MICRO-MODELLING OF RETIREMENT BEHAVIOR IN SPAIN¤

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This version: December 3, 2000

¤ We thank Paqui Mart¶inez and Aitor Deleyto for excellent research assistance.

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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 be very di®erent 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 milion at the end of 1999. This is slightly less than 30 percent of current total employment and it 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. The total amount of accumulated assets was 4,500 billions Pesetas, i.e. about 5 percent of GDP (+24 percent respect to December 31, 1997). Most participants are enrolled in individual pension plans (3M, equal to 88 percent and controlling 60 percent of assets). Professional plans (concentrated in the former state monopolies: electricity, telecommunication, gas and oil distribution, air transport) cover only 10 percent of the total number of participants, but their controlled assets equal to 37 percent of the total.

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 RGSS and the rest by the Special Regimes. This corresponds to the practical totality of Spanish private sector workforce (see Boldrin, Jimenez-Martin and Peracchi [2000] for further details). Enrollment in the Spanish SS programs grew remarkably fast during the last three years, in fact much faster than actual employment as estimated by the Spanish labor survey EPA. More precisely, the number of individuals enrolled in the Social Security Administration grew at 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 a rapid, indeed: historically exceptional, growth in the ranks of the SS Administration in 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 due to a one-time emersion of the underground economy. This should be attributed partly due to structural changes in the Spanish labor market and partly to an e®ort of the current administration to reduce contributive fraud. Hence, we should not extrapolate these growth rate in the future, even assuming that the current growth rate of the economy could be maintained.

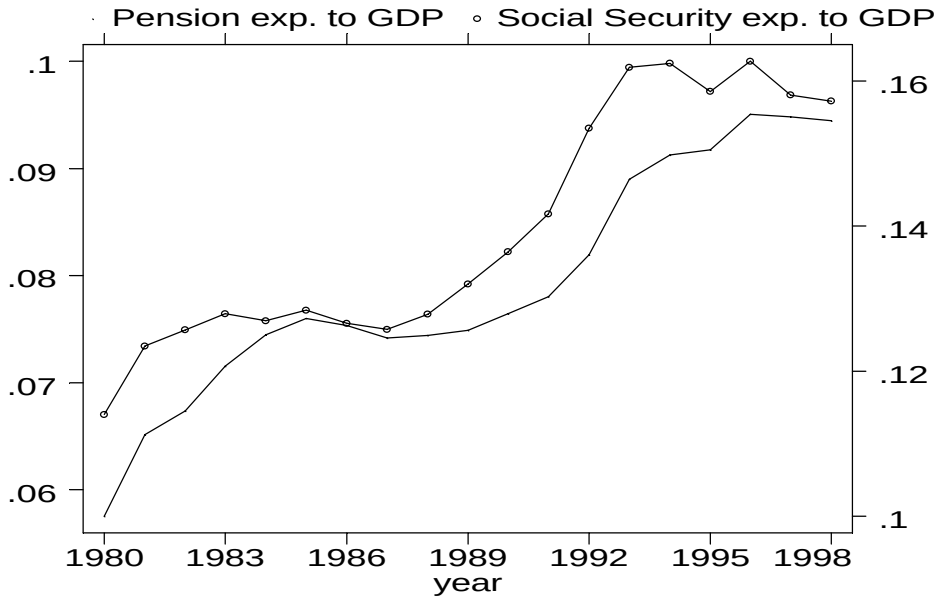
The total number of contributive pensions, as of December 31, 1999, was of 7.6 milion. The growth rate in the number of contributive pensions was of 2.6 percent in 1996, 1.96 percent in 1997, 1.52 percent in 1998, 1.26 percent in 1999 and 1.24 percent (estimated) in 2000. The functional composition of 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 regimes gives 55 percent to the RGSS (Regimen General de la Seguridad Social or RGSS), followed by the farmers special regime (RETA) at 21 percent and the self-employed regime (REA) with 11 percent. The other, much smaller, special regimes share the residual 10 percent.

For year 2000, expenditure on public pensions in Spain is expected to equal 9,229.7 billion pesetas, approximately 9.5 percent of GDP. By adding non-contributive 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 1996 and 1997. This is due to the strong growth performances of the Spanish economy over the four years 1997-2000, which may be continuing on into 2001. Social security contributions amounted, in 1999, to 9.4 percent of GDP and are expected to remain at about the same percentage level in 2000.

The functional distribution of payments re°ects the di®erence in average pension between old age and other functions. So, expenditure for old age is 68 percent of the total while survival bene¯ts are 19 percent and disability 12 percent of the total. During year 2000, the total expenditure for contributive pensions amounted to 8,300 bilion pesetas (about USD 45 bilion at the exchange rate of late November 2000) which corresponds to slightly less than 10 percent of Spanish GDP.

Figure 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 Social

Figure 1: Social Security and pension expenditures and GDP. 1980{1998.



Security System and GDP. Beside pensions, total expenditure includes expenditure for temporary illness, maternity/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 social security system accelerates as well.

It is hard to judge if the recent °attening 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 e®ects, we should brie°y mention which are the steps taken in a new direction.

The Spanish labor market is more °exible after the 1997 agreement between the Government and the Trade Unions. Firing costs are slightly lower and contracts that allow for dismissal can be signed. This is showing positive e®ects 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 seems 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.

If legislation is not modi¯ed in the meanwhile, by 2005-2010 the number of workers having the right to retire before the age of 65 will dwindle to almost zero. Current legislation allows this privilege only to those that started contributing before 1967. Currently this constitutes the bulk of the retirees or near-retirees. Within a decade, this will provide a one-time boost to labor force participation rates for the age group 60{65.

For a long time, an alarming feature of the retirement behavior of Spanish workers was the large fraction retiring and drawing pensions before the normal retirement age of 65 (see Boldrin, Jimenez-Martin and Peracchi [2000] for detailed time series). The percentage of new pensioners strictly younger than 65 seems to

have peaked at 71.64 percent in 1995, decreasing slowly in subsequent years. It was 68.16 percent in 1998. The percentage of those retiring at 60 may have peaked at 46.5 percent in 1997, decreasing 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 reported large and persistent discrepancies between enrollment rates in the SS programs and the employment levels estimated by EPA, suggest that the record increase in SS enrollment is partly due to the emergence of the black labor market. This has two consequences. 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 if actually a statistical artifact. This ¯ts well with the very low measured growth rate of labor productivity, 0.2-0.5 percent 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.

Further, recent legislation (Fall 1999) has once again increased the real value of minimum pensions, of about 3 to 5 percentage points. Beside raising the overall pension burden, this policy has negative e®ects on participation rates. As clearly shown in Boldrin, Jimenez and Peracchi [1999], minimum pensions are one of the major determinants of early retirement, especially among low earners. This suggests that the political willingnes to increase pension expenditure to please special interest groups, and to maintain the distortionary e®ects 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, Jimenez and Peracchi [2000].

Table 1 presents the evolution of the structure of the Spanish population in the 1950{2020 period. We break down the total population in three representative groups: 0{14, 15{64 and 65+. There are two salient features. On the one hand the young population (0{14), after peaking in 1970, has steadily decreased. Currently the size of each generation of newborn is half the size of the same generation twenty years ago. On the other hand, the fraction of 65+ has continuously increased and will reach 20 percent of the population before 2020. Further, life expectancy at 0 and at 65 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 contributors/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 ¯shermen).

The pattern of labor force participation in Spain is similar, from a qualitative view point, to the rest of \continental and non Scandinavian" Europe (France, Italy, Germany, Belgium). While worse in level (higher unemployemnt, lower LFPR, lower female participation rates) the dynamics have been very similar since Spain joined the 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 °ow into Spain at a much lower rate than the rest of continental Europe and Spain does not seem to be prone to policies to encourage immigration (recent political debate con¯rms this posture). This is con¯rmed by the extremely low number of working permits issued to foreigners over the last 5 years: 88.620 (1994) , 100.290 (1995), 126.407 (1996), 86.841 (1997) , 40.440 (1998). On average this is about 0.5 percent of the workforce.

The rest of this chapter is organized in seven sections. The next one, Section 2, provides an overview of the technical rules underlying the Spanish public pension system. Section 3 describes our microeconomic data set, illustrates its main limitations and outlines the steps we have taken to overcome such limitations. Additional material complementing sections 2 and 3 can be found in the Appendix. In Section 4 we proceed to characterize the sample distribution of earnings and our estimated projections. Section 5 uses such projections to compute the various measures of retirement incentive used in this study. Such retirement incentive measures are the inputs for the estimation of the retirement models, which is undertaken in Section 6. Section 7 studies three simple policy reforms, and evaluate their di®erential impact upon the retirement

Table 1: Trends of the structure of the Spanish population and life expectancy.

	Structure of the population			Life expectancy			
				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	65.50	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 and Fern§ndez Cord¶n from at www.fedea.es

incentives. Section 8 very brie°y concludes.

2 Institutional features

2.1 Public programs for old{age workers

Table 2 summarizes the programs available after age 50. Besides private pensions, there are three public programs that a®ect the behavior of old age workers: unemployment bene¯ts, disability bene¯ts and retirement pensions.

Unemployment bene¯ts are generally conditional on a previous spell of contributions (see Appendix B) and are available only for workers in the RGSS.[1] There are two continuation programs for those who have exhausted their entitlement to contributory unemployment bene¯ts: one for those aged 45+ (UB45+ program) and the other for those aged 52+ (UB52+ program). The UB45+ program does not give access to early retirement, whereas the UB52+ program pays a ¯xed bene¯t until the person becomes eligible for early retirement.

Disability (DI) bene¯ts are far more generous than any other old-age program, since they are not subject to penalties for young age or insu±cient years of contribution. DI bene¯ts are subject to approval by a medical examiner (notoriously, the tightness of the admissibility criteria used by examiners varies 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 bene¯ts after age 55. 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.

The retirement program has two schemes: early retirement and normal retirement. Early retirement is possible from age 60 but it only applies to workers who started their contributive career before January 1, 1967. The normal retirement age is 65, although some special professions have lower normal retirement ages (miners, military personnel, policemen and ¯shermen are the main ones). Collective Bargaining settlements

[1] People enrolled in RESS have either no access to unemployment bene¯ts (self-employed and household employees) or have special unemployment programs (farmers and ¯shermen).

Table 2: Public programs at older ages. (1)

	Unemployment insurance	Disability Insurance	private pension plan	Social security bene¯ts
50	cont. from 45+	cont. /non-cont.	yes	(2)
52	cont. from 52+	cont. /non-cont.	yes	(2)
55	cont. from 52+	cont. /non-cont.	yes	(2)
60	cont.	cont. /non-cont.	yes	ER: cont.
65	{	{	yes	NR: cont./non-cont.

keys: cont.: contributory; non-cont.: non contributory;
45+ and 52+: Special UI program for 45+ and 52+ workers enrolled in the RGSS.
ER: early retirement, NR: normal retirement
notes: (1) All the public programs have de¯ned dependant bene¯ts
(2). There are age bonuses for certain professions, that allow for retirement before 60.

may settle on mandatory retirement at age 65, facilitate retirement at 64 with full bene¯ts or motivate retirement between 60 and 63 through lump sum amounts.

2.2 Social Security regimes and their rules

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

- \General Social Security Scheme" (Régimen General de la Seguridad Social, or RGSS) and \Special Social Security Schemes" (Regímenes Especiales de la Seguridad Social, or RESS): They cover all private sector employees and self-employed workers and professionals, members of cooperative ¯rms, 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 65. The RESS include ¯ve special schemes:
  1. Self-employed, Régimen Especial de Trabajadores Autónomos or RETA.
  2. Agricultural workers and small farmers, Régimen Especial Agrario or REA.
  3. Domestic workers, Régimen Especial de Empleados de Hogar or REEH.
  4. Sailors, Régimen Especial de Trabajadores del Mar or RETM.
  5. Coal miners, Régimen Especial de la Minería del Carbón or REMC.
- Government employees scheme, Régimen de Clases Pasivas, or RCP: it includes public servants employed by the central government and its local branches.

In this study we will not consider the later regime, RCP. Summary information about its structure and rules are reported later in this Section. Legislation approved by Parliament on June 26, 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.

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 mini-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 3. Our concentration on the RGSS is justified by the fact that it is the main SS program in Spain and the benchmark for our simulations.

Financing and Eligibility

RGSS is a pure pay-as-you-go scheme. Contributions are a fixed proportion of covered earnings, defined as total earnings, excluding payments for overtime work, between a floor and a ceiling that vary by broadly defined professional category. 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 15 years of contributions. As a general rule, recipiency is conditional on having reached age 65 and is incompatible with income from anyform of employment requiring affiliation to the Social Security system.

Benefit computation

If eligibility conditions are met, a 65 years old retiring person retiring receives an initial monthly pension P_t equal to

$$P_t = \alpha_n BR_t;$$

where the benefit base (base reguladora) BR_t is a weighted average of covered monthly earnings $W_{t\,i\,j}$ over a reference period that consists of the last 8 years before retirement

$$BR_t = \frac{1}{112}\left(\sum_{j=1}^{24} W_{t\,i\,j} + \sum_{j=25}^{96} W_{t\,i\,j}\,\frac{I_{t\,i\,25}}{I_{t\,i\,j}}\right);$$

and $I_{t\,i\,j}$ is the consumer price index for the j-th month before retirement.

The replacement rate α_n depends on the number of years of contribution and is equal to

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

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

Beginning July 15, 1997, the number of reference years has been increased by one every year until 2001 and could then be increased further up to 15 years. Moreover, the formula for computing α_n has also been changed to the following

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

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 in the section dedicated to policy simulations (see R97 in that section).

Early retirement

The normal retirement age is 65, but early retirement at age 60 is permitted for those who became affiliated to SS before 1967. The current legislation distinguishes between two cases. The first one, representing the vast majority of those currently retiring between age 60 and 65, is the case of workers who started

contributing as dependent employees to some Mutualidad Laboral before 1967. In this case, the replacement rate is reduced by 8 percentage points for each year under age 65. As of July 15, 1997 workers who retires after the age of 60 with 40 or more contributive years will be charged a penalty of only 7 percent for each year under age 65.

The second case, representing about 10 percent of the early retirees, is the case of workers with dangerous or unhealthy jobs (e.g. bull¯ghters, employees of railroads, public transportation companies and airlines, etc.), or workers who were laid o® for industrial restructuring regulated by special legislation. In this case, no reduction applies. Notice that these exemption rights are \portable", as the minimum retirement age without penalty, for an individual who was previously employed in one of the sectors deemed dangerous or unhealthy, is reduced in proportion 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 65. We try to estim ate the impact of such special arrangements in our empirical estimates, as described in later section.

