M2 (that is, with the accrual, the peak value, and the option value as the incentive variable), estimated separately by sex and SS regime. In all cases, the age dummies have been rescaled to the empirical hazard scale. For males enrolled in the RGSS (left panels) and all three models (either accrual, peak value, or option value), the profile of the age dummies resembles the hazard profile, although there are some discrepancies between the two profiles at ages sixty to sixty-four and from age sixty-seven onward. For females enrolled in the RGSS, the discrepancies are more evident at all ages from fifty-five to sixty-four, with age fifty-nine as an exception. For individuals enrolled in RETA, the profiles are quite different from those estimated for the RGSS. In particular, important discrepancies between ages fifty-five and fifty-nine and between models are detected.

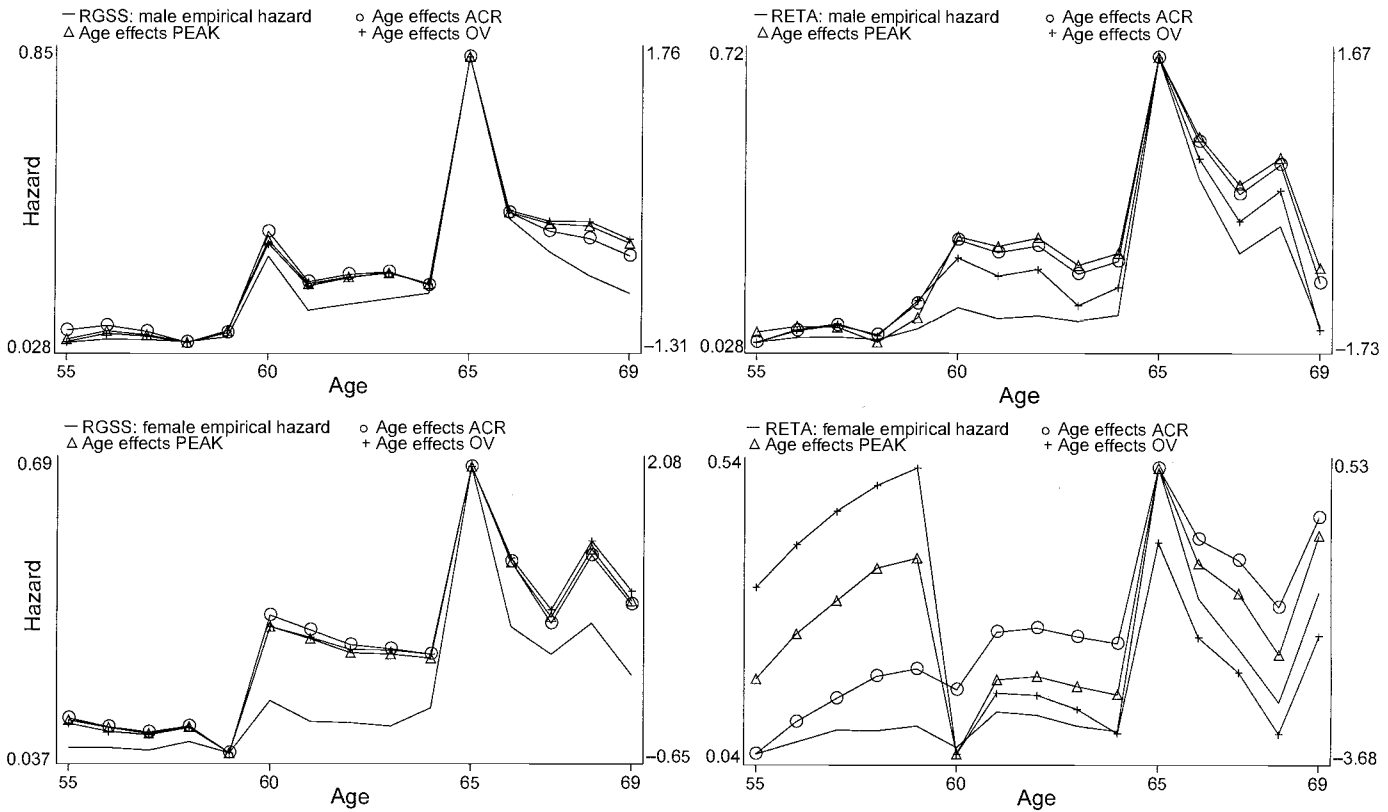


**Fig. 9.6 Evaluation of the explanatory power of incentive measures in M2: Empirical hazard versus age effects (rescaled)**

## 9.7 Policy Simulations

In this section we use our estimates to simulate retirement behavior under alternative institutional settings.

### 9.7.1 Description of the Simulations

In the simulations we consider three policies, of which the third is specific to the Spanish case.

R1: A reform of the existing system consisting of a three-year increase in both the early and the normal retirement age, while keeping all other aspects of the Spanish SS system unchanged.

R2: A reform common to all countries considered in this volume including (a) early entitlement age at sixty; (b) normal retirement age at sixty-five; (c) a replacement rate at age sixty-five equal to sixty percent of the earnings at age fifty-nine; and (d) an actuarial adjustment of 3.4 percent per year from age sixty to age seventy (this implies a replacement rate of 42 percent at age sixty and 78 percent at age seventy). Notice that (a) and (b) correspond to the current Spanish system, whereas the actuarial adjustment for retirement before age sixty-five is less favorable than the one currently used in Spain. The current Spanish system is more generous for retirement at age sixty-five and has no actuarial adjustment for postponing retirement after that age.

R97: The regime created by the 1997 Spanish reform and currently in place.

We recall that the 1997 reform, described in section 9.2, implies the following changes in the basic benefit formula and in the penalties related to age and contributive history: (a) the number of years of contribution used to construct the benefit base is increased from eight, as prescribed by the 1985 legislation, to fifteen; (b) workers retiring after the age of sixty with forty or more contributive years are charged an actuarial adjustment of only 7 percent (instead of 8 percent) for each year under age sixty-five; and (c) the penalty for insufficient contributions, expressed as a fraction of BR to be received (see section 9.2), is changed to

$$\alpha_n = \begin{cases} 0 & \text{if } n < 15 \\ .5 + .03(n - 15) & \text{if } 15 \leq n \leq 25 \\ .8 + .02(n - 25) & \text{if } 25 \leq n \leq 35 \\ 1 & \text{if } 35 \leq n. \end{cases}$$

For each of the three policies we carry out three simulation exercises.

S1: Starts from the model without age dummies (M1), we modify the SSW and incentive measures in accordance with the new policy. Specifically, in the calculation of SSW, we increase by three years the early and the

normal retirement ages and shift by three years the age-specific probability of receiving DI or UI benefits.

S2: Starts from the model with age dummies (M2), we modify the SSW and incentive measures according to the assumed policy changes. We also change the probabilities of receiving DI benefits, as in S1, but not the coefficients on the age dummies.

S3: Applies only for reform R1 and starts from the model with age dummies (M2). In addition to the changes described in S2, we also shift the coefficients on the age dummies by three years, so that the entire age-profile of the retirement hazard shifts forward by three years.

### 9.7.2 Results for Male Workers in the RGSS

Figures 9.7 to 9.15 show the simulated retirement probabilities by age for male workers in the RGSS. The results are presented separately for each combination of simulation (S1 to S3) and incentive variable (accrual, peak value, and option value). Each graph presents both the age profile of estimated conditional retirement probabilities or the "hazards," and the cumulative distribution function (CDF) of retirement age.[9]

In general, because all incentive measures explain little of the variation in retirement ages across individuals, it is hard to detect the impact of changes in the incentive measures on individual retirement behavior.

When the coefficients estimated under the specification M1 are employed in the simulations, all the reforms reduce retirement hazard at ages sixty and age sixty-five. Although in some cases an increase in the hazard at ages sixty-three or sixty-four is observed, in general, the CDF of retirement age is shifted to the right. The reduction of the hazard at sixty is more important for the Spanish reform (R97), while the reduction at age sixty-five is more important for the common reform (R2).

When, instead, the coefficients estimated under the specification M2 are used in the simulations but the age dummies coefficients are not shifted (S2), only the R2 reform seems to sensibly reduce the hazard at the key age range and thereby reduce the CDF at, for example, age sixty-five. In fact, both the R1 and the R97 reform mildly increase the average retirement hazard at age sixty. This appears to be largely a consequence of the minimum pension rules in effect in Spain. Apart from this, the reduction is more important when retirement incentives are measured by the option value. As expected, when the age dummies are shifted by three years (S3; figures 9.13 to 9.15), the whole hazard for R1 shifts to the right by three years, and consequently, the CDF is reduced substantially both at age sixty (by 50, 39, and 37 percent for the accrual, peak value, and option value specifications, respectively) and at age sixty-five (36, 30, and 28 percent for the accrual, peak value, and option value specifications, respectively).

9. The CDF $F(a)$ at age $a$ is obtained from the conditional retirement probabilities $h(a)$ through the recursion $F(a) = F(a-1) + [1 - F(a-1) \cdot h(a)]$, starting from $F(54) = 0$.