Maximum and minimum pension

Pensions are subject to a ceiling legislated annually and roughly equal to the ceiling on covered earnings. The 1996 ceiling corresponds to about 4.3 times the minimum wage (salario m¶nimo interprofesional, or 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 minimum pension legislated annually. Other things being equal, minimum pensions are higher for those who are older than 65 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 is about equal to the in°ation 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 general scheme receiving the minimum pension has been declining steadily, from over 75 percent in the late 1970s to 27 percent in 1995.

The fraction of the total pension which comes from complements varies with the pension type. It is 10.1 percent for men and 12.5 percent for women in the case of old-age pensions, 5.8 and 6.2 percent respectively in the case of disability pensions, and 19.4 percent in the case of survivors' pensions. Not surprisingly, the fraction of pensioners who receive complements to the minimum and the share of the pension due to complements both decrease with the number of years of contribution. For example, people who retire with 10 years of contributions get 40 percent of their pension from complements, whereas people who retire with 35 years get less than 10 percent from complements.

Pension indexation

Pensions are fully indexed to in°ation, as measured by the Consumer Price Index (Indice de precios de consumo, or IPC). Until 1986, pensions were also indexed to real wage growth.

It should be noted that indexation is to expected in°ation, as de¯ned annually by the Central Bank and the Treasury. If actual in°ation is above the expected one, then the di®erence is paid only to the pensions that are below the minimum wage. No adjustment is made, however, if actual in°ation falls below the expected one, as it occurred during the last few years. Pensions that have already reached the legislated ceiling are not indexed but are automatically adjusted with the ceiling.

While this indexation mechanism could, at least theoretically, induce large reductions in the real value of higher pensions and a strong tendency to pension equalization, in practice this has occurred only to a limited extent.

Family considerations

A pensioner receives a fixed annual allowance for each dependent child that is younger than 18 or disabled. In 1996, this allowance was equal to 408,840 pesetas (pta), corresponding to about 45 percent of the annualized minimum wage. In addition, the minimum pension is increased by a fixed amount if a pensioner has a dependent spouse.

Survivors (spouse, children, 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 5 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 a worker, it is computed as an average of covered earnings over an uninterrupted period of 2 years chosen by the beneficiary among the last 7 years immediately before death. If death occurred because of a work accident or a professional illness, then the benefit base coincides with 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 disability 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 18 or unable to work, and stay unmarried. A full 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, etc.) to 20 percent of the benefit base of the principal if they satisfy certain eligibility conditions (older than 45, do not have a spouse, do not have other means of subsistence, 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.

There are specific minimum pensions for the different types of survivorship. In particular, the minimum pension to a surviving spouse has been raised in 1992 and is now equal to the minimum old-age pension for a person without a dependent spouse.

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 servants, 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 the affiliated to the special schemes have no early retirement option (exception made for miners and sailors).

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

2.4.1 Self-employed

While the SS tax rate is the same for the RETA and the general scheme (28.3 percent in 1999), covered earnings are computed differently, as the self-employed are essentially free to choose their covered earnings between a floor and a ceiling legislated annually. 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 1996, the floor and the ceiling were equal to 101,940 pta and 374,880 pta per month respectively, corresponding to 1.6 and 5.8 times the minimum wage, and .5 and 1.9 times the average earnings in manu-

facturing and services. For a self-employed aged 50+, the ceiling was only about half, namely 195,000 pta 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 on.

Some other important provisions are the following. RETA only requires at least 5 years of contribution in the 10 years immediately before the death of the principal in order to qualify for survivors' pensions. 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 5 years chosen by the beneficiary among the last 10 years before the death of the principal.

2.4.2 Farmers

In this case, both the SS tax rate and the covered earnings differ with respect to the general scheme. Self-employed farmers pay 18.75 percent of a tax base that is legislated annually and is unrelated to actual earnings. In 1996, this was equal to 80,490 pta per month, corresponding to 1.24 times the minimum wage and about 40 percent 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.

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 5 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, etc.), 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 (certificado de escolaridad). There were many more categories before the 1985 reform. 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. So, for example, the ratio of level A to level E wages was equal to 2.39 between 1985 and 1989, dropped to 2.33 in 1990, and rebounded and remained constant at 2.45 afterwards.

SS contributions are the sum of three parts, each proportional to the legislated covered wage, according to proportionality factors legislated annually: a) derechos pasivos (3.86 percent in 1995), b) cuota mensual de Mutualidades (1.89 percent in 1995), and c) aportación 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 (ISFAS, MUFACE, MUGEJU).

The basic monthly pension of a public servant who retires in month t after contributing for n years to RCP is computed as $P_t = \alpha_n BR_t$, where the dependence of α_n upon the numbers of years worked has been changed quite frequently during the last 10 years. 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 15 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 35 years. So, for example, 15

years of service give right to a pension equal to only 26.92 percent of the bene¯t base, against 60 percent of the general scheme. After 30 years the same ratio has increased to 81.73 percent, against 90 percent for the general scheme). Historically, this replacement ratio has been rather unstable as it can be modi¯ed year-by-year through the budget law.

Second, the bene¯t base is computed as a weighted average of covered earnings, upon which the worker paid the contributions, with weights equal to the percentage of the career spent at each level, that is,

$$BR_t = \sum_i p_i H_{it};$$

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 65. Exception 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 60, without any penalty for public servants with at least 30 years of service (20 for military personnel).

A fourth important di®erence with respect to the general scheme is compatibility between RCP pensions recipiency and income from continuing to work. 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 °ow of income" (for example, this is 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.

It should be noted that those who leave the public administration after contributing the minimum number of years but before reaching the retirement age, can claim an RCP pension once they reach age 65. The bene¯t base used to compute such pension does not refer to the time when the individual left the public administration but is instead the one legislated for the year when they turn 65. Furthermore, any future modi¯cation in the law will have no impact upon the pensions which are already being paid. The latter will be forever regulated by the legislation of the time when the individual matured the right to the RCP pension.

When a public servant is dismissed because of disability (and therefore starts drawing a disability pension) or dies (and the survivors are therefore entitled to a pension), the missing years between the person's age at the time of the event and 65 are counted as actual years of service in the computation of either the disability or the survivors' pension. Should the disability be caused by an accident while on duty, the disability pension is doubled.

2.6 Disability and unemployment pensions

The SS system provides insurance against both temporary and permanent illness or disability. There exists also a special subsidy for unemployed people that are older than 52, lack income sources, have contributed to unemployment insurance for at least 6 years in their life and, except for age, satisfy all requirements for an old-age pension. Both kinds of insurance plans o®er, as we will argue momentarily, a \pathway to early retirement" alternative to the normal one (with early retirement at 60 and normal retirement at 65). Such alternative pathways are taken in due account in our estimation and simulation procedures.

To avoid cluttering the main text, we describe the various provisions of the disability and 52+ unemployment insurance plans in the Appendix. For a discussion of non-contributory 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 et al. [1998].

2.7 Pathways to retirement

This brief illustration of the Spanish public pension systems clari¯es that more than one pathway to retirement is available to Spanish workers, either employees of the private sector of self-employed ones. We have identi¯ed the main ones and summarized them, by sector of employment, in Table 4). Here is a brief listing

- 1. Normal retirement at age 65.
- 2. Early retirement at age 60 (Only for RGSS people enrolled before 1967).
- 3. Unemployment bene¯ts at some age between 52 and 60 and then early retirement.
- 4. Early retirement through the disability option at some age before 60.

3 Data description

This section describes in detail the data used for the analysis.

3.1 The main data set

Our main microeconomic data set is based on administrative records from the Spanish Social Security Administration (Historiales Laborales de la Seguridad Social, or HLSS from now on). The sample is a random draw of 250,000 individual work histories from the historical ¯les of SS a±liates (¯chero histórico de a¯liados or FHA). The sample includes only individuals aged 40+ on July 31, 1998, date at which the ¯les were prepared. The sample contains individuals from the RGSS and the ¯ve 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 we do not consider them in this study.

The data set consists of three ¯les. The ¯rst ¯le (\History ¯le", or H ¯le) contains the work history of the individuals in the sample. Each record in this ¯le describes a single employment spell of the individual. As we argue below, the work histories are very accurate for spells or histories which began after the mid{1960s. The second ¯le (\Covered Earnings ¯le", or CE ¯le) contains (annual averages) of covered earnings (bases de cotización) from 1986 to 1995. The third ¯le (\Bene¯ts ¯le", or B ¯le) contains information on the lifetime SS bene¯ts received by the individuals in the sample. Bene¯ts are classi¯ed by function (retirement, disability, survival, etc.) and initial amount received. To be more precise, the bene¯ts ¯le contains the initial bene¯t amount and the length of the period during which the bene¯t was received. A fourth ¯le (\Relatives ¯le", or R ¯le) is also available; it reports some bene¯ts paid to relatives of the individual while members of his/her household.

For each individual in the sample who contributed to SS during the 1986{1995 period, the CE ¯le 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 doubly censored (from above and below) version of earnings. What this means is that covered earnings have both ceilings and °oors: contributions must be paid over some legislated minimum wage, no matter what actual earnings are. Also, earnings above a certain legislated ceilings, are not covered, in the sense that they do not generate any rights toward future pension and, as such, are not reported in the SS Administration ¯les. Notice, though, 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 °oors (see Section 2 above for details) and, consequently, there is no clear link between covered and actual earnings in this case.

For each employment spell in the H ¯le, 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 distiguish 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 (4-digits SIC), and the region of residence (52 Spanish provinces). For each individual in the H ¯le who has received some bene¯ts at any point in time, we know most of the information that the SS administration uses to compute the monthly bene¯ts to be paid. In particular, we know the initial and current pension, the bene¯t 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 bene¯ts, etcetera.

Table 3: Pension provisions, institutions and systems

Institutions	RGSS System after 1985	RGSS System after 1997
Provisions and institutions affecting all the individuals		
A. Basic ingredients		
A1.The benefit base formula	$\frac{1}{96}\left[\sum_{j=1}^{24} BC_{tij} + \sum_{j=25}^{120} BC_{tij}\frac{I_{tj25}}{I_{tij}}\right]$	$\frac{1}{180}\left[\sum_{j=1}^{24} BC_{tij} + \sum_{j=25}^{180} BC_{tij}\frac{I_{tj25}}{I_{tij}}\right]$
{Contribution period	8 years	15
{Fraction actualized	6 years	13
A2. Fiscal system		
{income tax	[progressive]	
{labor tax	linear (regime specific)	
B. Penalties		
-Insufficient contribution (®)	$\begin{cases} 0; & \text{if } n < 15, \\ :6 + :02(n - 15); & \text{if } 15 \leq n < 35, \\ 1; & \text{if } 35 \leq n. \end{cases}$	$\begin{cases} 0; & \text{if } n < 15, \\ :5 + :03(n - 15); & \text{if } 15 \leq n < 25, \\ :8 + :02(n - 25); & \text{if } 25 \leq n < 35, \\ 1; & \text{if } 35 \leq n. \end{cases}$
-Early retirement (τ)	$\begin{cases} 0; & \text{if } a < 60, \\ :6 + :8(a - 60); & \text{if } 60 \leq a < 65, \\ 1; & \text{if } 65 \leq a. \end{cases}$	only changes when $n \geq 40$: $\begin{cases} 0; & \text{if } a < 60, \\ :65 + :07(a - 60); & \text{if } 60 \leq a < 65, \\ 1; & \text{if } 65 \leq a. \end{cases}$
Provisions and/or institutions affecting some 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. Min/Max contributions		
{Min. level of contribution	(specific for 12 group)	
{Max. level of contribution	(specific for 12 group)	
E. Min. and Max. pensions		
{Minimum pension	linked to minimum wages	linked to minimum wages
{Maximum pension	4.3 minimum wages (in 1995)	4.3 times minimum wages
F. Age bonuses	YES (occupation specific)	YES (occupation specific)
G. Survivor benefits	$0{:}45P_d$	$0{:}45P_d$
$b_t = \max\{\min\{\tilde{b}_t[n; e; BR(BC; I)]; \bar{b}_t\}; \underline{b}_t\}$ 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.		

Table 4: Pathways to Retirement

Pathway	RGSS & asimilates	RETA	RCP (Public employees)
1. Normal retirement at 65	x	x	x
2. Early retirement at 60	x	x	x (without penalty with 35 years service)
3. UB, then ER	x		not relevant
4. ER through DI	x	x	x

We refer to Martínez (1998) 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 thereby recorded, is summarized in Table 5.

3.2 Data problems in 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 in the HLSS data by comparing sample statistics from the latter with those obtained from other data sources which are, presumably, more representative of the working population under study, at least along the dimensions considered in what follows.

- Over-representation of some regions or sectors. The fraction 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 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 (July 31, 1998). In other words, for those in the B file, we know if they stopped receiving benefits because of death before July 31, 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 55 or 60. This does not create a major problem for our computation of expected pensions, since the current system establishes a clear formula to impute years of contribution before the 1st of January 1967. This is

$$IDC = [1967 - (y_b + 21)] * 250$$

  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 January 1, 1967 as reported in the H file. The largest of these quantities is chosen as the individual's contributive history before January 1, 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 job. 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 (see Table 6 for an illustration). To fill in the gap we use the Spanish Labor Force Survey (EPA). From this survey, we can extract the following information:

  1. Working men are married with women 3 year younger, whereas working women are married with men who are 4 years older.
  2. Male workers are very likely to be married. The fraction of working males which are married, from EPA, is 95.10, 94.6 and 92.7 percent for males aged 50{54, 55{59 and 60{64, 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.

Table 5: Distribution of sample by activities in 1997

Activity status							
age & sex group	working full T.	working part T.	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
Male 55{59	69.76	0.52	2.89	1.49	2.49	22.85	20878
Male 60{65	39.72	0.31	1.23	1.51	3.54	53.68	22813
Male 65{69	5.22	0.07	0.21	1.80	4.12	88.58	19304
Fem 50{54	57.56	5.54	3.51	3.85	0.58	28.95	12409
Fem 55{59	56.32	4.21	2.40	4.01	0.85	32.21	9385
Fem 60{64	45.72	2.45	1.22	3.12	1.44	46.05	9237
Fem 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
Male 55{59	68.73	0.78	3.49	2.02	2.32	22.66	13887
Male 60{64	35.78	0.49	1.61	2.08	3.16	56.88	14327
Male 65{69	3.10	0.13	0.27	2.60	3.90	90.00	11127
Fem 50{54	46.41	10.47	4.96	7.00	0.66	30.51	6555
Fem 55{59	46.07	8.94	3.35	7.63	0.95	33.05	4417
Fem 60{64	34.88	5.85	2.02	6.24	1.16	49.86	3865
Fem 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
Male 55{59	72.72	{	2.21	0.09	2.64	22.34	3442
Male 60{64	52.23	{	1.17	0.22	4.68	41.70	3163
Male 65{69	8.03	{	0.24	0.00	5.27	86.46	2466
Fem 50{54	60.08	{	3.00	0.11	0.37	36.43	2698
Fem 55{59	53.99	{	2.47	0.43	0.66	42.45	2106
Fem 60{64	45.39	{	0.91	0.40	1.82	51.47	1976
Fem 65{69	15.24	{	0.53	0.07	1.72	82.44	1509
BENEFITS (as a fraction of people out of the LF)							
age & sex group	without SS ben.	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
Male 55{59	40.02	0.25	49.43	0.00	2.43	7.86	4770
Male 60{64	15.32	0.15	22.59	8.27	46.71	6.97	12246
Male 65{69	10.31	0.06	0.09	20.15	62.11	7.29	17100
Fem 50{54	80.68	5.12	11.72	0.00	0.03	2.45	3593
Fem 55{59	66.66	8.34	20.64	0.00	0.36	4.00	3023
Fem 60{64	41.02	10.04	21.77	7.45	14.81	4.91	4254
Fem 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
Male 55{59	40.48	0.29	47.63	0.00	3.18	8.42	3147
Male 60{64	14.48	0.11	19.45	6.87	51.74	7.35	8149
Male 65{69	10.66	0.06	0.12	17.39	64.20	7.58	10059
Fem 50{54	81.70	5.30	10.10	0.00	0.05	2.85	2000
Fem 55{59	67.81	9.38	17.19	0.00	0.68	4.93	1460
Fem 60{64	39.91	10.02	16.97	5.35	21.90	5.86	1927
Fem 65{69	23.02	7.16	0.09	17.72	47.30	4.71	2207
RETA							
Male 50{54	72.82	0.73	23.26	0.00	0.15	3.05	688
Male 55{59	52.28	0.26	42.13	0.00	0.91	4.42	769
Male 60{64	26.91	0.45	26.91	9.40	31.24	5.08	1319
Male 65{69	12.90	0.14	0.09	18.15	62.24	6.47	2132
Fem 50{54	86.78	4.48	7.53	0.00	0.00	1.22	983
Fem 55{59	78.64	7.72	12.75	0.00	0.00	0.89	894
Fem 60{64	57.23	12.29	14.85	4.42	8.85	2.36	1017
Fem 65{69	31.67	10.29	0.08	14.95	39.07	3.94	1244

Table 6: Marital status by sex in the HLSS. 1997.

marital status	male	female	Total
No information	28696	21830	50526
percent	17.89	26.03	20.68
Single	63724	27838	91562
percent	39.73	33.19	37.48
Married	44111	8647	52758
percent	27.50	10.31	21.60
Widow	23569	25349	48918
percent	14.69	30.22	20.02
Other	307	215	522
percent	0.19	0.26	0.21
Total	160407	83879	244286

3. For low educated, 55+ male workers, the fraction of working spouses is very low (less than 15 percent) and decreases with age; whereas for high educated male workers, the fraction of working spouses is much higher (35 percent).
4. For low educated, 55+ female workers, the fraction of working spouses is low (less than 35 percent for age group 55{59 and 25 percent for the age group 60{64). For high educated female workers, the fraction of working spouses is also much higher (45 percent and 30 percent respectively for the age groups 55{59 and 60{64).

[2] 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 a®ect either contribution rates (like marital status) or pensions (marital status does, see above).

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 2 we show the distribution of the sample by sex and year of birth. Note the upward jump between 1918{1919 and the reduction in 1938 and 1939 followed by a spike in 1940, the latest being a direct consequence of the Spanish Civil war.

While we place practically no restrictions on the participation sample (derived from the H ¯le), which covers all the Spanish SS regimes (see Table 7 for a description of the sample distribution by Regime), the wage sample (obtained from the CE ¯le) 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.

3.4 Key elements in data handling

De¯nition of retirement

In any given year t, being retired can be characterized by a number of di®erent events or characteristics of the individual. Correspondingly, we have the following ¯ve di®erent de¯nitions of retirement, of which the ¯rst is the broadest, while the others cannot be directly compared.

A. Not having an open spell after year t.

Figure 2: Distribution of the participation sample by birthdate and sex.

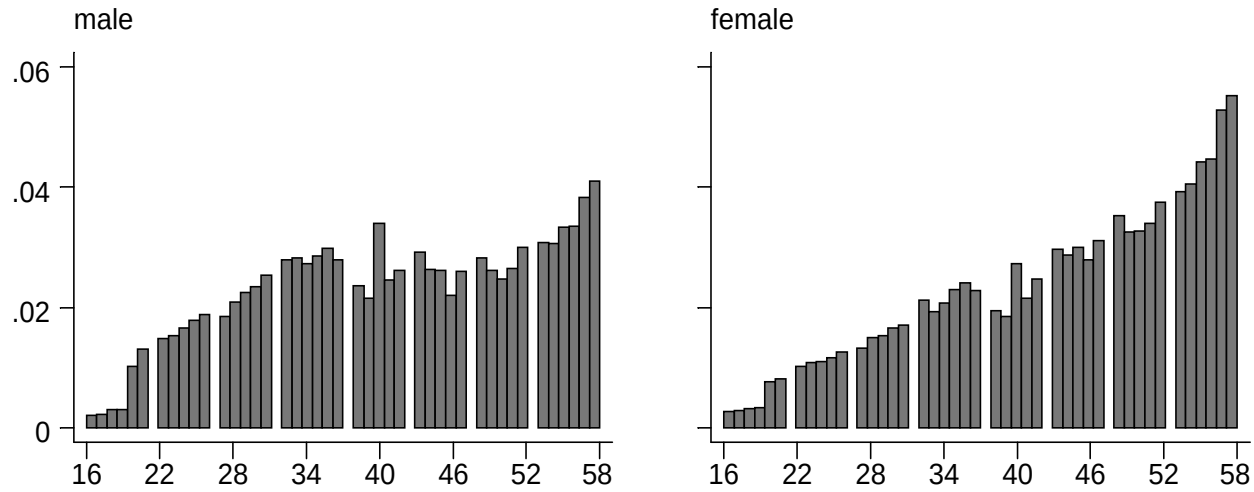


Table 7: Distribution of the participation sample by regime.

year	RGSS	RETA	REA	RTMAR	RTMC	REEH	obs.
85	59.66	15.98	18.48	2.97	0.07	2.87	213238
89	61.36	16.97	16.24	3.08	0.07	2.28	196254
93	63.43	17.01	14.32	3.40	0.07	1.77	168560
97	62.00	17.58	14.93	3.90	0.08	1.51	132587

B. In addition to A., not contributing in years t + k, k > 0.

C. In addition to A., a record in the entry \cause of termination of the spell": retirement.

D. In addition to A., a record in the entry \cause of termination of the spell": retirement or termination by temporary illness.

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

1. Eligibility: The early retirement age in Spain is 60 (see Section 2 for a description of restrictions and related penalties). Some exceptions are still possible at age 58 for workers of distressed ¯rms. 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 52 who are eligible for a special kind of unemployment bene¯ts. This special kind of unemployment bene¯t are not reported in the current version of our data set. Still, we need to consider that for individuals older than 52, this is a possible path to retirement. In particular, we must decide whether unemployed people older than 52 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 s/he is contributing to the Social Security administration, i.e. ful¯lls the de¯nition of retirement B. or is in the \wage sample".

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 also 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 s/he ful¯lls the de¯nition of retirement B.

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 (4-digit SIC classi¯cation) and province of residence. Other available information is: part-time work, length of tenure in the current job and length of tenure in the labor market.

Table 8 captures the labor force participation, by sex, for two particular cohorts (people born in 1930 and 1935) at di®erent points within our sample period. Notice that, for both cohorts, most individuals are out of the labor force before reaching normal retirement age. If we count disability pensions as retirement pensions, then the majority of men is also receiving a pensione before the regular retirement age.

Individuals classi¯ed as retired in table 8 correspond to the broadest de¯nition of retirement (de¯nition A. above). Adopting de¯nition B. we obtain practically the same fraction of retired people. More precisely, 99.15 percent of males retired under de¯nition A. are also retired under de¯nition B. Likewise, 96.01 of females retired under A. are retired under B. The de¯nitions using the cause for the termination of the last employment spell (either C. or D.) are much stricter and probably too much so. Only a fraction of those considered retired under de¯nition A. are still so under either C. or D. (48.82 and 30.82 of the male and female sample, respectively). This lack of coincidence is sharply reduced when considering individuals aged 60{64, but is still very important (well above 40 per cent in both cases). Most likely, this large discrepancy is due to omission of the cause for termination of spell and does not re°ect a di®erent status.

In the top panels of Figure 3 we report the patterns of participation and employment by age in 1997, separately for mmen and women. Notice the two sharp drops in male participation at ages 60 and 65, the early and \normal" retirement age respectively. For women, the drop at age 60 is less evident. The reported behavior of the HLSS sample is consistent with the overall available evidence about labor force participation in Spain (for details see Boldrin, Jimenez and Peracchi [2000]).

Table 8: Sample distribution by LF status for selected cohorts.

	in labor force			out labor force				
	employed	not employed	died	not receiving	disabled	receiving Retired	Survivor	died
	Male born in 1930; 3779 obs.							
85	74.17	9.84	0.69	8.02	1.46	5.69	0.13	0.00
88	72.98	4.74	1.46	8.79	2.20	9.63	0.21	0.00
91	47.45	2.36	2.57	10.66	3.36	33.37	0.24	0.00
94	30.99	0.85	3.18	13.60	3.63	46.20	0.29	1.27
97	2.43	0.19	3.33	12.28	0.19	75.58	0.08	5.93
	Male born 1935; 4588 obs.							
85	77.94	12.99	0.61	4.36	4.08	0.00	0.02	0.00
88	79.77	7.26	1.22	4.90	6.76	0.02	0.07	0.00
91	73.63	5.56	2.11	6.76	11.57	0.24	0.13	0.00
94	64.82	3.60	3.03	9.81	17.35	0.54	0.35	0.50
97	36.70	1.24	3.62	10.90	19.31	25.48	0.28	2.46
	Female born in 1930; 1378 obs.							
85	68.07	9.29	0.07	13.06	0.51	3.05	5.95	0.00
88	63.06	5.73	0.58	15.24	1.02	5.01	9.36	0.00
91	51.89	2.54	1.09	19.96	2.18	10.81	11.54	0.00
94	37.52	1.38	1.38	26.34	3.05	16.76	13.21	0.36
97	8.13	0.29	1.60	31.28	0.15	45.36	10.16	3.05
	Female born in 1935; 1924 obs.							
85	77.03	10.65	0.16	7.43	1.51	0.00	3.22	0.00
88	76.09	7.90	0.47	8.89	2.34	0.00	4.31	0.00
91	69.80	5.82	0.94	12.32	5.61	0.00	5.51	0.00
94	58.73	3.79	1.14	18.76	9.82	0.00	7.59	0.16
97	44.18	0.94	1.56	25.16	11.75	5.30	9.88	1.25

Figure 3: Participation, employment and Education level. All Regimes.

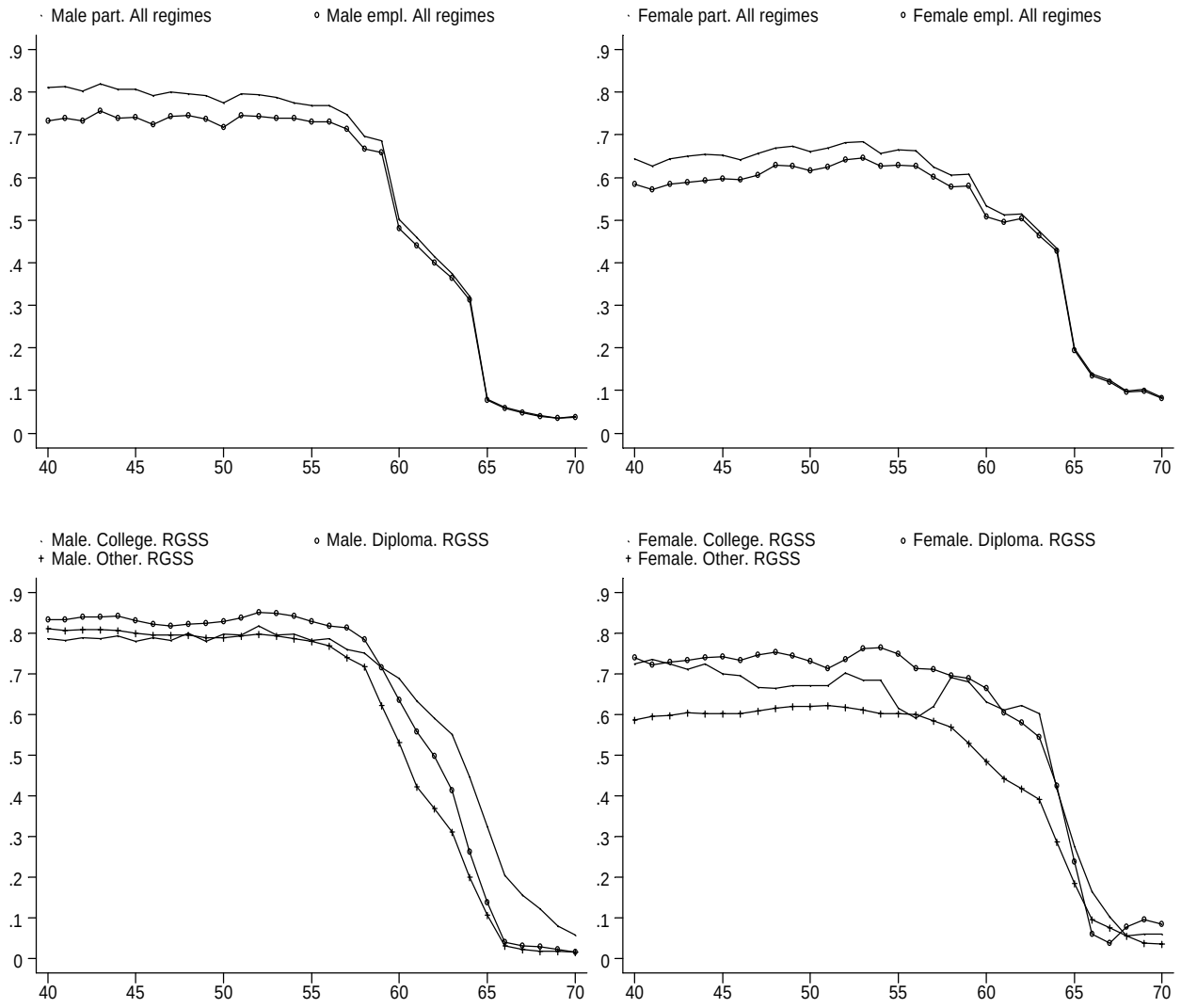


Table 9: Distribution by education in HLSS and EPA in 1997.