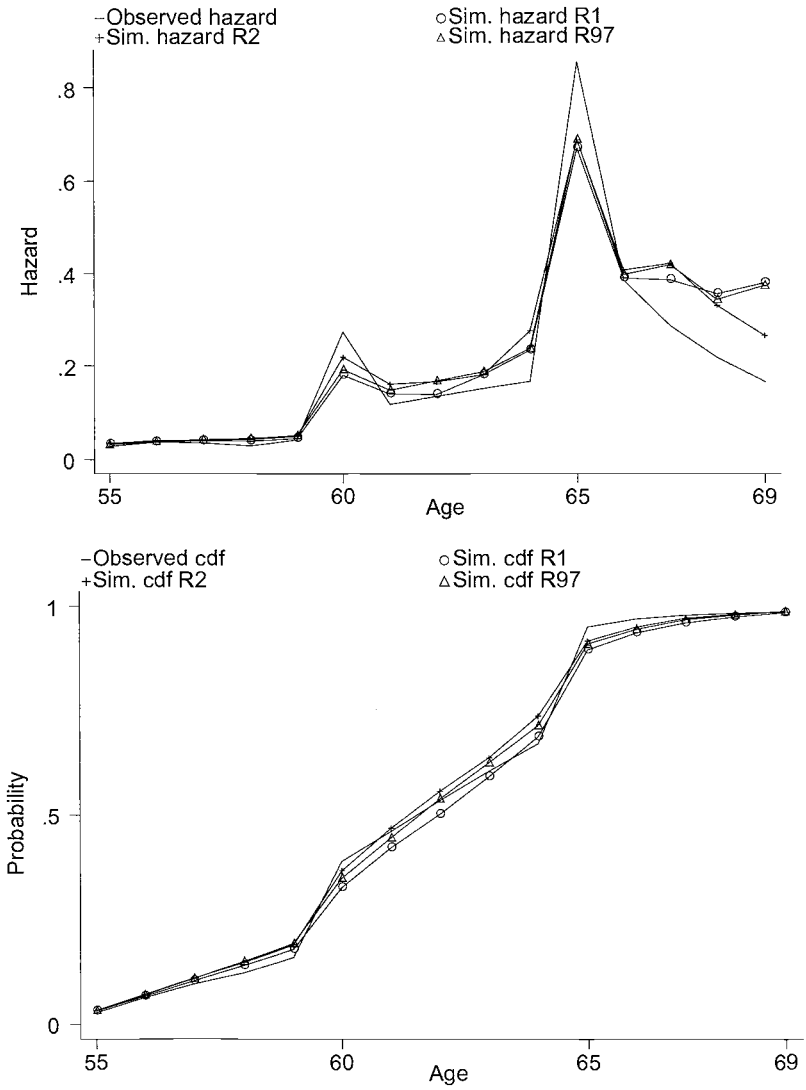


**Fig. 9.7 Male workers in the RGSS: S1, accrual**

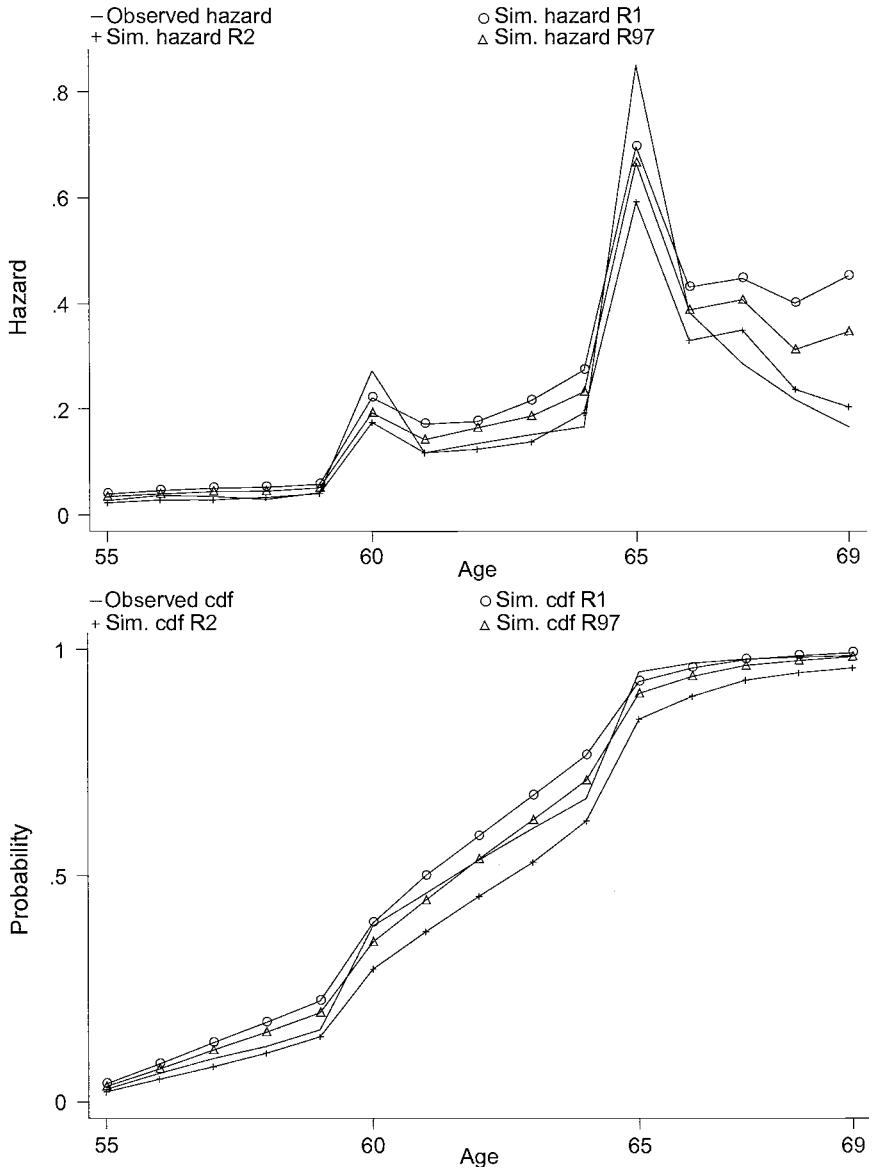


**Fig. 9.8 Male workers in the RGSS: S1, peak value**

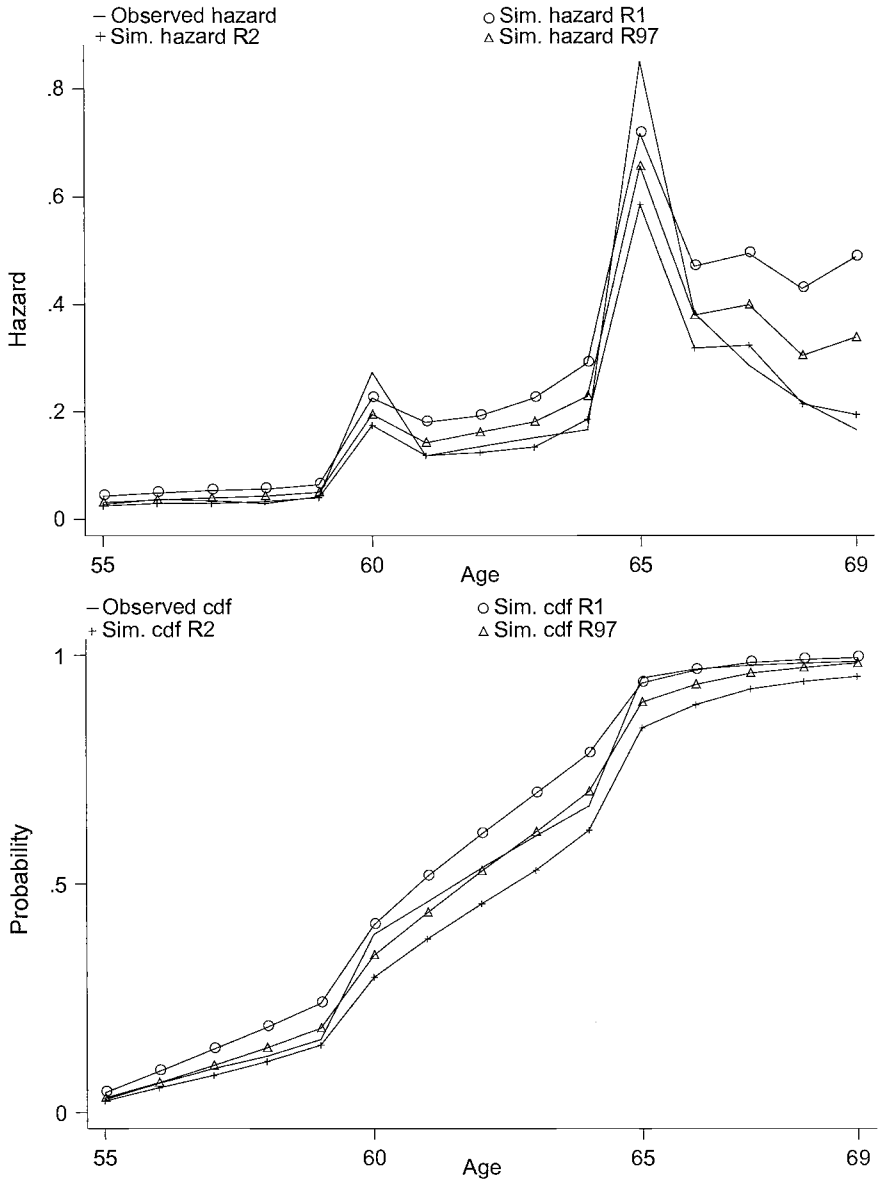


**Fig. 9.9 Male workers in the RGSS: S1, option value**

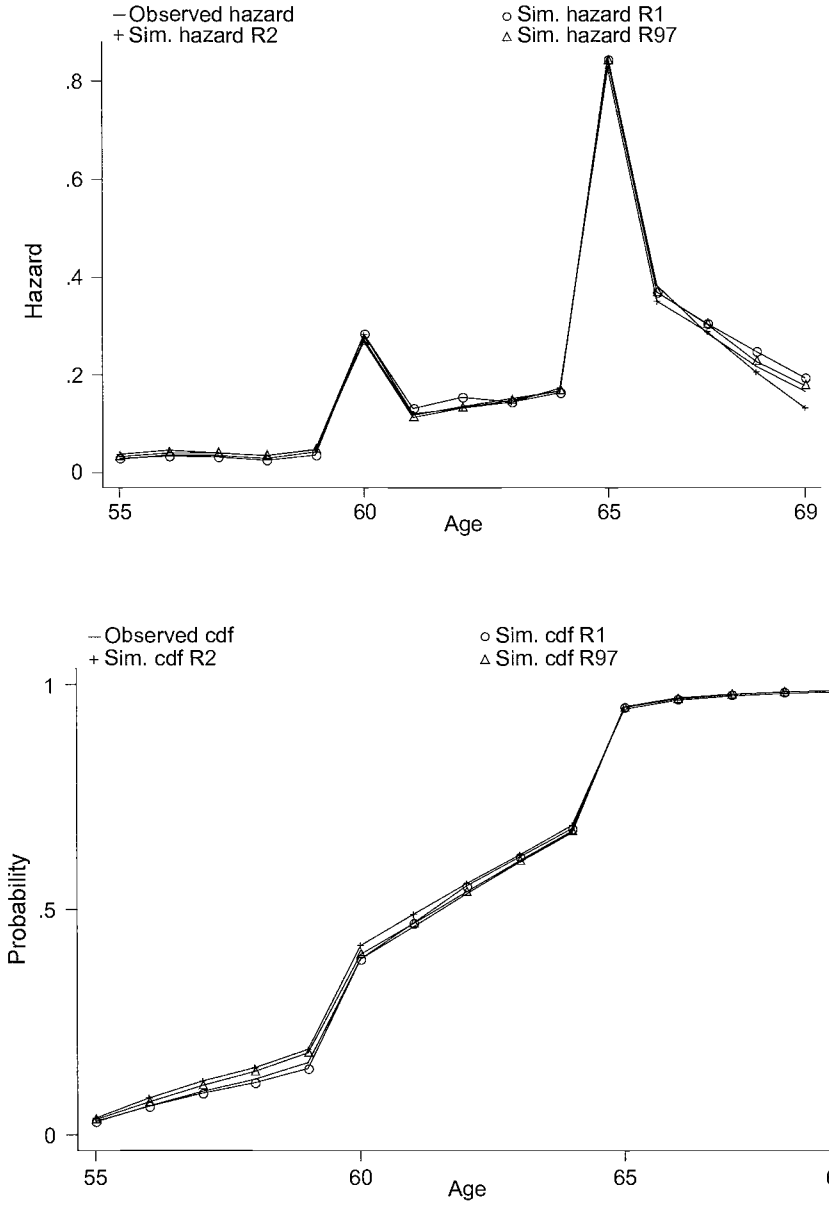


**Fig. 9.10 Male workers in the RGSS: S2, accrual**

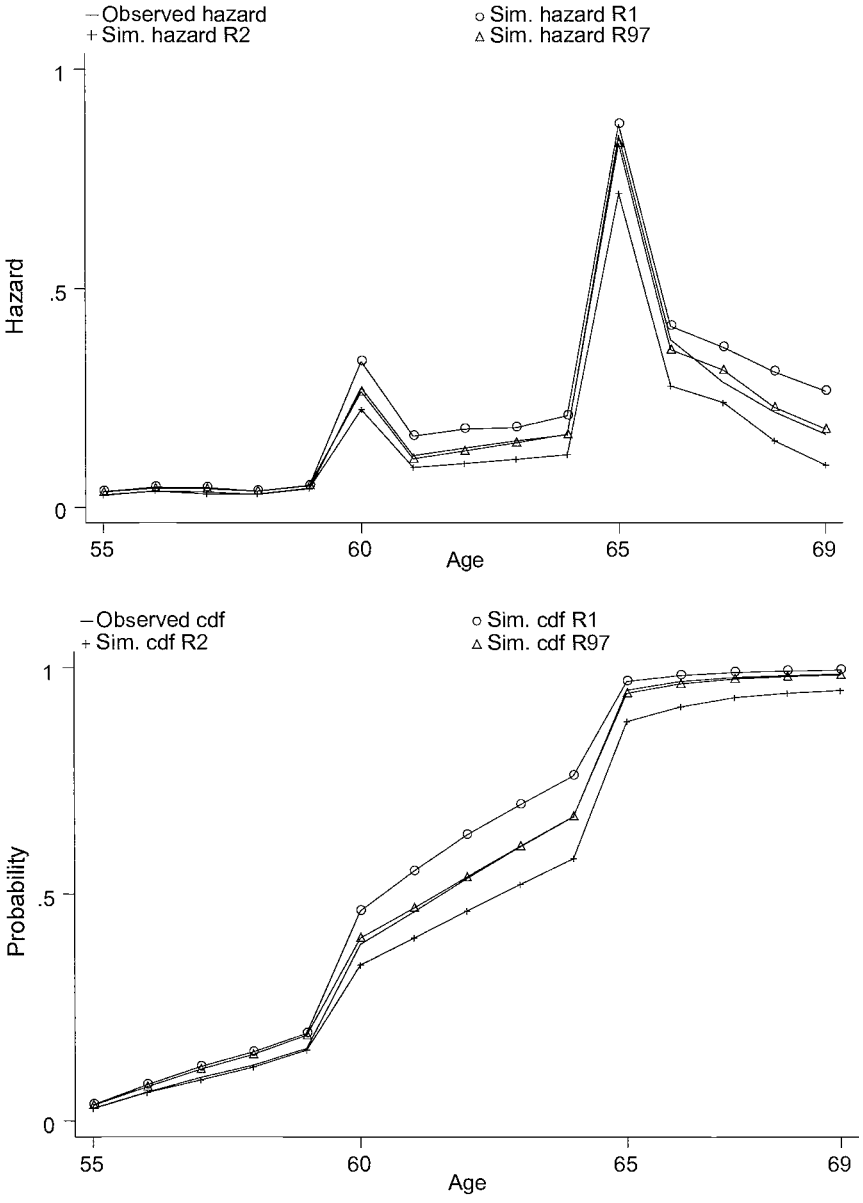


**Fig. 9.11 Male workers in the RGSS: S2, peak value**

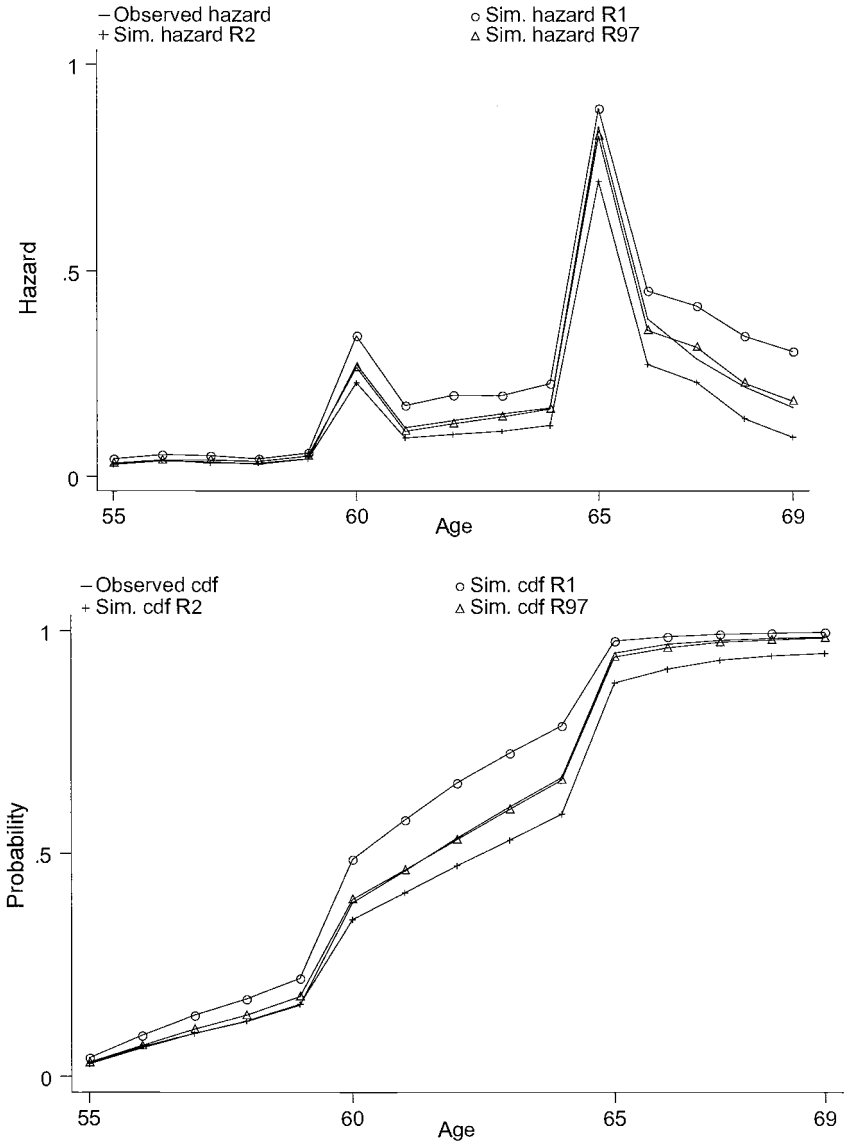


**Fig. 9.12 Male workers in the RGSS: S2, option value**

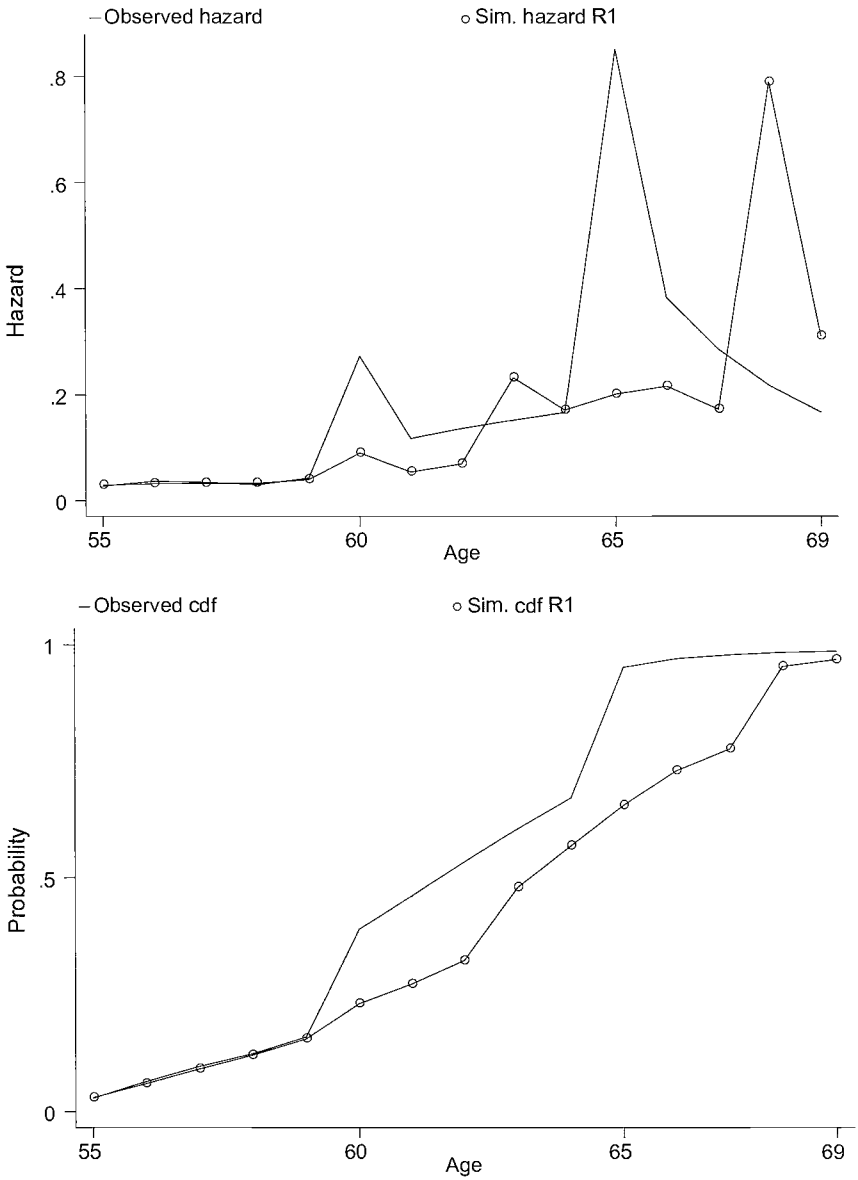


**Fig. 9.13 Male workers in the RGSS: S3, accrual**

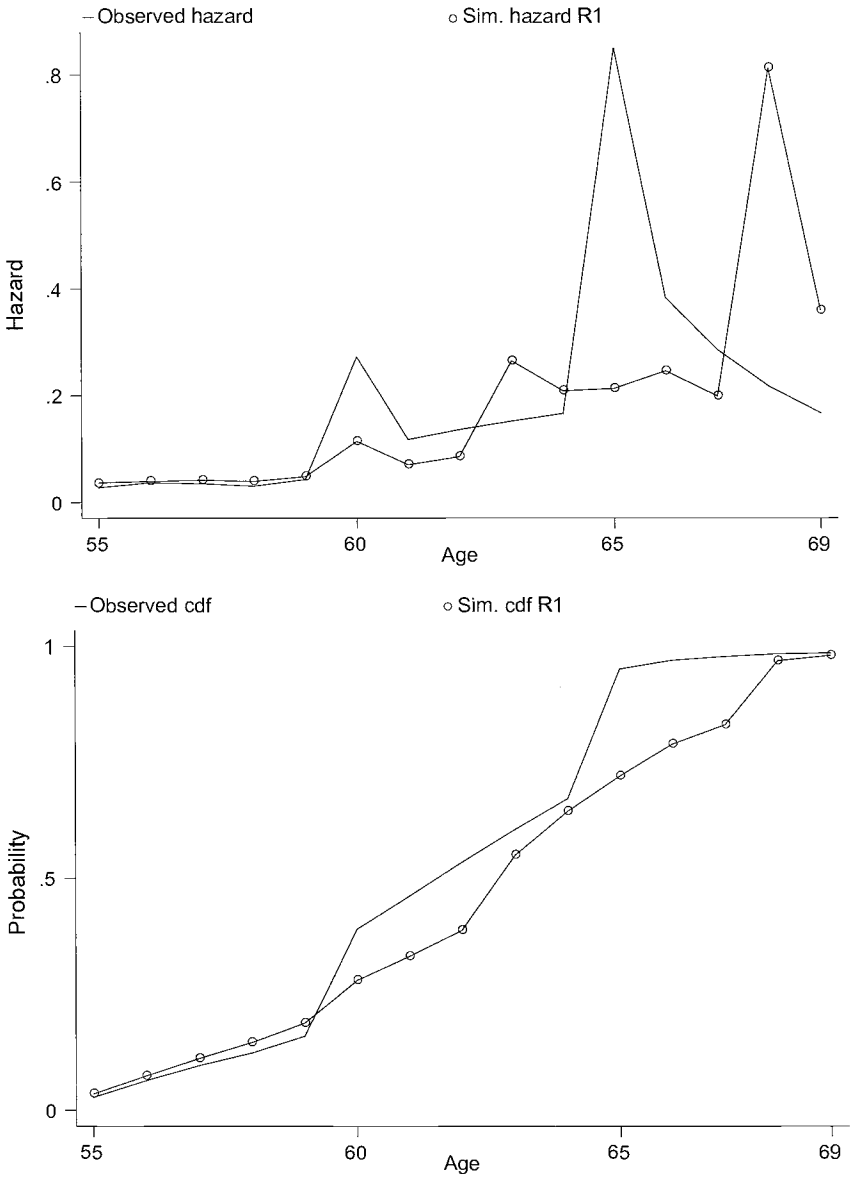


**Fig. 9.14 Male workers in the RGSS: S3, peak value**

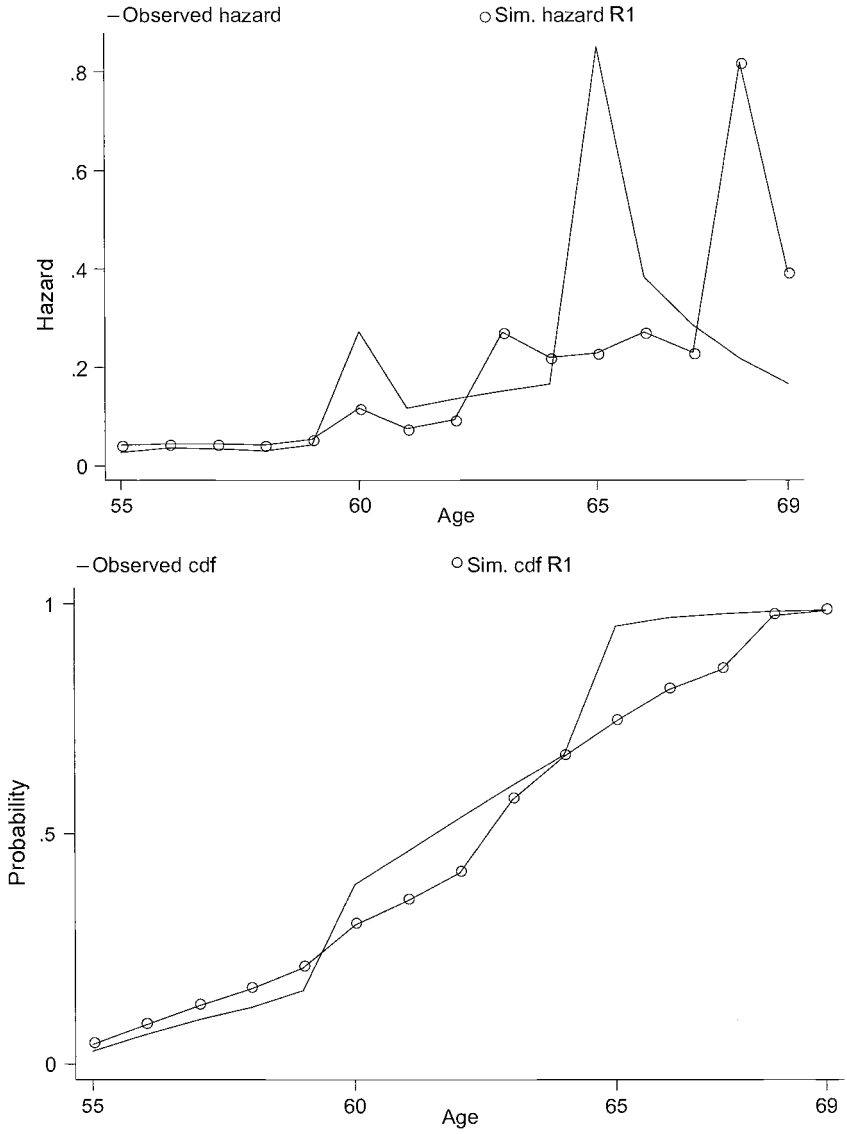


**Fig. 9.15 Male workers in the RGSS: S3, option value**

### 9.7.3 Results for Female Workers in the RGSS

Figures 9.16 to 9.18 present the simulated retirement probabilities by age for female workers in the RGSS. Results are presented separately for each simulation exercise S1 to S3.