	HLSS SAMPLE			EPA IV-97		
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

Employed individuals, born 1916-58, enrolled in the RGSS

Education and participation, RGSS

No direct measure of educational attainment is available. For individuals enrolled in the General Regime (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 are assigned to the high school (Diploma) level. People in all other contributive groups are assigned to a generic class labeled as \less than high school".

Table 9 compares the resulting distribution of educational levels in our HLSS sample in 1997 with the corresponding distribution obtained from the Spanish Labor Force Survey (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 overestimate 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 educational level from the professional rank in which individuals are classi¯ed for contributive purposes. The Spanish labor market is notoriously characterized by a substantial amount of sexual discrimination. This forces a large fraction of working women into occupational pro¯les lower than those of men with similar educational attainment and quali¯cation. Various empirical studies have documented this fact, which is clearly re°ected also in the SS administrative records we use.

The bottom panels of Figure 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 50 should be interpreted as noise, generated by the very limited number of observations available for female in those age groups.

The table con¯rms the well documented ¯nding 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 de¯ned: hazard rates before the normal retirement age of 65 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 10 we show, for selected years, the sample distribution by contributive group 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 semi-skilled and unskilled decreases. This ¯ndings re°ect accepted modi¯cations in the skill distribution of the Spanish labor force over the sample period.

Table 11 shows the sample distribution of workers in the RGSS by broad industry categorization (1 digit SIC classi¯cation). For both men and women, the most important sector of employment is Administration

Table 10: Distribution of the RGSS + RTMC sample by group of contribution.

group of contribution	year			
	85	89	93	97
White collars:				
1. Engineers and Coll.	6.08	7.10	7.75	7.75
2. Technical engineers	4.34	4.68	5.11	5.87
3. Supervisor and foremen	3.97	4.53	5.13	5.36
4. Auxiliar without grad.	3.39	3.70	3.91	4.09
5. Clerks	9.35	9.68	10.13	10.70
6. Janitors	5.73	5.87	6.21	6.70
7. Clerks assistants	7.04	6.58	6.67	7.08
Blue collars:				
8. Skilled (1st & 2nd class)	21.57	24.05	24.89	25.42
9. Semi-skilled (3rd and specialized)	14.43	12.97	11.43	10.26
10. Unskilled	20.83	20.13	18.50	16.58
11. Workers 17 years old	0.29	0.16	0.09	0.04
12. Workers 16 years old	0.16	0.07	0.01	0.00
13. Other	2.81	0.38	0.17	0.16
Total	127356	120568	107032	82313

and Other Services, followed by Retail Services. Note also the important fraction of men in a condition of temporary illness. We do no 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 classi¯ed.

Table 12 shows the relevance of part-time work in the RGSS sample (part-time work is not recorded in RESS except for the RTMAR). As detailed in Jim¶enez-Mart¶n (1998), part-time work is still of a limited (but increasing) importance for Spanish males. On the contrary, part-time work has become quite relevant for women, although the Spanish levels are still modest compared to the northern European countries.

In Table 13 we present the average length of the last spell of work (a good proxy for the length of tenure with the current ¯rm) 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 ¯rm are much longer for self-employed than for employees. Both ¯rm and market tenures are much longer for men than for women.

4 Earnings distribution, earnings histories and projections

4.1 Earnings distribution

As commented in section 3.1, we do not observe earnings directly but only covered earnings. Covered earnings are a doubly censored version of earnings for workers in the RGSS or RTMC, while they are potentially, and de facto, unrelated to true earnings in any of the RESS because of the presence of both legislated tari®s and widespread tax fraud.

In Figure 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 clear patterns arise. First, the increase over time in the fraction of top-censored observations for both the ¯rst (workers with college degrees) and the eighth (skilled workers) contributive group. For both sexes, the increase is quite pronounced for the ¯rst group, which corresponds to the highest wages. In the other group, which corresponds to median and below

Table 11: Sample distribution by sector, 1985 and 1997; RGSS and RTMC.

	1985			1997		
act	male	female	Total	male	female	Total
Agriculture, ¯shing	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, engeneering	10.52	2.29	8.21	6.94	1.54	5.36
Other manufacturing ind.	11.19	8.58	10.46	7.67	5.32	6.98
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
Comm. and Finnancial	8.16	6.72	8.97	8.26	7.14	7.94
Other services	6.09	16.67	8.97	9.04	24.69	13.62
Administration	11.67	28.90	16.51	20.09	30.56	23.15
Code 9130	8.66	8.97	8.75	8.10	8.01	8.08
In 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	69682	27219	96901	53134	22006	75140

Table 12: Fraction of people enrolled in the RGSS or the RTMC working part-time.

	All the sample		age 50		age 55		age 60		age 65	
year	male	female	male	female	male	female	male	female	male	female
85	0.3	2.2	0.1	3.0	0.1	1.6	0.1	0.9	1.7	0.0
88	0.6	4.8	0.6	5.8	0.4	5.3	0.5	3.4	0.0	8.1
91	0.8	6.1	0.6	6.1	0.6	5.2	0.6	5.2	0.0	8.5
94	1.6	12.0	1.3	14.2	1.2	11.0	1.2	11.0	2.3	13.2
97	2.2	15.1	2.1	18.1	1.2	16.8	1.2	10.6	1.4	13.8

Table 13: Length of ¯rm and market tenure, in years.

	All SS Regimes				RGSS and RTMC			
	spell		experience		spell		experience	
year	male	female	male	female	male	female	male	female
85	8.3	5.0	16.3	8.1	6.5	4.7	16.7	10.1
88	7.7	4.8	16.0	8.1	5.9	4.4	16.2	9.9
91	7.4	4.6	15.9	7.9	5.7	4.2	16.2	9.7
94	7.2	4.5	15.8	7.9	5.9	4.4	16.2	9.9
97	6.8	4.4	15.3	7.9	5.8	4.5	15.9	10.1

The history spell are uncorrected for left censored histories

median wages, it is relevant only for men and not for women. This asymmetry in the data, suggests that the sexual bias characterizing the Spanish labor market is actually weaker or weakening in the top segments of the wage distribution, but 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 consumer price in°ation 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 and that very low wages are not keeping up with consumer price in°ation. Notice that the Spanish government has also followed a policy of progressively reducing the relative size of the °oor-to-ceiling bands, by increasing the °oor faster than the ceiling, which helps explaining the increasing number of bottom-censored individuals.

Overall the evidence reported suggests we should invest a considerable e®ort in recovering true earnings from covered earnings for people enrolled in the RGSS or RTMC. Also, if one thinks of the purpose for which we need to uncover true earnings, eliminating the e®ect of top-censoring is the important goal. In our analysis, true earnings are used to project/forecast future wages for workers (55 years or older) which 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 look forward to an ever decreasing salary if they keep working. Both, the skill-acquisition process and the existence of seniority pay, still quite relevant in Spain, suggest that old workers are usually in the upper tail of the distribution of salaries.

This intuition is con¯rmed, but only partially, by the data. In Table 14 we report the percentage of workers, men or women, that are 40 or older and that are either at the bottom or at the top of the distribution of covered earnings for each one of the 10 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 ¯nd it rather unlikely that near-retirees be found in any signi¯cant proportion at the bottom of the distribution of wages 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 a®ected by the ceilings. 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 ¯rst two steps of the above procedure are detailed in the Appendix A, the latter is described in subsection 4.2.

As we pointed out, for individuals enrolled in the special schemes (RESS), such as RETA, REA or REEH, covered earnings are very weakly related to true earnings. In particular, the self-employed are free to choose their bene¯t base between an annual °oor and a ceiling. Practically, all of them choose the °oor, as con¯rmed by Table 14, 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 well known behavior is due to widespread tax fraud. In must be taken into account when modeling retirement incentives for the a±liates to RETA and, to a lesser extent, to REA. This implies that there is no way in which true earnings for self employed can be recovered from the HLSS data set. We have therefore assumed that the earnings and the contributive pro¯le coincide.[2]

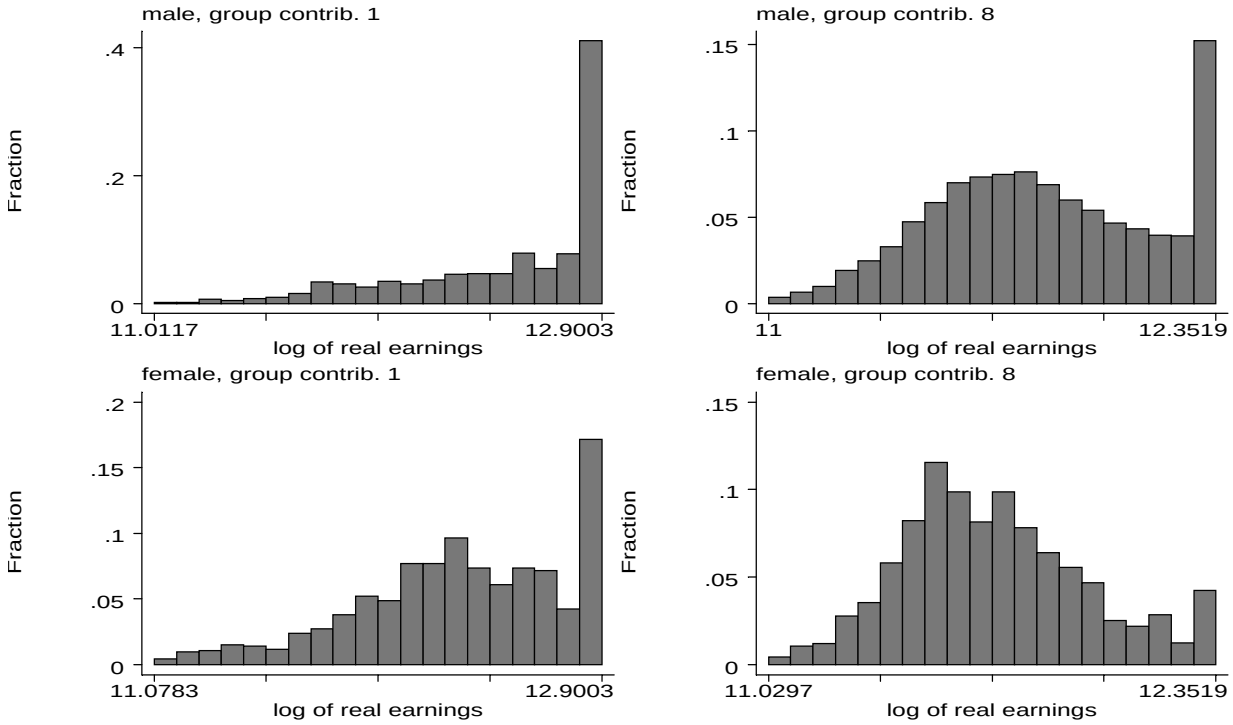
It is important to recall, from Section 2, that current Spanish legislation allows self-employed individuals to begin drawing retirement pensions without retiring, at least as long as they keep managing their own business. Hence, in the dynamic choice of the self-employed, the opportunity cost of retiring is not measured by the loss of future earnings but, instead, by the fact that contributions cannot longer be accumulated

[2] An alternative solution to this problem is to impute to self-employed an \average" earnings pro¯le obtained from alternative sources (the recent European Community Household Panel or ECHP constitutes an excellent example; see Peracchi (2000) for a description).

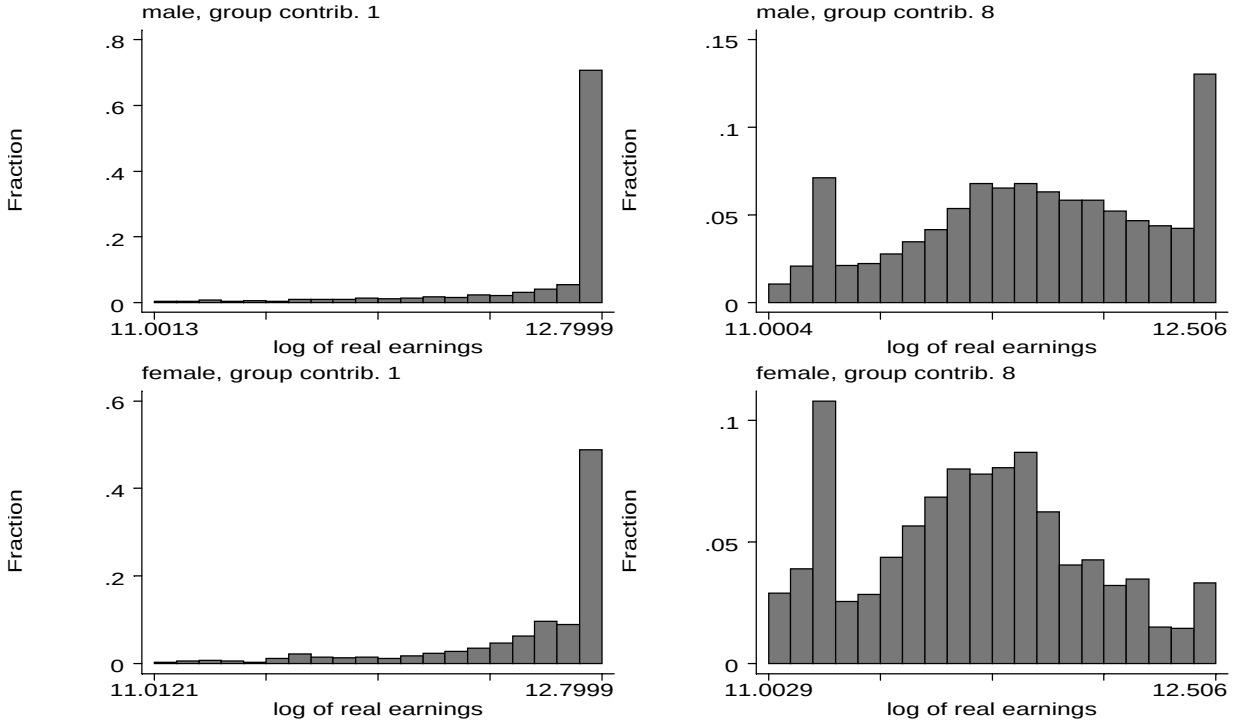
Table 14: Relevance of °oors and ceilings in covered earnings. RGSS, RTMC and RETA