When the coefficients estimated under the specification M1 are employed, only the R2 reform reduces the hazard of retirement at both ages sixty and sixty-five (figure 9.16). The reduction is similar for all incentive measures (about 35 and 37 percent at ages sixty and sixty-five, respectively). As a consequence, the CDF of retirement age is substantially lower at age sixty-five than in the sample. The reduction is slightly bigger under the peak or the option value (17 percent) than under the accrual (16 percent). On the other hand, both the R1 and R97 reforms are ineffective in reducing the retirement hazard in the relevant age range. Very similar results are obtained under S2.

In S3, on the other hand, the results for R1 change substantially (figure 9.18). The CDF at age sixty reduces by 22.5 percent in all cases and by 33.6, 35.1, and 35.6 percent at age sixty-five for accrual, peak value, and option value, respectively.

### 9.7.4 Results for Individuals in the RETA

In figures 9.19 to 9.22, we present the simulated retirement probabilities by age for the self-employed or individuals enrolled in the RETA. However, in this case, we do not report any result based on model M1, since this model is unable to capture the retirement peaks at sixty and sixty-five that are evident in the data. Thus, in each figure, we present results for combinations of sex and simulation exercise (S2 and S3) jointly for all the incentive variables (accrual, peak value, and option value).

When the coefficients estimated under the specification M2 are used in the simulations but the age-dummies coefficients are not shifted (S2), the R2 reform seems to considerably reduce the hazard over the key age range and thereby reduce the CDF at, for example, age sixty-five. In fact, the Spanish reform (R97) substantially increases the retirement hazard at all ages below the normal retirement age (see figures 9.19 and 9.21 for men and women, respectively). When the age dummies are shifted by three years (S3), the whole hazard for R1 shifts three years toward the right, and consequently, the CDF of retirement age is reduced substantially in all cases (see figures 9.20 and 9.22 for men and women, respectively). The reduction of the CDF at ages sixty and sixty-five for men is much more important when the peak value is employed than it is for either the accrual or the option value. For example, the reduction for the accrual specification is 19.5 and 34.9 percent for men at ages sixty and sixty-five, while for the peak value, it reaches 28.1 and 38.7 percent, and under the option value, it lowers to 10.7 and 31.4 percent. For women, instead, the reduction is more