		1986									
		RGSS and RTMC									
		male					female				
group	censored	40{54	55{59	60{64	65+	total	40{54	55{59	60{64	65+	total
1	below	5.5	5.0	5.4	19.4	5.6	9.0	11.1	0.0	0.0	8.5
	above	37.9	33.2	30.4	25.8	36.6	14.6	5.6	13.3	0.0	13.8
2	below	1.4	4.1	3.3	9.5	1.9	3.1	6.5	5.3	0.0	3.6
	above	37.8	22.1	21.3	9.5	34.8	4.8	4.8	0.0	11.1	4.6
3	below	1.2	1.6	1.9	4.8	1.3	5.1	5.3	0.0	0.0	4.7
	above	34.8	32.3	25.0	14.3	33.5	18.2	10.5	10.0	25.0	17.1
4	below	0.6	0.9	0.9	0.0	0.7	1.8	7.1	0.0	|	2.3
	above	34.1	20.3	19.7	13.3	31.3	14.5	0.0	12.5	|	12.9
5	below	1.2	2.2	0.4	0.0	1.3	3.2	2.7	4.0	0.0	3.2
	above	37.0	36.1	30.0	22.9	36.3	22.2	20.5	12.0	33.3	21.7
6	below	2.8	2.8	3.1	10.2	3.0	6.9	9.8	11.6	0.0	7.7
	above	17.6	12.8	8.2	6.8	14.8	3.1	2.5	5.8	11.1	3.3
7	below	8.6	10.5	10.3	5.6	8.9	9.1	12.3	3.1	100.	9.2
	above	25.2	18.8	10.3	5.6	22.6	12.1	7.0	3.1	0.0	10.9
8	below	3.2	3.3	2.2	2.9	3.1	5.2	9.3	3.8	0.0	5.7
	above	13.2	15.1	10.8	0.0	13.3	4.4	2.8	1.9	0.0	3.9
9	below	2.3	2.8	3.1	17.1	2.5	15.8	13.2	13.5	11.1	15.3
	above	14.8	11.2	8.9	0.0	13.8	3.8	3.6	1.9	0.0	3.6
10	below	12.7	16.5	10.1	21.7	13.3	24.3	19.9	22.9	39.3	23.5
	above	9.6	4.9	6.0	8.3	8.2	3.1	2.2	0.9	0.0	2.7
		RETA									
	below	93.2	90.8	83.8	83.6	91.6	97.6	96.3	93.3	93.6	96.5
	above	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1995									
		RGSS and RTMC									
		male					female				
group	censored	40{54	55{59	60{64	65+	total	40{54	55{59	60{64	65+	total
1	below	3.8	3.7	4.0	7.8	3.9	9.6	7.2	8.0	0.0	9.2
	above	54.6	54.2	48.1	39.2	53.5	31.7	39.1	44.0	15.4	32.6
2	below	2.8	4.9	4.1	3.0	3.2	3.8	5.5	5.3	17.6	4.2
	above	36.9	39.1	25.1	18.2	36.0	5.2	5.5	7.4	0.0	5.3
3	below	3.0	6.0	5.5	6.8	3.9	4.3	8.9	7.7	12.5	5.2
	above	33.6	29.1	20.9	25.0	31.4	14.4	8.9	0.0	12.5	12.8
4	below	2.6	8.4	7.7	15.2	4.4	16.1	9.1	18.2	16.7	15.4
	above	20.5	15.4	11.6	12.1	18.5	5.9	5.5	9.1	0.0	6.0
5	below	4.4	9.6	6.2	8.7	5.5	12.5	15.0	16.3	16.0	13.0
	above	35.1	29.9	23.5	11.6	32.7	19.8	13.1	14.1	4.0	18.5
6	below	5.0	9.0	6.2	5.8	6.1	11.4	14.6	11.8	13.5	11.9
	above	18.6	11.7	4.8	4.3	14.4	5.3	5.1	0.8	0.0	4.7
7	below	10.8	12.0	16.1	34.6	12.3	21.8	30.1	20.2	28.6	22.6
	above	19.1	19.5	13.5	1.9	18.0	5.0	2.8	3.2	0.0	4.7
8	below	9.8	18.5	14.3	18.3	12.1	27.2	27.2	23.4	53.3	27.3
	above	9.4	9.1	5.5	2.4	8.9	2.0	2.5	0.0	0.0	1.8
9	below	10.1	16.3	18.4	23.6	12.7	36.9	39.6	38.0	29.6	37.2
	above	8.3	8.1	3.5	0.0	7.6	1.9	1.3	0.5	0.0	1.7
10	below	25.8	41.5	39.5	58.2	32.3	49.3	45.2	41.0	42.5	47.6
	above	2.9	3.2	2.1	0.7	2.8	0.8	0.5	1.0	2.1	0.8
		RETA									
	below	91.9	85.6	80.8	83.9	89.1	96.5	95.6	94.9	93.9	96.0
	above	0.1	0.3	0.4	0.7	0.2	0.0	0.1	0.1	0.0	0.0

Figure 4: Distribution of covered earnings, RGSS by sex and group of contribution, 1986



Distribution of covered earnings, RGSS by sex and group of contribution, 1995



to increase future pensions, and marginal income taxes must be paid on pensions. This implies that, for the self-employed, maximization of the (net of taxes) social security payo® is a very reasonable objective function.

4.2 Covered Earnings and projections for individuals in RGSS + RTMC

Given an individual pro¯le of covered earnings c_t between $T - k; ::; T$, we obtain the individual pro¯le of "true" real earnings (w_t, $t = T - k; :::; T$). Given this information, we project earnings backward and forward using

- Forwards: [Zero real growth] $\hat{w}_{T+m} = w_T$ for $m = 1; ¢¢¢; M$.
- Backwards: $\hat{w}_{T-k-l} = w_{T-k} + g(a_{T-k-l})$ for $l = 1; ¢¢¢; L$. The function $g(a_t)$ = corrects for the growth of earnings imputable to age a and is de¯ned as:

$$g(a_{T-k-l}) = \bar{}_1 ¤ a_{T-k-l} + \bar{}_2 ¤ a^2_{T-k-l} - \bar{}_1 ¤ a_{T-k} - \bar{}_2 ¤ a^2_{T-k}:$$

The $\bar{}$'s are the estimated coe±cients from a ¯xed e®ects earnings equation, the details of which are available upon request. The correction is speci¯c for each combination of sex and contributive group.

4.3 Covered earnings and projections for individuals in RESS

As discussed earlier, covered earnings for those individuals contributing to RESS are unrelated to actual earnings. In particular, individuals below 50 years of age and enrolled in the self-employed regime (RETA) are free to choose any level of contribution (base de cotización) between a minimum and a maximum, legislated annually. After the age of 50, they can only choose either the minimum or the maximum contribution legislated annually for 50+ workers, which is tighter that the general one. In fact, the vast majority of the self-employed only contributes the mandated minimum (the percentages are 0.92 and 0.95 at 50; 0.85 and 0.96 at 55; 0.83 and 0.93 at 60 for men and women respectively).

To project (real) earnings (w_t), given the observed pro¯le of (real) contributions (c_t) we use

- $w_{t-k-l} = c_{t-k}$, for $l = 1; ¢¢¢; L$ (backward),
- $w_{t+m} = c_t(1 + g)^m$, for $m = 1; : : : ; M$ and $g = 0{:}005$ (forward).

In other words, we assume that contributions were constant up to the ¯rst time they are observed, while they grow at a constant annual rate of 0,5 percent after that.

5 Evaluation of Social Security incentives

5.1 Assumptions made in the computations

For every male in the "wage sample" who is enrolled in either the RGSS or the RETA we assume that: (i) he is married to a nonworking spouse, (ii) his wife is three years younger, and (iii) 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: (i) she is married to either a retiree or a worker entitled to retirement bene¯ts, (ii) her husband is four years older, and (iii) 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: (iv) starting at age 55 and until a person reaches age 65, there are three pathways into retirement: the UB52+ program, DI bene¯ts and early retirement. At each age, an individual has an age-speci¯c probability of going into 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 60.
2. After age 60, a person cannot claim UB52+ and can only claim early retirement or DI bene¯ts.
3. A self-employed person enrolled in RETA can never claim UB52+ bene¯ts.

5.2 Calculating SS incentives

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

$$SSW_h = \sum_{s=h+1}^{S} \rho_s B_s(h)$$

Here S is the age of certain death, $\rho_s = \beta^{s-a}\pi_s$, with β denoting the pure time discount factor and π_s 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 de¯ne three incentive variables for a worker of age a:

1. Social security accrual (SSA) is the di®erence in SSW from postponing retirement from age a to age a + 1

$$SSA_a = SSW_{a+1} - SSW_a = \sum_{s=a+2}^{S} \rho_s [B_s(a+1) - B_s(a)] - \rho_{a+1} B_{a+1}(a).$$

   The SSA is positive if the expected present value $\sum_{s=a+2}^{S} \rho_s [B_s(a+1) - B_s(a)]$ of the increment in the °ow of pension bene¯ts is greater than the expected present value $\rho_{a+1} B_{a+1}(a)$ of the pension bene¯t 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 $\tau_a = -SSA_a / W_{a+1}$, 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/subsidy on postponing retirement from age a to age a + 1.

2. Peak value $PV_a = \max_h \{SSW_h - SSW_a\}$, $h = a+1, \ldots, R$, where R is a mandatory retirement age (which does not exist in Spain, but given the retirement evidence we ¯nd it reasonable to assume R = 70). Thus, the peak value is the maximum di®erence in SSW between retiring at any future age and retiring at age a.

3. Option value $OV_a = \max_h \{V_h - V_a\}$, $h = a+1, \ldots, R$, 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 di®erence between retiring at any future age and retiring at age a. We parameterize the model by assuming $\beta = .97$, $\gamma = 1$ and $k = 1.25$. Under our assumptions, $V_a = 1.25\ SSW_a$ and

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

Table 15: Unconditional disability take-ups by regime, sex and age. 1985{1994.

	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	2f.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

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

$$V_h \text{ ¡ } V_a = W_a \sum_{s=a+1}^{h} \text{½}_s + 1{:}25(SSW_h \text{ ¡ } SSW_a);$$

that is, the peak value and the option value are proportional to each other except for the e®ect due to the term $\sum_{s=a+1}^{h} \text{½}_s$.

The restrictions embodied in assumption (iv) above require us to combine the incentive measures I_j from the various programs (j = UB, DI, R, where UB denotes unemployment bene¯ts, DI disability bene¯ts and R the retirement programs) as follows

$$I = \begin{cases} I_{DI} p_a^{DI} + I_{UB}(1 \text{ ¡ } p_a^{DI}); & \text{if } 55 \cdot a < 60, \\ I_{DI} p_a^{DI} + I_R(1 \text{ ¡ } p_a^{DI}); & \text{if } 60 \cdot a < 65, \\ I_R; & \text{if } 65 \text{ ¸ } a, \end{cases}$$

where p_a^{DI} denotes the probability of observing a transition from employment into disability at age a. Since the self-employed have no access to UB52+ bene¯ts, the combined incentives from age 55 to age 59 for members of this group change to

$$I = I_{DI} p_a^{DI} + I_R(1 \text{ ¡ } p_a^{DI}); \qquad 55 \cdot a \cdot 59:$$

We follow a regression based approach to compute the unconditional probability of qualifying for a disability pension (see Table 15 for summary statistics by regime, sex and age). The model is estimated, separately 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.

5.3 Results under the 1985 system

Tables 16 and 17 present the estimates of SS incentives by age (omitting ages 66{68) for the combined set of options UB/DI/R described earlier on. Incentives are computed separately by sex, for the RGSS and the RETA. Earnings projections are based on the methodology and the assumptions described in section 4.2.

Table 16 presents median values for SSW, SSA and the implicit tax/subsidy to work, as well as the 1st and 9th decile and the standard deviation of the accrual. For comparison purposes, the column labeled \simulated" reports the age pro¯les of the implicit tax constructed for synthetic individuals using the criteria described in Boldrin et al. [1999]. More precisely, we consider the following cases:

1. Male in RGGS: base case as in Boldrin et al. [1999, p. 338];
2. Male in RETA: same as above, but with 32 years of contributions at age 60 and contributing to the minimum;
3. Female in RGSS: 20 years of contributions at age 60, without dependent spouse, receiving 60 percent of the sample average wage;
4. Female in RETA: same as above, but with 22 years of contribution at age 60, without a dependant spouse, always contributing to the minimum.

For men in the RGSS, the SSW starts o® at 95,311 US$ (1995 exchange rate) and peaks between 63 and 64 years of age at 134,735 US$. The 10th percentile of the accrual is negative at all ages. The median accrual is negative until age 56, becomes positive between 57 and 64, and negative at older ages. Notice that, except after age 65, there is little agreement between our median or \average" tax rate and the simulated base case in Boldrin et al. [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 et al. [1999] we assumed that when the individuals stop working between 55 and 59, his/her pension were computed considering earnings until that age, even if he/she started to receive the pension only at age 60. In this work, for an individual aged a, $a = 55; ¢; 59$ we assume instead that:

- He/she receives unemployment bene¯ts until age 60 and retirement bene¯ts after that.
- The pension is computed at age 60. From age a to age 60 the individual contributes the mandatory minimum level of contributions to his/her pension.

For the median worker, this modi¯cation introduces incentives to keep working until the early retirement age. However for the 75th or higher percentiles we still ¯nd strong incentives to stop working.

For men in RETA, the SSW reaches a peak ($ 91132) at 60 but is very °at between 59 and 65. The median accrual is negative at all ages except age 64, whereas the opposite occurs with the median implicit tax. The age-incentive pro¯les 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 60{64. 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 17 presents the age pro¯le of the median, 10th and 90th quantiles 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 accrual and the accrual (presented in the previous table) show very similar pro¯les. However, from age 55 to age 64 the median peak accrual is much higher, thus reinforcing retention incentives in that age range. From age 65 they are identical in practically all the cases.

The option value of retiring start at a very high level for individuals enrolled in the RGSS and decreases continuously with age. Note that the 10th percentile is close to zero at practically all ages, revealing strong retirement incentives for those people. For the individuals in the RETA or self-employed regime the fact that we have used the contributive pro¯le 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 RETA contributes for the minimum explains why the 10th and 90th percentiles of the OV are very similar.[3]

[3] We must also take into account our lack of information about true earnings for people enrolled in RETA. To compute the Option Value we have used information on contributions instead.