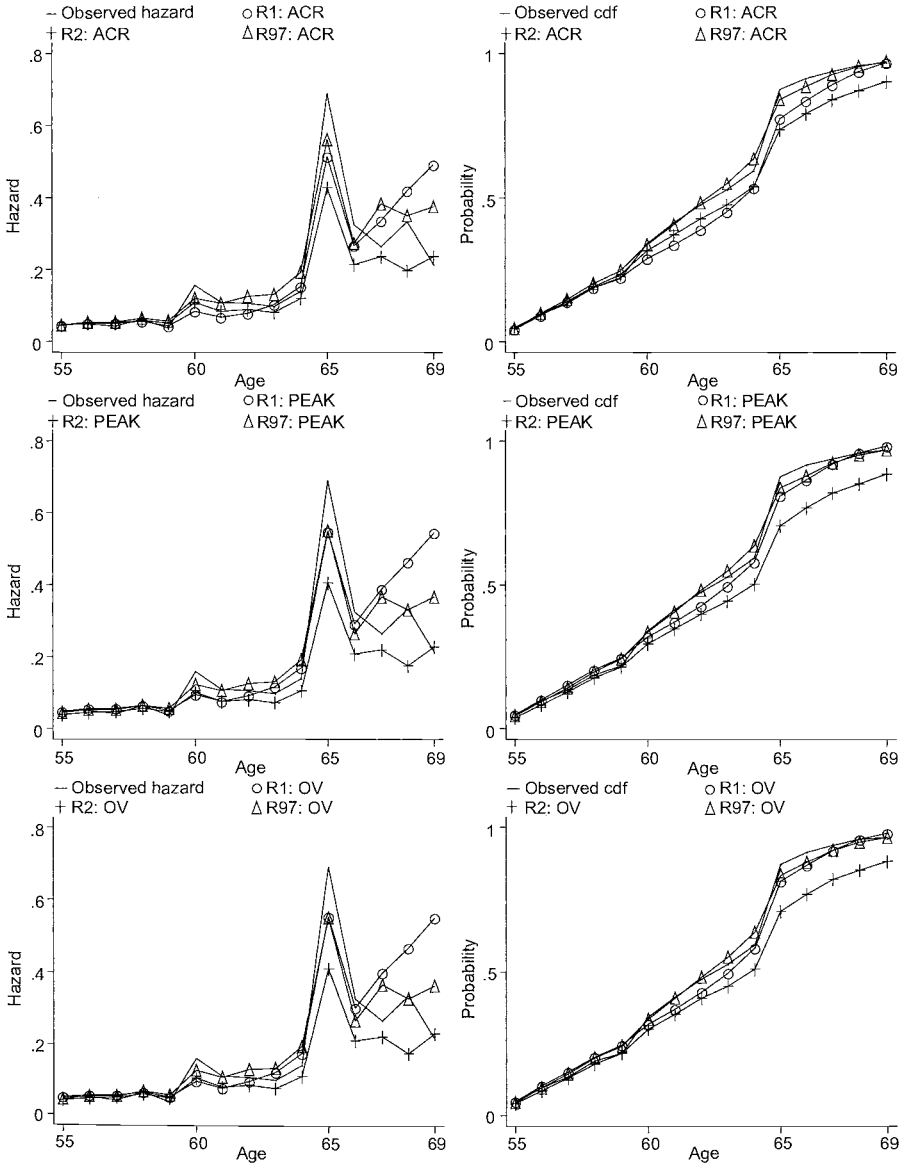


**Fig. 9.16 Female workers in the RGSS: S1**

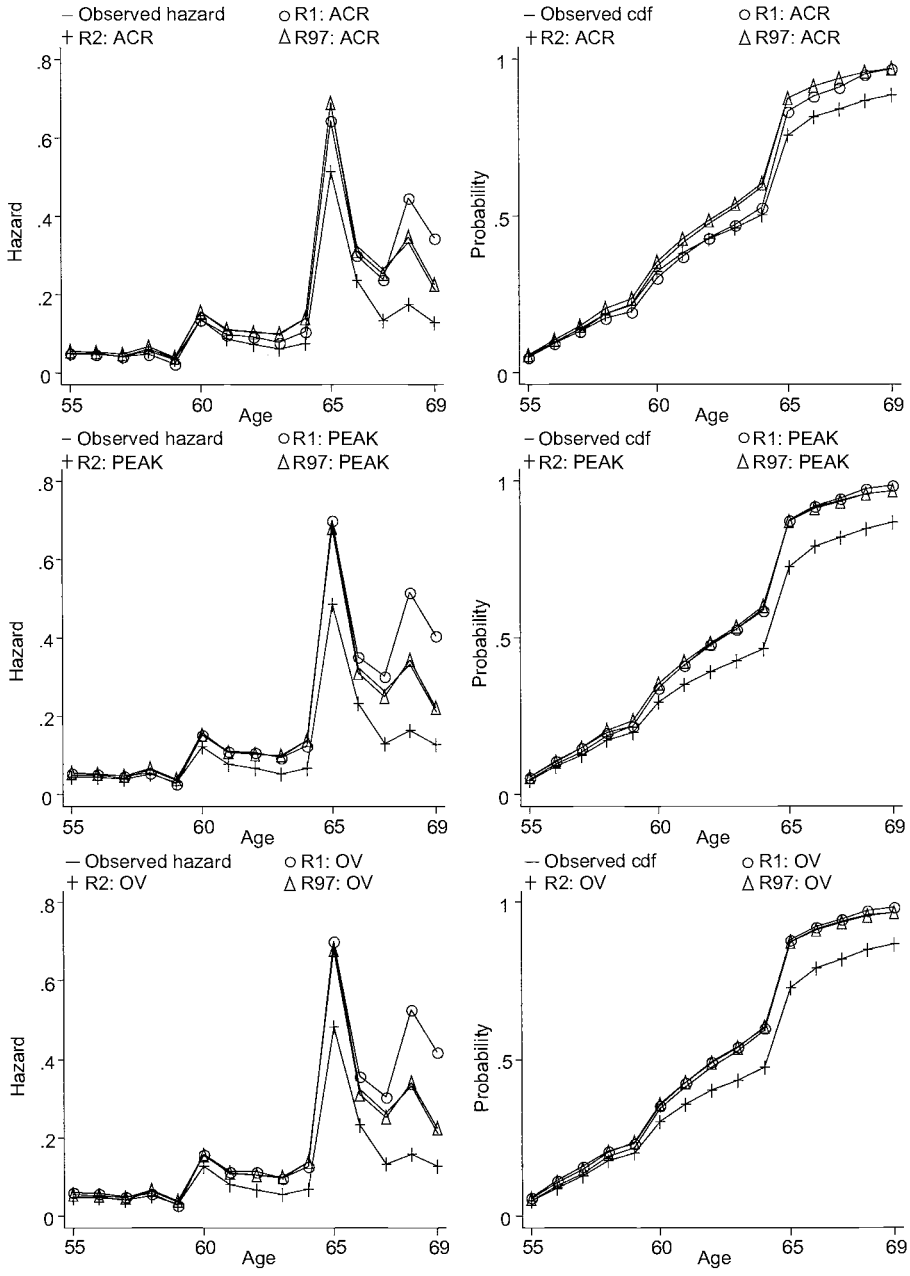


**Fig. 9.17 Female workers in the RGSS: S2**

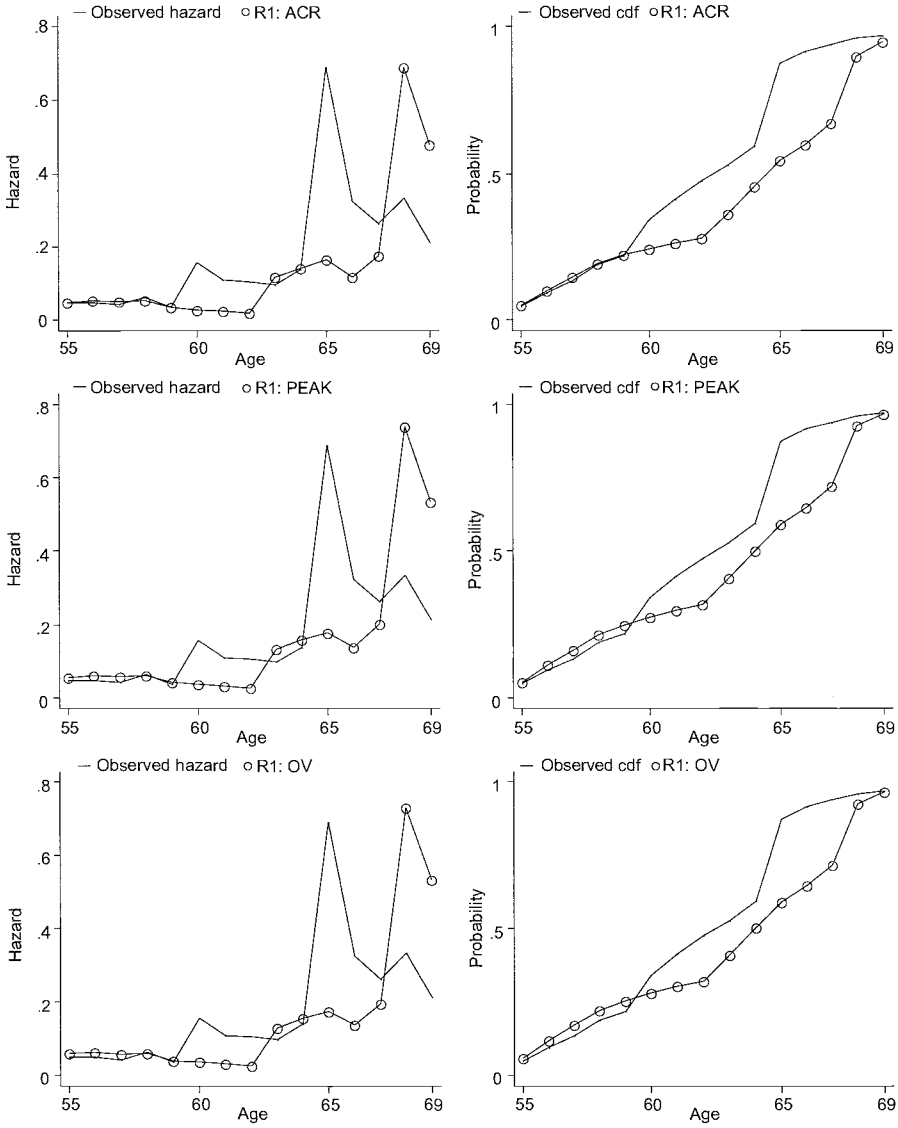


**Fig. 9.18 Female workers in the RGSS: S3**

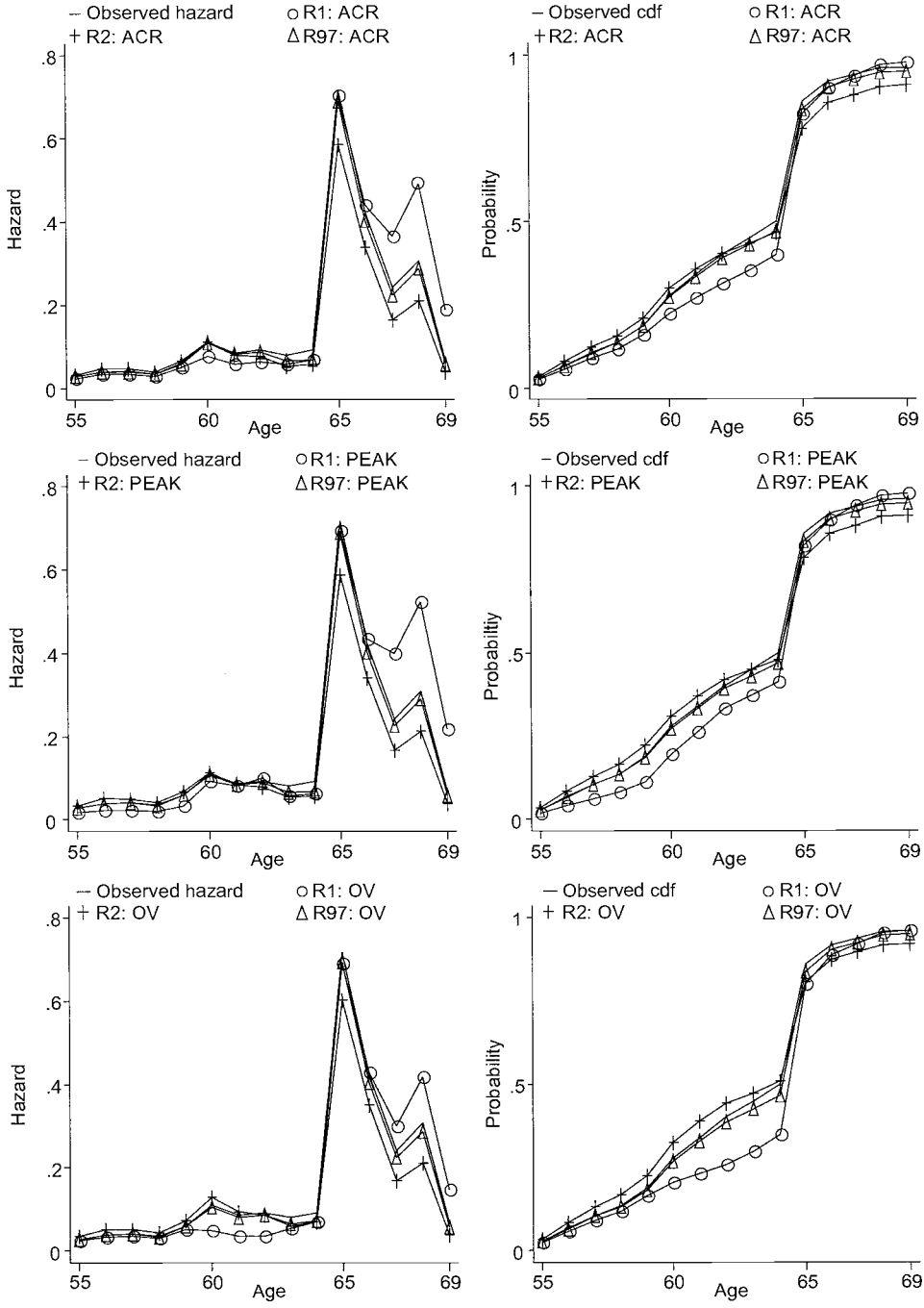


**Fig. 9.19 Male workers in the RETA: S2**

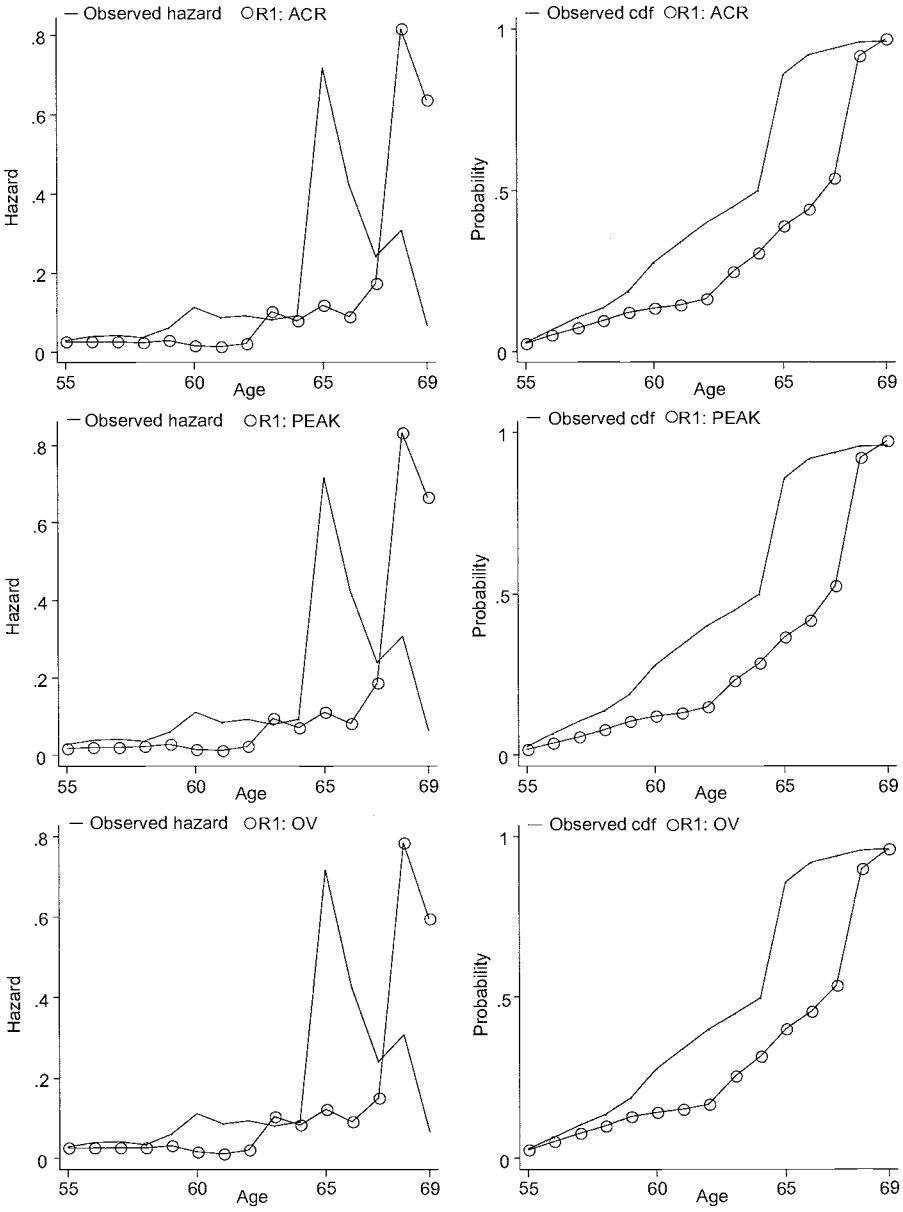


**Fig. 9.20 Male workers in the RETA: S3**

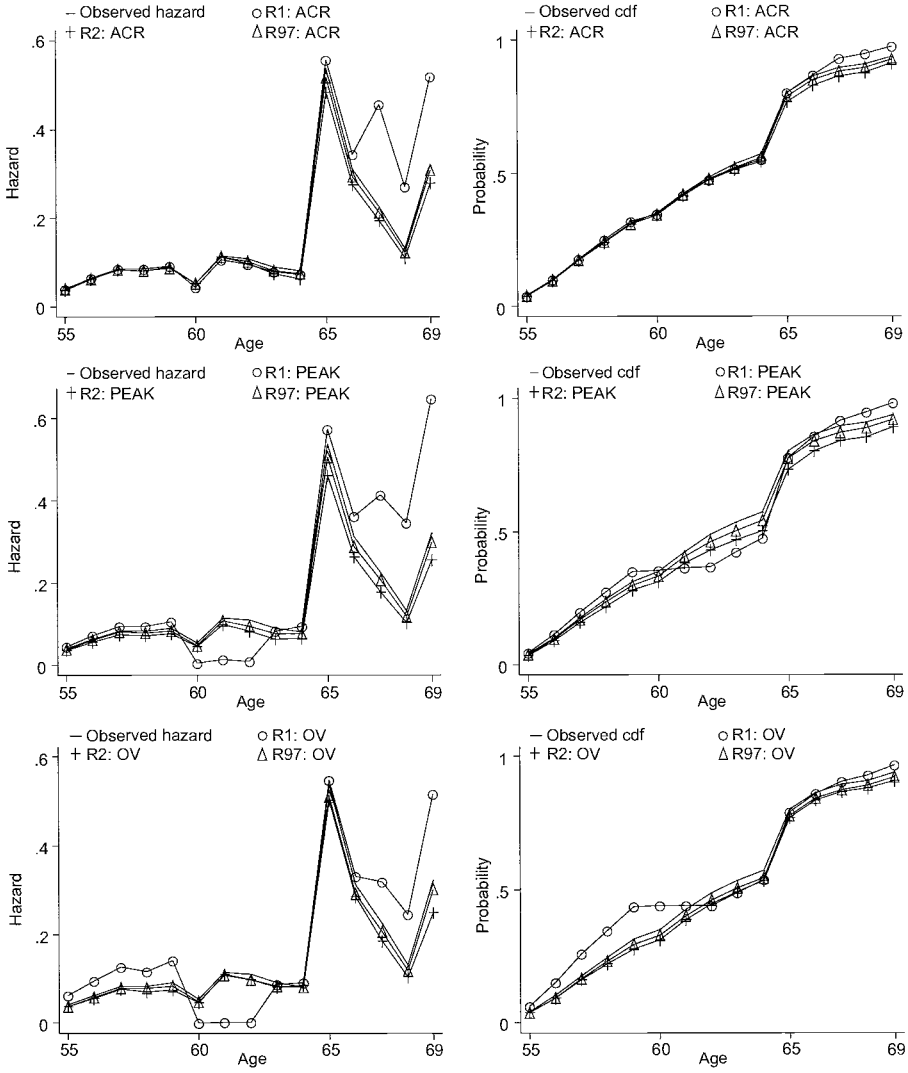


**Fig. 9.21 Female workers in the RETA: S2**

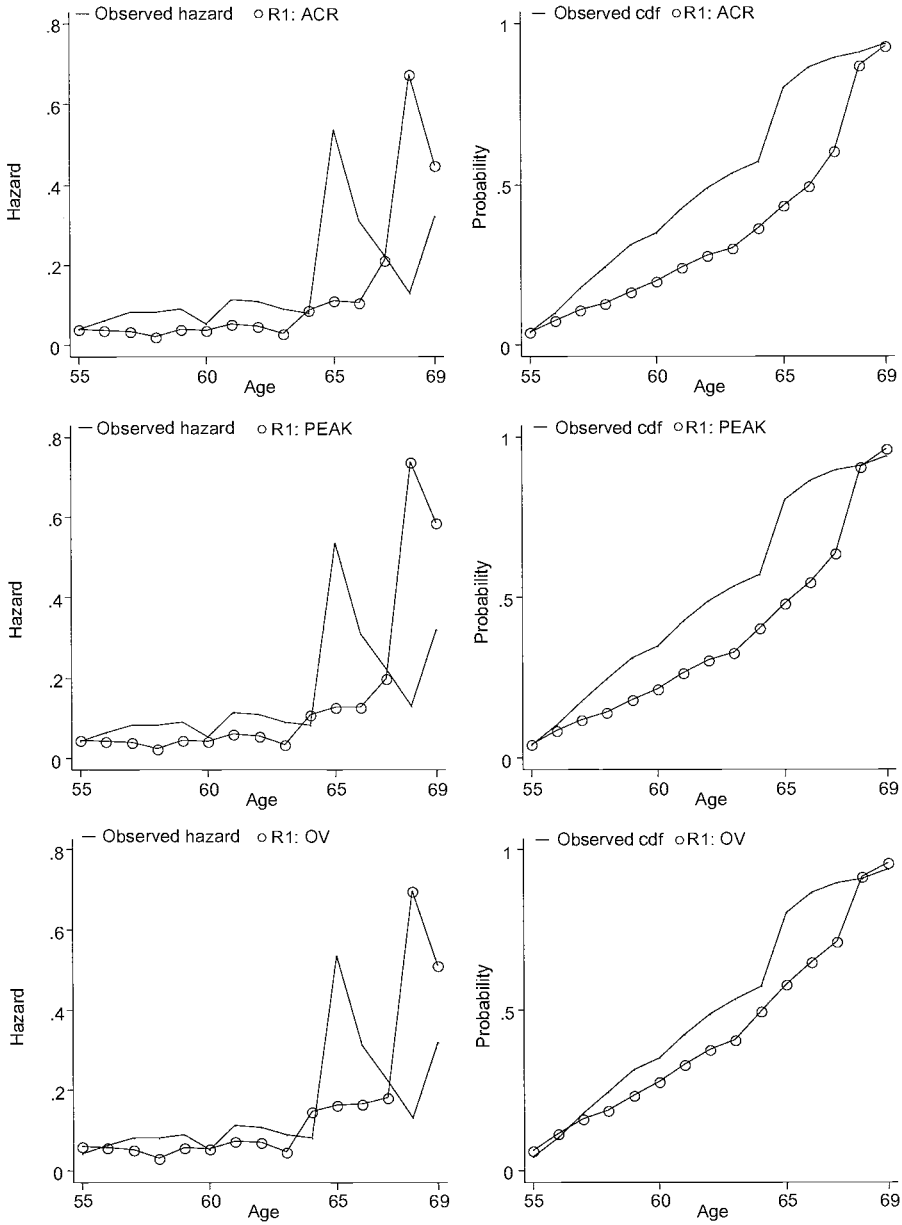


**Fig. 9.22 Female workers in the RETA: S3**

**Table 9.16** Average Retirement Ages from Simulated Policies

| | Male (observed 62.00) | | | Female (observed 62.31) | | |
|---|---|---|---|---|---|---|
| | R1 | R2 | R97 | R1 | R2 | R97 |
| | | | *RGSS* | | | |
| S1 | | | | | | |
| Accrual | 62.19 | 61.87 | 61.98 | 62.90 | 63.00 | 62.26 |
| Peak value | 61.58 | 62.74 | 61.99 | 62.53 | 63.34 | 62.31 |
| Option value | 61.41 | 62.74 | 62.10 | 62.51 | 63.27 | 62.30 |
| S2 | | | | | | |
| Accrual | 61.98 | 61.81 | 61.92 | 62.70 | 63.04 | 62.18 |
| Peak value | 61.39 | 62.61 | 61.90 | 62.24 | 63.39 | 62.22 |
| Option value | 61.15 | 62.54 | 61.98 | 62.12 | 63.33 | 62.20 |
| S3 | | | | | | |
| Accrual | 63.58 | — | — | 64.00 | — | — |
| Peak value | 62.96 | — | — | 63.54 | — | — |
| Option value | 62.69 | — | — | 63.49 | — | — |
| | Male (observed 62.88) | | | Female (observed 62.35) | | |
| | R1 | R2 | R97 | R1 | R2 | R97 |
| | | | *RETA* | | | |
| S2 | | | | | | |
| Accrual | 63.40 | 63.12 | 63.03 | 62.27 | 62.58 | 62.47 |
| Peak value | 63.51 | 62.99 | 63.03 | 62.56 | 63.00 | 62.63 |
| Option value | 63.69 | 62.81 | 63.06 | 61.96 | 62.79 | 62.63 |
| S3 | | | | | | |
| Accrual | 65.38 | — | — | 64.75 | — | — |
| Peak value | 65.59 | — | — | 64.38 | — | — |
| Option value | 65.32 | — | — | 63.53 | — | — |

*Note:* Dashes indicate that data are not available.

important for the accrual specification (55.4 and 53.7 percent at ages sixty and sixty-five, respectively) than for either the peak or the option value specifications.

### 9.7.5 Effects of Reforms on Average Retirement Ages

In table 9.16, we summarize the impact of the proposed reforms on the average retirement age.[10] In almost all cases, the impact of the reform varies considerably across both simulation exercises and choice of the incentive measures (accrual, peak value, and option value). An exception is the 1997 Spanish reform, and its effect on the average retirement age is very small in

10. The average retirement age is obtained as $\bar{a} = \Sigma_{a=55}^{70} a f(a)$, where $f(a) = F(a-1)$ is the unconditional probability of retiring at age $a$.

general and if anything negative, thus confirming previous evaluations in Jiménez-Martín and Sánchez (2000) or Jiménez-Martín (1999).

For male employees in the RGSS (top-left panel of table 9.16) the impact of R1 and R2 on the average retirement age is unclear. However, we detect the following regularities. First, R1 has little impact in S1 or S2. Second, R1 in S3 implies an increase of the average retirement age between 0.69 years (option value specification) and 1.58 years (accrual specification). Finally, R2 has a similar impact in either simulation, the impact for the accrual specification being much smaller than for either the peak or the option value.

For female employees in the RGSS (right top panel of table 9.16), the effect is much more consistent across specifications of the incentive variable. Again, for S1 and S2, we are able to show a significant increase of the average retirement age (between 0.70 and 1.0 years) only for R2, depending on the specification of the incentive variable. The R1 reform visibly increases the average retirement age in S3 (between 1.2 and 1.7 years) in all cases.

For a self-employed male in the RETA (bottom-left panel of table 9.16), the results are very different than those obtained for males in the RGSS, since only R1 is able to significantly increase the average retirement age in either S2 or S3 (between 0.46 and 1.37).[11] The R2 reform, instead, reduces the average retirement age in all cases. Finally, for females in the RETA (bottom-right panel of table 9.16), the results vary sharply across incentive specifications. In S2, only R2 slightly increases retirement age. The effect of R1 is substantial only in S3, but, in the case of female self-employed, its effect varies considerably across specifications of the incentive variable.

## 9.8 Final Remarks

Summarizing the large number of findings reported in this study is not an easy task. We will therefore limit ourselves to the most important results, paying special attention to those that appear to have at least potential implications for actual policy.

The first important result is that, while economic and financial measures of retirement incentives can go a long way to explain and quantify retirement behavior, a substantial portion of the latter still remains unexplained. Various specifications of the basic model do decently well for workers enrolled in the general regime (RGSS) but rather poorly for the self-employed regime (RETA). This may be attributable, on the one hand, to the poor quality of the socioeconomic information available and, on the other hand, to the amply discussed unreliability of the earnings re-

11. Again, we do not present results of S1 for the self-employed.

ported by self-employed Spanish workers. This makes the evaluation of true expected earnings and opportunity costs of retiring most difficult, if not impossible.