Table 16: SSW, accrual and tax incentive measures. 1985 system. 1995 sample. In 1995 US dollars.

		median	p10	median	p90	sd	median of tax	
age	obs	ssw	ssa	ssa	ssa	ssa	sample	simulated
RGSS male sample								
55	2609	95311	-3538	-3265	15466	7231	26.8	21.6
56	1563	95005	-3553	-2120	15674	7626	19.3	10.8
57	1772	95980	-3525	1420	13418	7294	-10.9	15.3
58	1981	100033	-3526	2363	13282	7334	-23.6	36.2
59	1975	104421	-3513	3507	13552	7369	-36.0	28.6
60	1734	112619	-4527	5910	13619	9102	-47.4	-14.9
61	1166	126567	-4449	6559	12995	8385	-50.4	-12.0
62	1063	130285	-4462	5289	11806	8098	-42.2	-11.0
63	969	134383	-4464	3876	10090	7111	-33.9	4.6
64	717	134735	-5023	2797	9321	7046	-25.8	16.0
65	512	131576	-14917	-5437	-879	7622	61.9	77.5
69	12	117295	-10582	-5174	-1721	4312	60.4	70.0
RETA male sample								
55	563	77772	-24	-14	-3	1670	0.3	41.6
56	414	80379	-29	-22	-13	1320	0.4	40.1
57	416	82930	-40	-26	-12	2446	0.5	39.0
58	430	85611	-36	-33	4	2269	0.6	37.7
59	467	88307	-43	-38	67	2165	0.7	35.3
60	422	91132	-4388	-4345	-4178	4598	83.9	106.5
61	374	89514	-4381	-4308	7726	6859	83.1	94.5
62	346	87907	-4360	-3925	8339	5616	75.7	48.7
63	299	86471	-4371	-1279	3529	5769	24.7	15.3
64	283	84836	-4907	2610	5006	3995	-50.4	26.8
65	219	87132	-4967	-2277	-971	2229	43.9	100.7
69	15	76862	-4976	-2791	-2791	1053	53.9	95.2
RGSS female sample								
55	569	75376	-3469	-3440	8564	4953	37.9	43.2
56	346	74441	-3469	-3430	8285	5083	37.2	41.9
57	375	73605	-3479	-3404	8268	5159	32.1	40.9
58	445	79449	-3466	-3262	9245	5661	31.5	39.5
59	409	82798	-3457	-2739	9692	5615	23.6	29.4
60	381	83095	-18703	-1305	13096	12674	14.7	-4.3
61	311	98829	-18666	5388	13557	14004	-52.8	-55.9
62	294	96258	-3803	5501	12800	10339	-54.6	-27.2
63	276	96240	-3797	5226	10295	9034	-54.1	-8.9
64	194	104197	-4300	3858	9749	12840	-41.5	-0.3
65	167	95158	-9839	-3340	1075	6041	48.5	78.7
69	14	65969	-9099	-4003	-2358	2212	65.7	69.9
RETA female sample								
55	240	59685	-32	-5	-2	1318	0.1	41.8
56	158	61714	-25	-8	-3	1494	0.2	40.5
57	168	63756	-46	-12	-5	1039	0.2	39.7
58	182	65883	-45	-17	-7	885	0.3	38.5
59	209	68081	-53	-23	-10	1158	0.4	36.4
60	207	70352	-3782	-3698	-3107	7198	71.4	97.1
61	165	68662	-18358	-3722	-858	11749	71.8	92.8
62	137	67369	-3745	-3425	3918	10440	66.1	81.4
63	177	65788	-3745	-2289	5866	7640	44.2	-23.5
64	122	64202	-4193	1932	5466	9036	-37.3	-14.6
65	110	66026	-4214	-56	164	4571	1.1	68.3
69	28	58198	-2255	-742	-552	2261	14.3	76.4

Table 17: Peak and Option value incentive measures. 1985 system. In 1995 US dollars.

age	obs	p10 peak	p50 peak	p90 peak	sd peak	p10 ov	p50 ov	p90 ov	sd ov
RGSS male sample									
55	2609	-3529	18384	86697	35220	3319	124264	311883	119742
56	1563	-3546	18228	75456	31228	2690	111068	284558	109823
57	1772	-3518	19871	60505	25333	2049	103772	245406	91044
58	1981	-3525	15379	50096	21085	1382	85871	215663	80676
59	1975	-3513	13827	41647	18759	702	73011	187562	70260
60	1734	-4508	13384	35447	16834	0	65032	162590	59415
61	1166	-4439	12949	28876	14286	4023	58829	143823	49550
62	1063	-4453	9800	23764	12001	3337	46348	116935	40827
63	969	-4458	6511	17902	9459	593	33269	82473	31124
64	717	-5023	2806	9798	7815	0	19916	67644	29071
65	512	-14710	-5388	-687	7745	0	3567	39548	21755
69	12	-10582	-5174	-1721	4312	0	2432	12755	7527
RETA male sample									
55	563	-4	1	48	12234	31203	38383	40927	28280
56	414	-20	-14	6	9960	23017	33906	34129	23042
57	416	-29	-25	217	12207	21707	29294	35741	27015
58	430	-35	-33	964	10878	14391	24528	34185	23836
59	467	-42	-38	8023	10760	10433	19715	45954	23273
60	422	-4388	-4345	2920	10031	5272	14216	31141	18699
61	374	-4378	-4307	19124	13007	5460	13947	52692	22595
62	346	-4360	-1112	18030	9728	4308	13413	49320	18960
63	299	-4365	1312	6235	7506	2058	11824	23436	14432
64	283	-4907	2610	5006	4371	2693	10449	20114	10981
65	219	-4967	-2277	-971	2365	90	4184	8863	6352
69	15	-4976	-2791	-2791	1053	34	1693	1693	889
RGSS female sample									
55	569	-3460	4363	64805	28777	1283	90648	233563	91939
56	346	-3465	-745	59539	26634	4007	80670	207748	83268
57	375	-3464	12030	49515	22512	0	93303	171444	71615
58	445	-3456	11121	49837	21830	0	74859	177974	74338
59	409	-3451	16531	41702	19911	781	78794	142584	60987
60	381	-18654	13871	39334	21953	0	62281	128809	55387
61	311	-18585	13840	36429	22330	1	56892	118919	51049
62	294	-3794	11547	28191	16147	0	46127	93063	39942
63	276	-3790	9757	19173	12009	294	34382	65189	28377
64	194	-4300	3858	10509	12910	0	18913	49401	28260
65	167	-9135	-3294	1586	7266	0	6217	37962	18361
69	14	-9099	-4003	-2358	2212	0	1372	6180	2845
RETA female sample									
55	240	-28	180	8934	10398	36029	44058	55356	22158
56	158	-25	-8	8756	11312	31578	39105	51242	23707
57	168	-46	-12	8431	7212	26115	34216	46872	15544
58	182	-45	-9	8117	7047	10167	32113	42401	16533
59	209	-45	-23	7810	6295	5273	26156	37817	14472
60	207	-3769	-2564	7104	12086	12670	22642	32810	17505
61	165	-18358	-2423	9862	14296	113	20000	31882	10470
62	137	-3745	2411	11686	13087	10576	22058	29615	12153
63	177	-3742	2805	10293	9122	8647	20497	26610	7544
64	122	-4193	2011	5466	9106	10341	17729	21394	6350
65	110	-4214	-56	164	4646	6422	13573	15823	5399
69	28	-2255	-742	-552	2261	2364	4255	4493	1197

6 Retirement models for the year 1995

This section investigates the effects of monetary incentives (accrual, peak value, and option value) on 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.

6.1 Sample evidence

Figure 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 Social Security 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 60 and 65 (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 65 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 60 against the quantiles of expected earnings at the same age (in 1995 ptas.). Who is leaving the labor force at age 60? The answer, especially for men, is clear from the figure: those with relatively low wages, in particular those with wages below the 25th percentile. As shown in Jiménez-Martín and Sánchez [1999], 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 already non-negligible at age 55. Finally, the right panel plots the exit rate at the normal retirement age of 65. It makes it evident that exit rates at this age are largely independent of expected wages.

6.2 Retirement models

We follow a regression based approach to model the effect of Social Security Wealth, incentive measure (either accrual, peak or option value) and the individual's demographic characteristics into the decision to retire in year 1995, conditional on being active at the end of 1994,

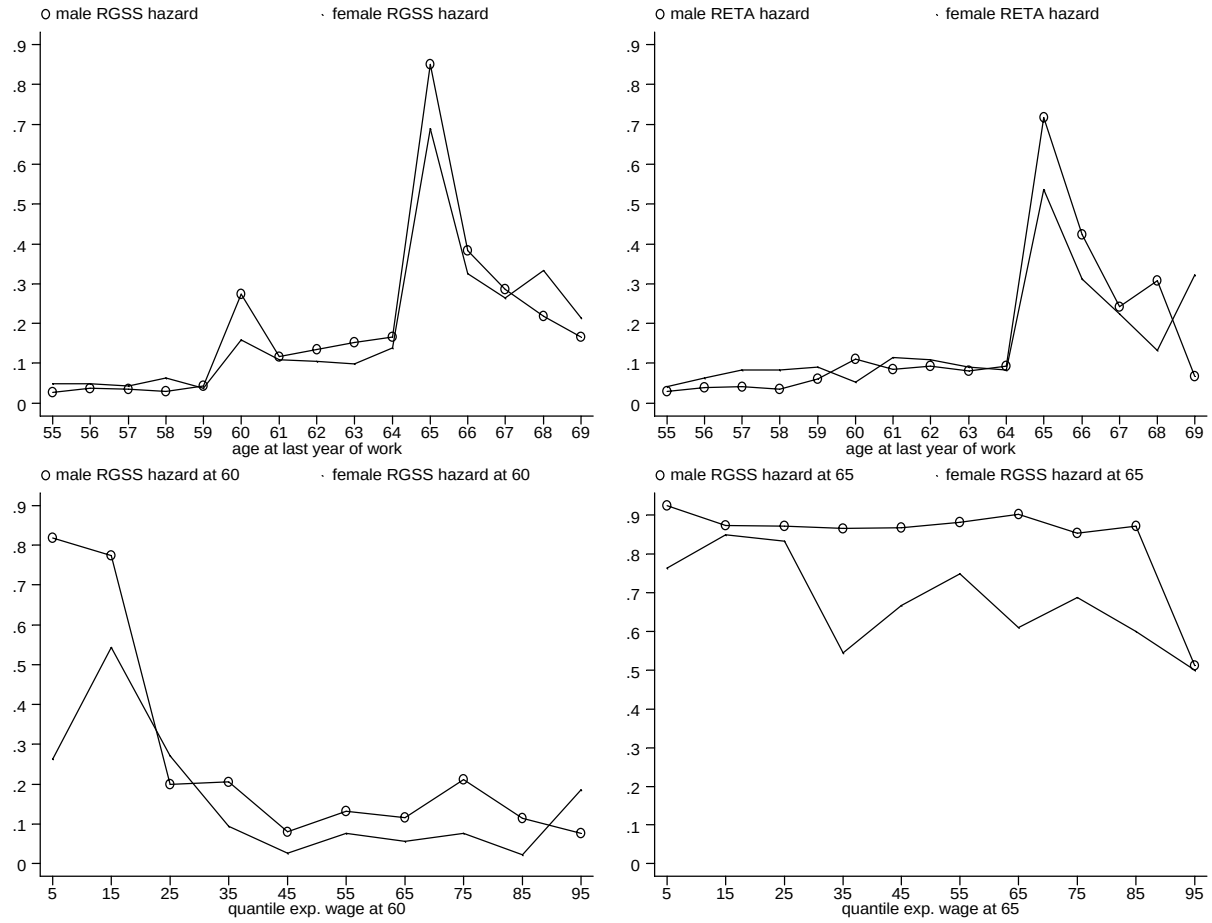
$$R_i^S = \pm_1 SSW^S + \pm_2 I_i + \pm_3' X_i^S + v_i^S$$

Here R is the individual propensity to retire, $S = \{RGSS, RETA\}$ denotes the system, I denotes the incentive measure (either SSA, PV or OV) and X is a vector of available individual earnings and sociodemographic characteristics.[4] For each incentive measure we present, separately by sex and Social Security regime, the results obtained for the following probit specifications:

- M1: Basic specification. Three sets of predictors:
  - M1A: It includes the incentive measure (either accrual, peak or OV), an eligibility dummy for attainment of a minimum of 15 years of contributions and three industry-specific variables: the fraction of collective settlements which have a clause favoring early retirement, the presence of rules permitting retirement at age 64 without any age penalty, and the existence of mandatory retirement at age 65 (see the Appendix D for a brief description of the data source).
  - M1B: It 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: It includes controls for earnings (expected wage, pension, 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.

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

Figure 5: Retirement patterns by sex, age and expected wage. Year 1995.



[2] M2: is the same as M1 with age dummies replacing the linear age trend.

In Table 18 we present the main results obtained by fitting our two models to the observed transitions between 1994 and 1995. We show, for 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 Appendix D. 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 demographic and earnings controls only (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 65 for workers in the RETA. This is partly due to the fact that the socioeconomic information for individuals enrolled in RETA is scarcer than for people enrolled in 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 or 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.

Table 18: Probit models of the 1995 retirement rates.