Of the three quantitative indicators tested, SSW seems to perform uniformly better. This is somewhat comforting, as it is the simplest measure of forward-looking behavior, the easiest to compute, and, quite likely, also the most reliable, given the available data. The great relevance of age dummies suggests that institutional factors and coordination incentives play a major role in determining workers retirement decisions. This lends credibility to the view that a proper mix of economic incentives and institutionally mandated constraints may provide the most effective way to modify and, in the light of the increasing life expectancy, push forward in time retirement decisions.

Nevertheless, further and more detailed analysis appears to be necessary in order to properly and safely design much-needed reforms. Because the financial incentives explain only a small portion of the variation in retirement ages across individuals, it is hard to detect the impact of changes in the incentive measures on individual retirement behavior.

This view, which calls for additional investigation, is confirmed by the results of our policy simulations. None of the three reforms considered predicts a major shift of the distribution of retirement ages in the desired forward direction. In particular and, in our view, most importantly (given that this reform has recently been implemented in Spain), we confirm that R97 has very little impact on retirement incentives and, consequently, on the average retirement age. In fact, as predicted by earlier and much simpler studies, it may even shift the distribution of retirement ages in the wrong direction, especially for low earners.

It seems hard to rank the other two stylized reforms, at least in the light of our findings. Both of them seem to move the average retirement age in the right direction, but only by fairly small amounts (less than two full years). The R1 reform, definitely the simplest, tends to perform better than the R2 reform, but this result is not uniform across regimes and sexes. On the other hand, R2 (which is designed to be common to all countries considered in this volume) modifies current Spanish legislation only slightly. As pointed out above, the early and normal retirement ages selected by R2 coincide with those already in place in Spain. The only difference is the actuarial adjustment for retirement before age seventy, which is considerably less favorable than the one currently used in Spain. Our finding that even a relatively sizeable reduction in SSW would increase the average retirement age by only about one-and-a-half year is a direct consequence of the fact that SSW explains much less than half of the total variability in Spanish retirement age. Uncovering the socioeconomic factors explaining the residual half of such variability is therefore crucial for designing an effective reform.

## Appendix

### From Covered Earnings to Earnings; Workers in the RGSS

The relationship between earnings $w_t$, covered earnings (*base de cotización*) $e_t$, and benefit base (*base reguladora*) $B_t$ follows. The value of $e_t$ is a doubly censored version of $w_t$, specifically,

$$e_t = \max[\ell_t, \min(w_t, u_t)],$$

where $\ell_t$ and $u_t$ are lower and upper ceilings mandated annually, while $B_t$ is a weighted average of current and past covered earnings

$$B_t = \sum_{j \geq 0} b_j e_{t-j}$$

for a suitable set of weights $b_j$.

For each person $i$ in our sample, we observe covered earnings $e_{it}$ at each year during the period 1986–1995 in which the person works. From these data, we have to compute $B_{it}$ using formula (1) and impute $w_{it}$, which is not observed whenever it exceeds $u_t$ or falls below $\ell_t$. Clearly, imputation is only needed for those observations such that $e_{it} = \ell_t$ or $e_{it} = u_t$, and not for the others that are fully observed.

To impute $w_{it}$, we proceed as follows. We assume that the marginal distribution of the logarithm of earnings, $\ln w_{it}$, is normal with mean $\mu_{it} = \alpha_t + \beta_t^{\perp} X_{it}$ and variance $\sigma_t^2$, where $\mathbf{X}_{it}$ is a vector of observable individual characteristics. The model parameters $\alpha_t$, $\beta$, and $\sigma_t^2$ are then estimated using maximum likelihood. To perform these calculations, we neglect left censoring.

When $e_{it} = u_t$ (the observation is right censored), a *naive* imputation of $w_{it}$ is

$$\hat{w}_{it} = \hat{\mu}_{it} = \hat{\alpha} + \hat{\beta}_t^{\perp} X_{it},$$

with the estimated mean of $w_{it}$ under the tobit model. Since we know that $w_{it}$ is at least equal to $u_t$, a better approach is to use instead the estimated conditional mean of $w_{it}$, given that $w_{it} \geq u_t$, specifically,

$$\hat{w}_{it} = \hat{\mu}_{it} + \hat{\sigma}\lambda(c_t) + \hat{\varepsilon}_{it},$$

where $c_t = (u_t - \hat{\mu}_{it})/\hat{\sigma}$, $\lambda(c_t) = \phi(c_t)/[1 - \Phi(c_t)]$, and $\phi(\cdot)$ and $\Phi(\cdot)$ denote, respectively, the density and the distribution function of a standard normal.

Replacing in the original data set the censored values $e_{it}$ with the imputations $\hat{w}_{it}$ gives a set of "completed data" that may be treated (to a first approximation) as the true earnings.

With the complete data we may estimate a fixed-effects model for the level of earnings, use the estimates from this model to project earnings for-

ward and backward; and use projected earnings to compute projected benefit base (necessary for computing projected payroll taxes and projected pension amounts) and the implicit tax for working one additional year.

**Unemployment Benefits**

The Spanish Social Protection system provides contributory and noncontributory coverage against unemployment spells through the Instituto Nacional Empleo (INEM).

*Contributory Unemployment Benefits*

A program exists protecting employees against a nonvoluntary unemployment spell. Duration of benefits ranges from 120 to 720 days, increasing at the rate of 120 days per year of contribution within the previous six years. The amount of benefits is a function of the benefit base, which is the average of the contributive bases during the 180 days preceding the unemployment spell. The minimum benefit amount in 1999 was PTA 69,611, or $405 (PTA 150) equals $1). The maximum benefit amount is a function of the number of dependent children. Without children, it equals PTA 137,395 or $916. With two or more children, it equals PTA 177,793, or $1,185. Unemployment benefits are subject to both SS contributions and income taxes.

*Subsidy for Workers Aged Fifty-Two and Older*

A special unemployment scheme exists for those workers fifty-two and older who (a) are otherwise eligible for a retirement pension, except for their age and (b) have an income below 75 percent of the monthly minimum wage, which is PTA 51,952. The benefit amounts to 75 percent of the monthly minimum wage. It can be collected until the person reaches a retirement age, either early or normal.

**Disability Pensions**

The SS system provides insurance against both temporary and permanent illness or disability.

*Temporary Illness or Disability*

The subsidy for temporary illness or disability (*incapacidad laboral transitoria*) was not regulated by the 1985 reform, and its terms of provision have undergone frequent changes.

Eligibility requires affiliation to the SS system for a minimum period that depends upon the nature of the covered risk. Common illness requires only 180 days of contributions during the last five years, and paid maternity or paternity leave requires at least nine months before the date of delivery and 180 days during the last twelve months, whereas no minimum eligibility criterion is imposed for work-related accidents or illnesses.

The benefit base depends on actual earnings during the last twelve months. In case of a common illness or a non-work-related accident, the subsidy is equal to 6 percent of the benefit base for each day of absence between the fourth and the twentieth and to 75 percent of the benefit base afterwards until the maximum period is reached. It is always equal to 75 percent in case of work-related accident or illness and in case of maternity or paternity leave (only one of the parents being allowed to use the subsidy for each child). The maximum period for which the subsidy can be received is eighteen months, after which the worker must either return to work or be classified as "permanently disabled."

*Contributive Disability Pensions*

Permanent disability pensions have played an important role in allowing Spanish workers to retire at ages earlier than sixty. In particular, they have been used extensively during the late 1970s and early 1980s as an early retirement mechanism for workers in restructuring industries (shipbuilding, steel, mining, and so forth) or as substitutes for long-term unemployment subsidies in depressed regions. The total disability rate (as a percentage of the workforce) doubled in less than ten years, from about 0.7 percent in 1975 to 1.5 percent in 1983. The 1985 reform, by tightening the requirements, managed to bring the phenomenon under partial control. Disability rates have since decreased, stabilizing around 0.6 percent (see table 9A.1 for an illustration).

**Table 9A.1** **Percentage Ratio Between the Number of Disability Pensions Paid and the Number of Workers Covered by the Various SS Programs, 1981–1994**

| Year | RGSS | RETA | REAa | REAb | REMC | RETM | REEH | Total |
|---|---|---|---|---|---|---|---|---|
| 1981 | 0.79 | 1.06 | 2.29 | 2.14 | 2.33 | — | 2.32 | 1.10 |
| 1982 | 1.15 | 1.06 | 3.17 | 2.34 | 3.61 | — | 2.79 | 1.45 |
| 1983 | 1.31 | 1.03 | 3.02 | 2.33 | 3.21 | — | 2.88 | 1.54 |
| 1984 | 1.17 | 0.83 | 2.41 | 2.14 | 2.91 | — | 2.57 | 1.33 |
| 1985 | 0.72 | 0.58 | 1.61 | 1.80 | 1.52 | — | 2.48 | 0.90 |
| 1986 | 0.62 | 0.57 | 1.67 | 1.97 | 1.80 | 1.58 | 1.93 | 0.83 |
| 1987 | 0.55 | 0.51 | 1.34 | 1.84 | 1.42 | 1.34 | 2.00 | 0.72 |
| 1988 | 0.52 | 0.51 | 1.21 | 2.06 | 1.69 | 1.45 | 2.21 | 0.70 |
| 1989 | 0.43 | 0.43 | 1.13 | 1.95 | 1.64 | 1.12 | 2.25 | 0.60 |
| 1990 | 0.44 | 0.51 | 1.21 | 2.38 | 2.36 | 1.22 | 2.90 | 0.62 |
| 1991 | 0.41 | 0.57 | 1.30 | 2.58 | 2.18 | 1.18 | 3.30 | 0.62 |
| 1992 | 0.47 | 0.64 | 1.37 | 2.53 | 2.37 | 1.26 | 3.12 | 0.67 |
| 1993 | 0.47 | 0.68 | 1.25 | 2.15 | 2.29 | 1.25 | 2.85 | 0.64 |
| 1994 | 0.44 | 0.77 | 1.35 | 1.91 | 2.03 | 1.24 | 2.75 | 0.61 |

*Notes:* General Fund (RGSS); self-employed (RETA); agricultural employees (REAa); farmers (REAb); coal miners (REMC); sailors (RETM); domestic workers (REEH). Dashes indicate that data are not available.

Disability pensions are distinguished into contributory and noncontributory. We limit ourselves to the contributory pensions. Eligibility and pension amounts depend on the level of disability. The 1985 reform distinguished four levels of permanent disability characterized by increasing severity. Since then, the legislation has formally reduced them to three, but has also created a special subcase of the first level with the explicit purpose of using the disability funds to subsidize the dismissal of old workers from certain sectors or geographic areas.

The first level (*incapacidad permanente total para la profesión habitual;* IPT) corresponds to inability to do the usual job. A special subcase (*incapacidad permanente total cualificada para la profesión habitual;* IPTC) applies only to employees older than fifty-five that are in particular socioeconomic situations. The second level (*incapacidad permanente absoluta;* IPA) corresponds to inability to do any kind of job. The third level (*gran invalidez;* GI) requires, in addition to the inability to perform work, continued attendance by other persons in order to carry out the basic vital functions.

When disability is caused by an ordinary illness, eligibility to a pension requires from five to fifteen years of contributions, depending on the age when the person fell ill and the seriousness of the disability. There is no contributive requirement when the disability is caused by an accident (whether work related or not) or a professional illness. Table 9A.2 shows the fraction of new disability pensions awarded to individuals aged fifty-six and older by program and regime.

Eligibility requirements are fairly complicated. We try here to streamline their presentation. In the cases of IPA or GI, fifteen years of contributions are required, of which at least three must be during the last ten years. For the other two cases (IPT and IPTC), eligibility depends on age. For persons aged twenty-six or younger, the requirement is half of the number of years between the age of sixteen and the age when disability began. For persons older than twenty-six, the requirement is either five years or one-fourth of

**Table 9A.2** **Fraction of New Disability Pensions Awarded to Individuals Aged 55+, by SS Program and Level of Disability (1994)**

| Program | IPT | IPA | GI |
|---|---|---|---|
| RGSS | 4.0 | 43.5 | 39.3 |
| RETA | 53.4 | 64.4 | 49.3 |
| REA | 58.5 | 63.7 | 68.9 |
| REMC | 0.3 | 48.6 | 60.0 |
| RETM | 14.9 | 32.1 | 32.0 |
| REEH | 25.0 | 75.0 | 80.6 |

*Notes:* Inability to do the usual job (IPT); inability to do any kind of job (IPA); complete inability (GI). See table 9.A1 for definitions of program variables.

the number of years between the age of twenty and the age when disability began, whichever is largest. Furthermore, at least one-fifth of the required contributory years must have occurred during the last ten years.

The benefit base depends on the source of disability. In case of ordinary illness, it is computed the same as for old age pensions. For a non-work-related accident, it is the average annual wage over a period of twenty-four consecutive months chosen by the person from the last seven years of work. For a work-related accident or professional illness, it is the average wage in the last year of work.

The pension equals 55 percent of the benefit base under IPT and increases to 75 percent under IPTC. In case of IPA, it is equal to 100 of the benefit base, whereas for GI it is equal to 100 percent of the benefit base plus another 50 percent covering the person taking care of the disabled.

Disability pensions are indexed to inflation, like the other pensions of the RGSS. Unlike the latter, however, disability pensions may be kept while earning income from a job different from the one for which the disability (even a complete one) was determined.

**Data and Variables**

In this section, we define the variables that have been employed in the specification of the reduced-form probit (see table 9A.3 for descriptive statistics). The data source is the HLSS (see Martínez 1999 for description), unless we otherwise stated.

*Variables from HLSS: Experience, Education, and Occupation*

- Spell: length of the current spell in the data set
- History: history in the data set (i.e., length of participation to the labor market)
- Part Time: indicator variable that takes the value of 1 if the individual does not work full time
- Fraction Working: history divided by potential experience (time elapsed since first time observed in the data set)
- Temporary illness: length of history spent in temporary illness
- Sector: 1-digit SIC industry classification
- Contributive group: ten groups, from college degree to unskilled blue-collars
- Education: proxy for the level of education, constructed as follows—all individuals in contributive group 1 (i.e., college) are assigned to the college level of the educational variable, People belonging to contributive groups 2, 3, and 4 are assigned to the high school (*diploma*) category, and people in the remaining contributive groups are assigned to a general class labeled "less than high school"
- Years of contributions: number of years contributed
- Eligibility indicator: a dummy variable that takes the value of 1 if the

**Table 9A.3 Descriptive Statistics**

| | RGSS | | | | RETA | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| Retirement | 0.1130 | 0.3166 | 0.1098 | 0.3127 | 0.1029 | 0.3038 | 0.1180 | 0.3227 |
| Age | 58.89 | 2.948 | 59.29 | 3.179 | 59.54 | 3.262 | 60.18 | 3.644 |
| SSW | 118.31 | 36.4737 | 90.3704 | 28.0817 | 87.1748 | 10.7495 | 67.9971 | 10.9800 |
| Accrual | 2.9720 | 7.9557 | 0.4338 | 8.6825 | –0.9075 | 4.1614 | –1.5855 | 6.5413 |
| Peak value | 17.5364 | 24.7313 | 13.3365 | 22.3410 | 1.3826 | 10.4062 | 1.3056 | 9.8729 |
| Option value | 90.0784 | 89.7464 | 68.8603 | 69.7920 | 25.0808 | 24.4423 | 27.3171 | 19.0409 |
| Eligibility | 0.9499 | 0.2181 | 0.8063 | 0.3952 | 0.9770 | 0.1498 | 0.8581 | 0.3490 |
| Average-LFI | 1035.973 | 621.855 | 663.854 | 542.598 | 337.578 | 119.85 | 237.63 | 77.647 |
| id squared | 1,459,921 | 181,245 | 735,039 | 128,180 | 128,320 | 145,097 | 62,491.9 | 47,122. |
| Expected wage | 12.4631 | 6.9057 | 9.5710 | 5.1261 | | | | |
| id squared | 203.014 | 235.350 | 117.873 | 137.711 | | | | |
| Expected-wage peak value indicator | 9.2904 | 8.2419 | 7.4796 | 7.0318 | 2.9242 | 1.9530 | 3.2752 | 2.0349 |
| Expected-wage option value indicator | 14.7937 | 12.0910 | 11.3172 | 8.4369 | 5.5842 | 2.4331 | 5.8361 | 2.4006 |
| Pension below MP indicator | 0.0593 | 0.2362 | 0.1449 | 0.3520 | 0.2923 | 0.4549 | 0.4393 | 0.4964 |
| Pension | 5.7539 | 3.6514 | 5.5854 | 3.9094 | 2.6031 | 2.9124 | 2.8775 | 3.6001 |
| id squared | 46.4389 | 72.5773 | 46.4762 | 83.3227 | 15.2561 | 31.2876 | 21.234 | 61.2252 |
| Spell in the firm (years) | 7.9719 | 8.4374 | 7.9754 | 7.6232 | 18.5711 | 8.7681 | 12.740 | 6.6738 |
| id squared | 134.736 | 248.1310 | 121.7048 | 209.830 | 421.745 | 343.308 | 206.84 | 213.08 |
| Years of contributions | 30.3409 | 7.2298 | 23.7570 | 8.6233 | 31.2213 | 7.1568 | 22.414 | 6.9346 |
| id squared | 972.835 | 396.92 | 638.737 | 406.99 | 1025.98 | 422.886 | 550.49 | 329.20 |
| Potential experience (days) | 10,601.4 | 2,859.6 | 7,708.3 | 3,471.4 | 10,090.1 | 3,337.0 | 5,940.5 | 3,112.2 |
| Part time | 0.0078 | 0.0882 | 0.0802 | 0.2717 | | | | |
| Contributions censored below | 0.1636 | 0.3669 | 0.2233 | 0.4165 | | | | |

| | | | | |
|---|---|---|---|---|
| Contributions censored above | 0.1437 | 0.3508 | 0.0421 | 0.2007 |
| College | 0.0905 | 0.2869 | 0.0405 | 0.1972 |
| Diploma | 0.0314 | 0.1745 | 0.0649 | 0.2464 |
| Engineers | 0.0697 | 0.2546 | 0.0296 | 0.1695 |
| Technical engineers | 0.0285 | 0.1665 | 0.0618 | 0.2408 |
| Supervisor and foremen | 0.0601 | 0.2377 | 0.0273 | 0.1629 |
| Aux. and clerks assistant | 0.1296 | 0.3358 | 0.1142 | 0.3181 |
| Janitors and clerks assistant | 0.1094 | 0.3121 | 0.1978 | 0.3984 |
| Unskilled | 0.1534 | 0.3604 | 0.3697 | 0.4828 |
| Energy | 0.0180 | 0.1329 | | |
| Mineral, chemicals | 0.0410 | 0.1983 | 0.0086 | 0.0922 |
| Mechanic & engineering | 0.0466 | 0.2109 | 0.0083 | 0.0908 |
| Other manufacturing | 0.0763 | 0.2654 | 0.0410 | 0.1984 |
| Construction | 0.0862 | 0.2807 | 0.0127 | 0.1121 |
| Retail | 0.0941 | 0.2919 | 0.1267 | 0.3327 |
| Transportation | 0.0478 | 0.2134 | 0.0119 | 0.1086 |
| Communications and financial | 0.0552 | 0.2284 | 0.0517 | 0.2214 |
| Administration and other | 0.1870 | 0.4012 | 0.4457 | 0.5035 |
| Code 9130 | 0.1674 | 0.3734 | 0.1477 | 0.3549 |
| Temporary illness | 0.1438 | 0.3509 | 0.1202 | 0.3252 |
| Other codes | 0.0288 | 0.1543 | 0.0145 | 0.1197 |
| Collective bargaining clauses favoring retirement at | | | | |
| 65 | 0.0154 | 0.1147 | 0.0194 | 0.1242 |
| 64 | 0.0039 | 0.0312 | 0.0045 | 0.0314 |
| Early retirement | 0.2249 | 0.2227 | 0.2222 | 0.2130 |

*Note:* Blank cells indicate that data are not available.

individual meets the contributive threshold (fifteen years of contributions) and zero otherwise
- Pension amount: see section 9.2 for a detailed description
- Average lifecycle earnings: constructed on the basis of a fixed-effect model for each contributive group
- Expected earnings: see section 9.4.1 for description
- Expected-earnings peak indicator: discounted sum of the expected earning from the present to the year the peak is reached
- Expected-earnings OV indicator: discounted sum of the expected earning from the present to the year the option value (OV) is maximized
- Minimum pension indicator: a dummy variable that takes value of 1 if the individual's expected retirement pension falls below the minimum retirement pension
- Censoring earnings indicators: two dummy variables—the first takes value of 1 if the individual's level of contributions falls below the minimum (mandatory) level of contributions, and the second takes value of 1 if the individual's level of contribution is greater than the maximum level of contributions

*Variables from the Collective Settlements Register (Estadística de Convenios Colectivos; ECC)*

Since we do not have direct information about regulations affecting specific workers, we use the Spanish register of collective settlements in order to construct proxies for such regulations. In particular, using the ECC [see Jiménez-Martín (1998) for a brief description of the source], we have constructed three indicators of the coverage of early and mandatory retirement provisions for each (2-digit SIC) industry.

- Early retirement indicator: fraction (weighted by employment) of collective settlements including a prevision favoring early retirement
- Retirement at sixty-four: fraction (weighted by employment) of collective settlements including a provision to facilitate retirement of workers aged sixty-four without incurring any age penalty (this variable only applies to people aged sixty-four enrolled in RGSS)
- Mandatory retirement at sixty-five: fraction (weighted by employment) of collective settlements including a provision promoting mandatory retirement at sixty-five (this variable only applies to people aged sixty-five enrolled in RGSS)

We refer to Martínez (1999) for a detailed description of the variables and for summary statistics of the histories, covered earnings, and benefits files.

*Complementary Data Sources*

At various stages of this work, we have made use of the following complementary data sets: Encuesta de Presupuestos Familiares (EPF; INE

1995a), 1973–1974, 1980–1981, and 1990–1991; Encuesta de Estructura Salarial (EES; INE 1997) 1995; Encuesta Continua de Presupuestos Familiares (ECPF; INE 1998) 1985–1995; EPA 1987–1998. All these data sets are collected by the Spanish National Statistical Institute (INE). A brief description follows.

- EPF: A cross-sectional household budget survey carried out in 1974, 1981, and 1991, with reference to income and expenditure in the previous calendar year (the 1990–1991 sample covers 21,155 households and 72,123 individuals)
- EES: A cross-sectional survey of the Spanish wage structure carried out in 1995 with reference to wages paid that year. It collects detailed information about gross wages, SS contributions, working hours, and personal characteristics of about 175,000 workers in 19,000 establishments. The EES is useful for understanding the relation between covered earnings and actual earnings for those cases in which the latter exceed the former, since it simultaneously reports both gross wages and contributions, together with relevant professional characteristics of the individual.
- ECPF: A rotating household survey carried out quarterly since 1985. It collects data on income, consumption, net quarterly income (broken down by source: wages, self-employment income, capital income, transfers, and subsidies), and personal characteristics (especially those of the household head and their spouse) for about 3,000 households.
- EPA: A quarterly CPS-like survey of roughly 60,000 Spanish households. It contains detailed information on labor force status and education and family background variables but no information on wages and income. Publicly released cross-sectional files are available from 1976 onwards. Starting with 1987, INE also releases the so-called *Encuesta de Poblacion Activa Enlazada,* or EPAL, which is the panel version of EPA obtained by exploiting the rotating cross-sectional nature of the original survey. It contains fewer variables than EPOA, but it permits to follow individuals for up to six consecutive months.

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