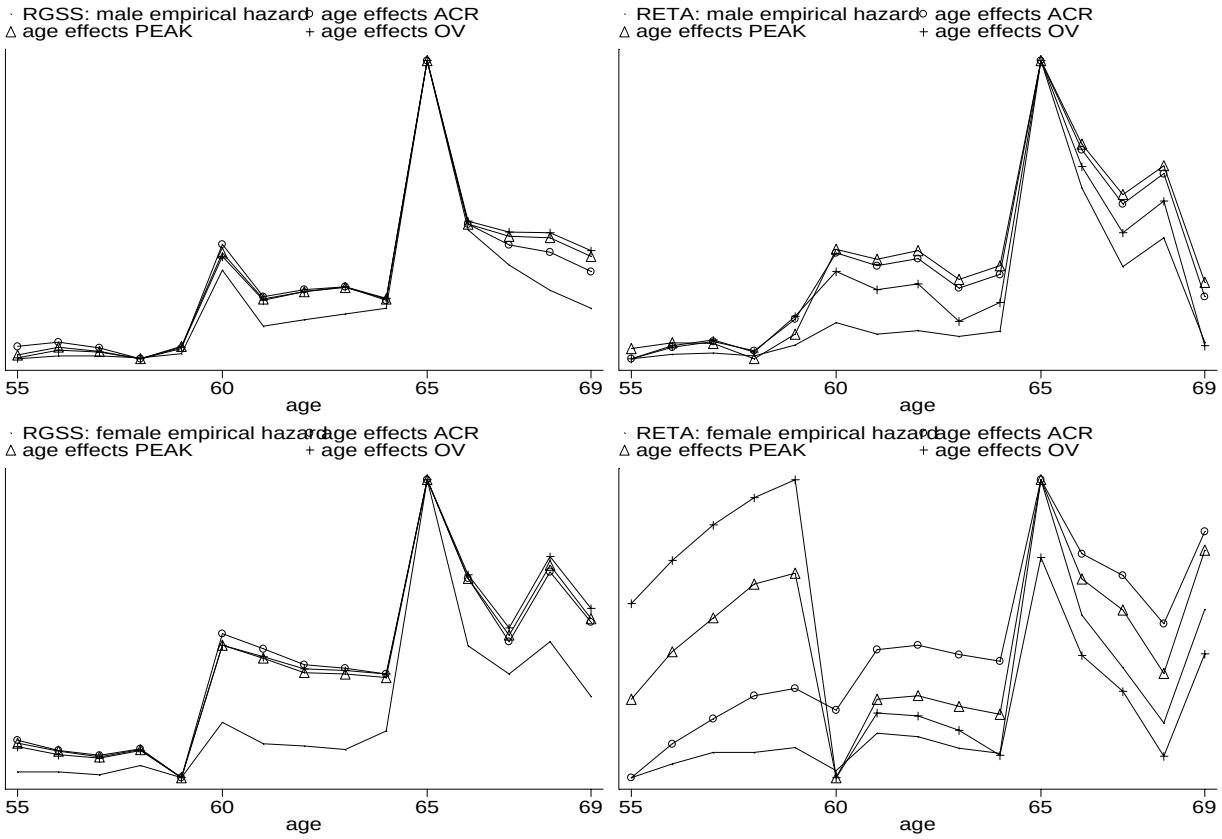
	ACCRUAL				PEAK				OV			
	M1		M2		M1		M2		M1		M2	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
	Male RGSS: 16191 obs.											
SSW	.00344	.00128	.00749	.00152	.00871	.00149	.01387	.00170	.01080	.00165	.01627	.00186
(m.e.)	.00033	.00012	.00071	.00014	.00087	.00015	.00136	.00017	.00109	.00017	.00161	.00018
Incent.	-.00906	.00430	-.00130	.00489	.00147	.00245	.00448	.00254	.00884	.00111	.01032	.00115
(m.e.)	-.00088	.00042	-.00012	.00046	.00015	.00024	.00044	.00025	.00089	.00011	.00102	.00011
Cons.	-1.642	.50046	-1.197	.53053	-1.495	.49230	-1.273	.52863	-1.360	.49665	-1.262	.53657
	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l
	.336	-3791.	.373	-3579.	.341	-3766.	.380	-3544.	.342	-3758.	.381	-3534.
	Female RGSS: 3852 obs.											
SSW	.00970	.00325	.01812	.00419	.01138	.00345	.02022	.00438	.01176	.00381	.02175	.00477
(m.e.)	.00090	.00030	.00162	.00038	.00107	.00033	.00185	.00040	.00111	.00036	.00199	.00044
Incent.	-.0092	.00710	-.00580	.00755	.00135	.00490	.00393	.00527	.00247	.00202	.00361	.00210
(m.e.)	-.00086	.00066	-.00053	.00068	.00013	.00046	.00036	.00048	.00023	.00019	.00033	.00019
Cons.	-.4766	.64579	-.2204	.74217	-.3112	.64244	-.2072	.74880	-.3301	.64892	-.3375	.75922
	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l
	.327	-897.8	.355	-860.1	.327	-897.7	.356	-858.5	.326	-897.9	.356	-858.5
	Male RETA 4355 obs.											
SSW	.00870	.00496	.00726	.01174	-.00068	.00695	.00992	.01238	.00757	.00938	.00501	.01451
(m.e.)	.00117	.00067	.00096	.00155	-.00009	.00092	.00131	.00163	.00100	.00124	.00066	.00191
Incent.	-.04703	.01212	.01050	.01440	-.02915	.00900	.01432	.01056	-.00920	.00729	.00187	.00758
(m.e.)	-.00630	.00162	.00138	.00190	-.00385	.00119	.00188	.00139	-.00122	.00097	.00025	.00100
Cons.	-2.079	.68022	-1.542	1.2772	-1.8482	.72708	-1.6444	1.2819	-2.107	.70436	-1.324	1.283
	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l
	.168	-1201.	.252	-1079.	.166	-1203.	.253	-1078.	.167	-1202.	.253	-1079.
	Female RETA 2051 obs.											
SSW	.00316	.00643	-.00176	.01113	.00188	.00732	-.00248	.01119	.00342	.01334	-.01475	.01781
(m.e.)	.00047	.00095	-.00025	.00156	.00028	.00108	-.00035	.00157	.00051	.00199	-.00207	.00250
Incent.	.01813	.01096	.02538	.01207	.00849	.00979	.01824	.01039	.00241	.01448	.00739	.01736
(m.e.)	.00268	.00162	.00355	.00169	.00126	.00145	.00256	.00146	.00036	.00215	.00104	.00244
Cons.	-3.358	3.5687	-3.678	3.7786	-3.175	3.5836	-2.4574	3.8070	-3.259	3.6326	-1.876	3.9571
	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l	R^2	log-l
	.142	-638.5	.197	-597.9	.141	-639.4	.196	-598.5	.140	-639.8	.195	-598.9

note: m.e. stands for marginal e®ect

On the other hand, the introduction of age dummies (speci¯cation M2) always increases the coe±cient of both the SSW and the incentive variables, and substantially improves the ¯t 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 6 compares the age pro¯le of the empirical hazard rate with those of the coe±cients 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 Social Security regime. In all cases, the age dummies have been rescaled to the empirical hazard scale. For male enrolled in the RGSS (left panels) and all three models (either accrual, peak or option value), the pro¯le of the age dummies resembles the hazard pro¯le, although there are some discrepancies between the two pro¯les at ages 60{64 and from age 67 onward. For female enrolled in the RGSS the discrepancies are more evident at all ages from 55 to 64, with age 59 an exception. For individuals enrolled in RETA the pro¯les are quite di®erent from those estimated for the RGSS. In particular, important discrepancies between ages 55 and 59 and between models are detected.

Figure 6: Evaluation of the explanatory power of incentive measures in M2: empirical hazard versus age effects (rescaled).



7 Policy Simulations

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

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: The following reform, common to all countries considered in this volume: (i) early entitlement age at 60, (ii) normal retirement age at 65, (iii) a replacement rate at age 65 equal to 60 percent of the earnings at age 59, and an actuarial adjustment of 6 percent per year from age 60 to age 70 (this implies a replacement rate of 42 percent at age 60 and 78 percent at age 70). Notice that (i) and (ii) correspond to the current Spanish system, whereas the actuarial adjustment for retirement before age 65 is less favorable than the one currently used in Spain. The current Spanish system is more generous for retirement at age 65 and has no actuarial adjustment for postponing retirement after that age.

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

Table 19: Average retirement ages from simulated policies.

RGSS	Male			Female		
observed	62.00			62.31		
	R1	R2	R97	R1	R2	R97
S1: accrual	62.19	61.87	61.98	62.90	63.00	62.26
S1: peak value	61.58	62.74	61.99	62.53	63.34	62.31
S1: 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
S2: peak value	61.39	62.61	61.90	62.24	63.39	62.22
S2: option value	61.15	62.54	61.98	62.12	63.33	62.20
S3: accrual	63.58	{	{	64.00	{	{
S3: peak value	62.96	{	{	63.54	{	{
S3: option value	62.69	{	{	63.49	{	{
RETA	Male			Female		
observed	62.88			62.35		
	R1	R2	R97	R1	R2	R97
S2: accrual	63.40	63.12	63.03	62.27	62.58	62.47
S2: peak value	63.51	62.99	63.03	62.56	63.00	62.63
S2: option value	63.69	62.81	63.06	61.96	62.79	62.63
S3: accrual	65.38	{	{	64.75	{	{
S3: peak value	65.59	{	{	64.38	{	{
S3: option value	65.32	{	{	63.53	{	{

We recall that the 1997 reform, described in Section 2, implies the following changes in the basic bene¯t formula and in the penalties related to age and contributive history: (i) the number of years of contribution used to construct the bene¯t base is increased from 8, as prescribed by the 1985 legislation, to 15, (ii) workers retiring after the age of 60 with 40 or more contributive years are charged an actuarial adjustment of only 7 percent (instead of 8 percent) for each year under age 65, (iii) the penalty for insu±cient contributions is changed to

$$\circledR_n = \begin{cases} 0; & \text{if } n < 15, \\ :5 + :03\,(n - 15); & \text{if } 15 \cdot n < 25, \\ :8 + :02\,(n - 25); & \text{if } 25 \cdot n < 35, \\ 1; & \text{if } 35 \cdot n, \end{cases}$$

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

S1: Starting from the model without age dummies (M1), we modify the SSW and incentive measures in accordance with the new policy. Speci¯cally, in the calculation of SSW we increase by three years the early and the normal retirement ages and shift by three years the age-speci¯c probability of receiving DI-UI bene¯ts.

S2: Starting 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 bene¯ts as in S1, but not the coe±cients on the age dummies.

S3: [Only for reform R1] Starting from the model with age dummies (M2), in addition to the changes described in S2, we also shift the coe±cients on the age dummies by three years, so that the entire age-pro¯le of the retirement hazard shifts forward by three years.

7.2 Results for male workers in the RGSS

Figures 7 to 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-pro¯le of estimated conditional retirement probabilities or \hazards" and the cumulative distribution function (CDF) of retirement age.[5]

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 coe±cients estimated under the speci¯cation M1 are employed in the simulations, all the reforms reduce retirement hazard at age 60 and age 65. Although in some cases an increase in the hazard at age 63 or 64 is observed, in general the CDF of retirement age is shifted to the right. The reduction of the hazard at 60 is more important for the Spanish reform (R97), while the reduction at age 65 is more important for the common (R2) reform.

When, instead, the coe±cients estimated under the speci¯cation M2 are used in the simulations but the age dummies coe±cients 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, say, age 65. In fact, both the R1 and the R97 reform mildly increase the average retirement hazard at age 60. This appears to be largely a consequence of the minimum pension rules in e®ect in Spain. Apart from this, the reduction is more important when retirement incentives are measured by the OV. As expected, when the age dummies are shifted by three years (S3) (Figures 13 to 15), the whole hazard for R1 shifts to the right by three years and, consequently the CDF is reduced substantially both at age 60 (by 50, 39 and 37 percent for the accrual, peak and OV speci¯cations respectively) and at age 65 (36, 30 and 28 percent for the accrual, peak and OV speci¯cations by respectively).

7.3 Results for female workers in the RGSS

Figures 16 to 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 coe±cients estimated under the speci¯cation M1 are employed, only the R2 reform reduces the hazard of retirement at both age 60 and 65 (Figure 16). The reduction is similar for all incentive measures (about 35 and 37 percent at age 60 and 65, respectively). As a consequence, the CDF of retirement age is substantially lower at age 65 than in the sample. The reduction is slightly bigger under the peak or the OV (17 percent) than under the accrual (16 percent). On the other hand, both the R1 and R97 reforms are ine®ective in reducing the retirement hazard in the relevant age range. Very similar results are obtained under simulation S2 (Figure 17).

In simulation S3, on the other hand, the results for R1 change substantially (Figure 18). The CDF at age 60 reduces by 22.5 percent in all cases, and by 33.6, 35.1 and 35.6 percent at age 65, respectively for accrual, peak and OV.

7.4 Results for individuals in the RETA.

In Figures 19 to 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 60 and 65 that are evident in the data. Thus, in each ¯gure 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).

[5] 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 $F(54) = 0$.

When the coe±cients estimated under the speci¯cation M2 are used in the simulations but the age dummies coe±cients are not shifted (S2), the R2 reform seems to considerably reduce the hazard over the key age range and thereby reduce the CDF at, say, age 65. In fact, the Spanish reform (R97) substantialy increases the retirement hazard at all ages below the normal retirement age (see Figures 19 and 21 for men and women respectively). When the age dummies are shifted by three years (S3) the whole hazard for R1 shifts three years towards the right and, consequently the CDF of retirement age is reduced substantially in all cases (see Figures 20 and 22 for men and women respectively). The reduction of the CDF at age 60 and 65 is much more important when the accrual is employed than when either the peak or the option value are employed. For example, the reduction for the accrual speci¯cation is 19.5 and 34.9 percent for men at age 60 and 65, while for the peak is 28.1 and 38.7 percent and under the OV is 10.7 and 31.4 percent. For women instead the reduction is more important for the accrual speci¯cation (55.4 and 53.7 percent at ages 60 and 65, respectively) than for either the peak or the OV speci¯cations.

7.5 E®ects of reforms on average retirement ages

In Table 19, we summarize the impact of the proposed reforms on average retirement ages. The average retirement age is obtained as $\bar{a} = \sum_{a=55}^{70} a\, f(a)$, where $f(a) = F(a) - F(a-1)$ is the unconditional probability of retiring at age a.

In almost all cases, the impact of the reform varies considerably across both simulation exercises and choice of the incentive measures (accrual, peak and option value). An exception is the 1997 Spanish reform, whose e®ect on the average retirement age is very small in general and if anything negative, thus con¯rming previous evaluations in Jiménez-Martín and Sánchez [1999] or Jiménez-Martín [1999].

For male employees in the RGSS (left top panel of Table 19) the impact of the reforms R1 and R2 on the average retirement age is unclear. However, we detect the following regularities. First, the R1 reform has little impact in S1 or S2. Second, the reform R1 in S3 implies an increase of the average retirement age between 0.69 years (option value speci¯cation) and 1.58 years (accrual speci¯cation). Finally, the R2 reform has similar impact in either simulation, being the impact for the accrual speci¯cation much smaller than for either the peak or the option value.

For female employees in the RGSS (right top panel of Table 19 the e®ect is much more consistent across speci¯cations of the incentive variable. Again, for S1 and S2 simulations only for R2 we are able to show a signi¯cant increase of the average retirement age, between 0.70 and 1.0 years, depending on the speci¯cation 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 male self-employed in the RETA (left bottom panel of Table 19) the results are very di®erent than those obtained for male in the RGSS, since only the R1 reform is able to signi¯cantly increase the average retirement age in either simulation S2 or S3 (between 0.46 and 1.37).[6] In fact, the R2 reform reduces the average retirement age in all cases. Finally, for females in the RETA (right bottom panel of Table 19) the results sharply vary across incentive speci¯cations. In simulation S2 only the R2 reforms slightly increases retirement age. The e®ect of R1 is only substantial in S3 but in the case of female self-employed varies a lot across speci¯cation of the incentive variable.

8 Final remarks

1. Retirement models badly explain retirement behavior, specially for individuals enrolled in the RETA (mainly, because the information for this group is not good enough).

2. We con¯rm that the R97 reform has very little impact in retirement incentives and, consequently, in average retirement ages.

3. The R1 reform moves the ARA in the rigth direction.

[6] Again, we do not present results of simulation S1 for the Self-employed.

4. The R2 reform has very little impact on ARA on males and very little on female.

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A From covered earning to earnings, for workers in the RGSS

The relationship between earnings w_t, covered earnings (base de cotización) e_t and benefit base (base reguladora) B_t is the following: e_t is a doubly censored version of w_t, namely

$$e_t = \max(\ell_t; \min(w_t; u_t));$$

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

$$B_t = \sum_{j \geq 0} b_j e_{t-j}; \tag{1}$$

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 1986–95 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 ℓ_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 which 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 $\mu_{it} = \alpha_t + \beta_t' X_{it}$ and variance σ_t^2, where X_{it} is a vector of observable individual characteristics. The model parameters α_t, β_t and σ_t^2 are then estimated using maximum likelihood. To simplify calculations, we neglect left censoring.

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

$$\hat{w}_{it} = \hat{\mu}_{it} = \hat{\alpha} + \hat{\beta}_t' X_{it};$$

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 $w_{it} \geq u_t$, namely

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

where $c_t = (u_t - \hat{\mu}_{it})/\hat{\sigma}_t$, $\lambda(c_t) = \phi(c_t)/[1 - \Phi(c_t)]$, 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 completed data we may estimate a fixed effects model for the level of earnings and use the estimates from this model to project earnings forward 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 on working one extra year.

B Unemployment Benefits

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

Contributory Unemployment Benefits

There exists a program protecting employees against a non-voluntary 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 69611 ptas. or \$405 (150 ptas. = \$1). The maximum benefit amount is a function of the number of dependent children. Without children it equals 137385 ptas. or \$916. With 2+ children it equals 177793 ptas. or \$1185. Unemployment benefits are subject to both SS contributions and income taxes.

Subsidy for 52+ workers

There exists a special unemployment scheme for those workers 52+ who:

- are eligible for a retirement pension, except for their age.
- have an income belos 75 percent of the monthly minimum wage, which is 51952 ptas.

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.

C 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 5 years, paid maternity/paternity leave requires at least 9 months before the date of delivery and 180 days during the last 12 months, whereas no minimum eligibility criterion is imposed for work-related accidents or illnesses.

The benefit base depends on actual earnings during the last 12 months. In case of common illness or work-unrelated accident, the subsidy is equal to 6 percent of the benefit base for each day of absence between the 4-th and the 20-th, 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/paternity (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 18 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 60. 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, etc.), 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.

Disability pensions are distinguished into contributory and non-contributory. 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, or IPT) corresponds to inability to do the usual job. A special subcase (incapacidad permanente total cualificada para la profesión habitual, or IPTC) applies only to employees older than 55 which are in particular socio-economic situations. The second level (incapacidad permanente absoluta, or IPA) corresponds to inability to do any kind of job. The third level (gran invalidez, or GI) requires, in addition, 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 5 to 15 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 or not work-related, or a professional illness.

Eligibility requirements are fairly complicated. We try here to streamline their presentation. In the cases of IPA or GI, 15 years of contributions are required, of which at least 3 during the last 10 years. For the other two cases (IPT and IPTC), eligibility depends on age. For persons aged 26 or younger, the requirement is half of the number of years between the age of 16 and the age when disability began. For persons older than 26, the requirement is either 5 years or a fourth of the number of years between the age of 20 and the age when disability began, whichever is largest. Furthermore, at least a ¯fth of the required contributory years must have occurred during the last 10 years.

The bene¯t base depends on the source of disability. In case of ordinary illness, it is computed as for old-age pensions. For work-unrelated accident, it is the average annual wage over a period of 24 consecutive months chosen by the person within the last 7 years of work. For work-related accident or professional illness, it is the average wage in the last year of work.

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

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

D Data and Variables

In this section we de¯ne the variables that have been employed in the speci¯cation of the reduced form probit. The data source is the HLSS, unless we state otherwise.

Variables from HLSS

Experience, education and occupation.

- Spell: Length of the current spell in the data set.
- History: History in the dataset, i.e. length of participation to the labor market.
- Part time: Indicator variable which takes the value one if the individual does not work full time.
- Fraction working: History divided by potential experience (time elapsed since ¯rst time observed in the dateset).
- Temporary illness: Length of history spent in temporary illness.
- Sector: 1-digit SIC industry classi¯cation.
- Contributive group: 10 groups, from College 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. People in all other contributive groups are assigned to a generic class labelled \less than high school".
- Years of contributions: Number of years contributed.
- Eligibility indicator: A dummy variable which takes the value one if the individual meets the contributive threshold (15 years of contributions); zero otherwise.

Table 20: Percentage ratio between the number of disability pensions paid and the number of workers covered by the various SS programs, 1981{1994: General Fund (RGSS), self-employed (RETA), agricultural employees (REAa), farmers (REAb), coal miners (REMC), sailors (RETM), domestic workers (REEH).

Year	RGSS	RETA	REAa	REAb	REMC	RETM	REEH	Total
1981	.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	.83	2.41	2.14	2.91		2.57	1.33
1985	.72	.58	1.61	1.80	1.52		2.48	.90
1986	.62	.57	1.67	1.97	1.80	1.58	1.93	.83
1987	.55	.51	1.34	1.84	1.42	1.34	2.00	.72
1988	.52	.51	1.21	2.06	1.69	1.45	2.21	.70
1989	.43	.43	1.13	1.95	1.64	1.12	2.25	.60
1990	.44	.51	1.21	2.38	2.36	1.22	2.90	.62
1991	.41	.57	1.30	2.58	2.18	1.18	3.30	.62
1992	.47	.64	1.37	2.53	2.37	1.26	3.12	.67
1993	.47	.68	1.25	2.15	2.29	1.25	2.85	.64
1994	.44	.77	1.35	1.91	2.03	1.24	2.75	.61

Table 21: Fraction of new disability pensions awarded to individuals aged 55+ by SS program and level of disability: Inability to do the usual job (IPT), inability to do any kind of job (IPA), complete inability (GI). Year 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	.3	48.6	60.0
RETM	14.9	32.1	32.0
REEH	25.0	75.0	80.6

Earnings and pension variables.

- Covered earnings or pensionable earnings: Monthly amount upon which SS taxes are levied.
- Monthly Earnings: Methods of computation (for workers in RGSS) is described in section A.
- Pension amount: See section 2 for a detailed description.
- Average lifecycle earnings: Constructed on the basis of a ¯xed e®ect model, for each contributive group.
- Expected earnings: See section 4.2 for a 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 is maximized.
- Minimum pension indicator: A dummy variable which takes value one if the individual's expected retirement pension falls below the minimum retirement pension.

- Censoring earnings indicators: Two dummy variables. The first takes value one if the individual's level of contributions falls below the minimum (mandatory) level of contributions. The second takes value one 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 or 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-digits) industry.

- Early retirement indicator: Fraction (weighted by employment) of collective settlements including a provision favoring early retirement.
- Retirement at 64: Fraction (weighted by employment) of collective settlements including a provision to facilitate retirement of workers aged 64 without incurring age penalty. This variable only applies to people aged 64 enrolled in RGSS.
- Mandatory retirement at 65: Fraction (weighted by employment) of collective settlements including a provision promoting mandatory retirement at 65. This variable only applies to people aged 65 enrolled in RGSS.

We refer to Martínez (1998) for a detailed description of the variables and for summary statistics of the history, 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) 1973{74, 1980{81 and 1990{91; Encuesta de Estructura Salarial (EES) 1995; Encuesta Continua de Presupuestos Familiares (ECPF) 1985{95; Encuesta de Poblacion Activa (EPA) 1987{98, all carried out by the Spanish National Statistical Institute (Instituto Nacional de Estadística or 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{91 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, social security contributions, working hours and personal characteristics of about 175,000 workers in 19,000 establishments. The EES helps understanding the relation between covered earnings and actual earnings for those cases in which the latter exceeds 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, pensions and subsidies) and personal characteristics (especially those of the household head and his/her spouse) for about 3,000 households.
- EPA: A quarterly CPS-like survey of roughly 60,000 Spanish households. It contains fairly detailed information on labor force status, education and family background variables but no information on wages and income. Publicly released cross-sectional files are available from 1976 onward. Starting with

Table 22: Descriptive statistics:

	Male in RGSS		Female in RGSS		Male in RETA		Female in RETA	
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	17.5364	24.7313	13.3365	22.3410	1.3826	10.4062	1.3056	9.8729
OV	90.0784	89.7464	68.8603	69.7920	25.0808	24.4423	27.3171	19.0409
elegibility	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	1459921	181245.	735039.	128180.	128320.	145097.	62491.9	47122.
expected wage	12.4631	6.9057	9.5710	5.1261	{	{	{	{
id squared	203.014	235.350	117.873	137.711	{	{	{	{
exp. wage PEAK indicator	9.2904	8.2419	7.4796	7.0318	2.9242	1.9530	3.2752	2.0349
exp. wage OV indicator	14.7397	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	83.8227	15.2562	31.2876	21.2348	61.2252
spell in the ¯rm	7.9719	8.4374	7.9754	7.6232	18.5711	8.7681	12.7405	6.6738
id squared	134.736	248.1310	121.7048	209.830	421.745	343.308	206.84	213.08
years of cont.	30.3409	7.2298	23.7570	8.6233	31.2213	7.1568	22.4149	6.9346
id squared	972.835	396.92	638.737	406.99	1025.98	422.886	550.49	329.20
potential exp.	10601.4	2859.6	7708.3	3471.4	10090.1	3337.0	5940.5	3112.2
part time	0.0078	0.0882	0.0802	0.2717	{	{	{	{
cont. censored below	0.1636	0.3699	0.2233	0.4165	{	{	{	{
cont. 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	{	{	{	{
group cont. 1	0.0697	0.2546	0.0296	0.1695	{	{	{	{
gruop cont. 2	0.0285	0.1665	0.0618	0.2408	{	{	{	{
group cont. 3	0.0601	0.2377	0.0273	0.1629	{	{	{	{
group cont. 4{5	0.1296	0.3358	0.1142	0.3181	{	{	{	{
group cont. 6{7	0.1094	0.3121	0.1978	0.3984	{	{	{	{
group cont. 10+	0.1534	0.3604	0.3697	0.4828	{	{	{	{
sector 2	0.0180	0.1329	{	{	{	{	{	{
sector 3	0.0410	0.1983	0.0086	0.0922	{	{	{	{
sector 4	0.0466	0.2109	0.0083	0.0908	{	{	{	{
sector 5	0.0763	0.2654	0.0410	0.1984	{	{	{	{
sector 6	0.0862	0.2807	0.0127	0.1121	{	{	{	{
sector 7	0.0941	0.2919	0.1267	0.3327	{	{	{	{
sector 8	0.0478	0.2134	0.0119	0.1086	{	{	{	{
sector 9	0.0552	0.2284	0.0517	0.2214	{	{	{	{
sector 10	0.5271	0.4993	0.7316	0.4432	{	{	{	{
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:								
retirement at 65	0.0154	0.1147	0.0194	0.1242	{	{	{	
retirement at 64	0.0039	0.0312	0.0045	0.0314	{	{	{	
early retirement	0.2249	0.2227	0.2222	0.2130	{	{	{	

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-section nature of the original survey. It contains fewer variables than EPA, but it permits to follow individuals for up to 6 consecutive quarters.

Figure 7: Male workers in the RGSS. Simulation S1: accrual.

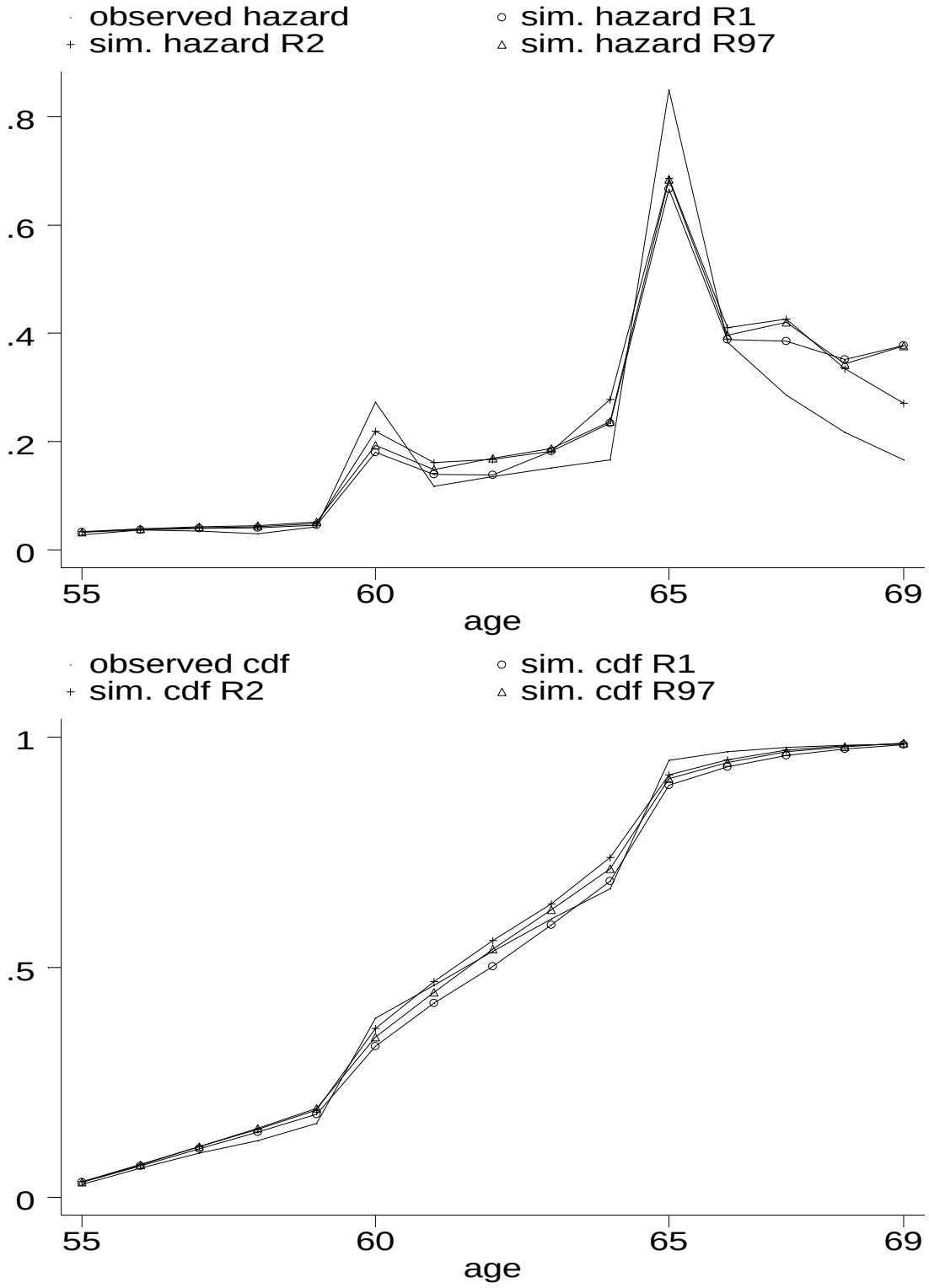

Figure 8: Male workers in the RGSS. Simulation S1: peak value.

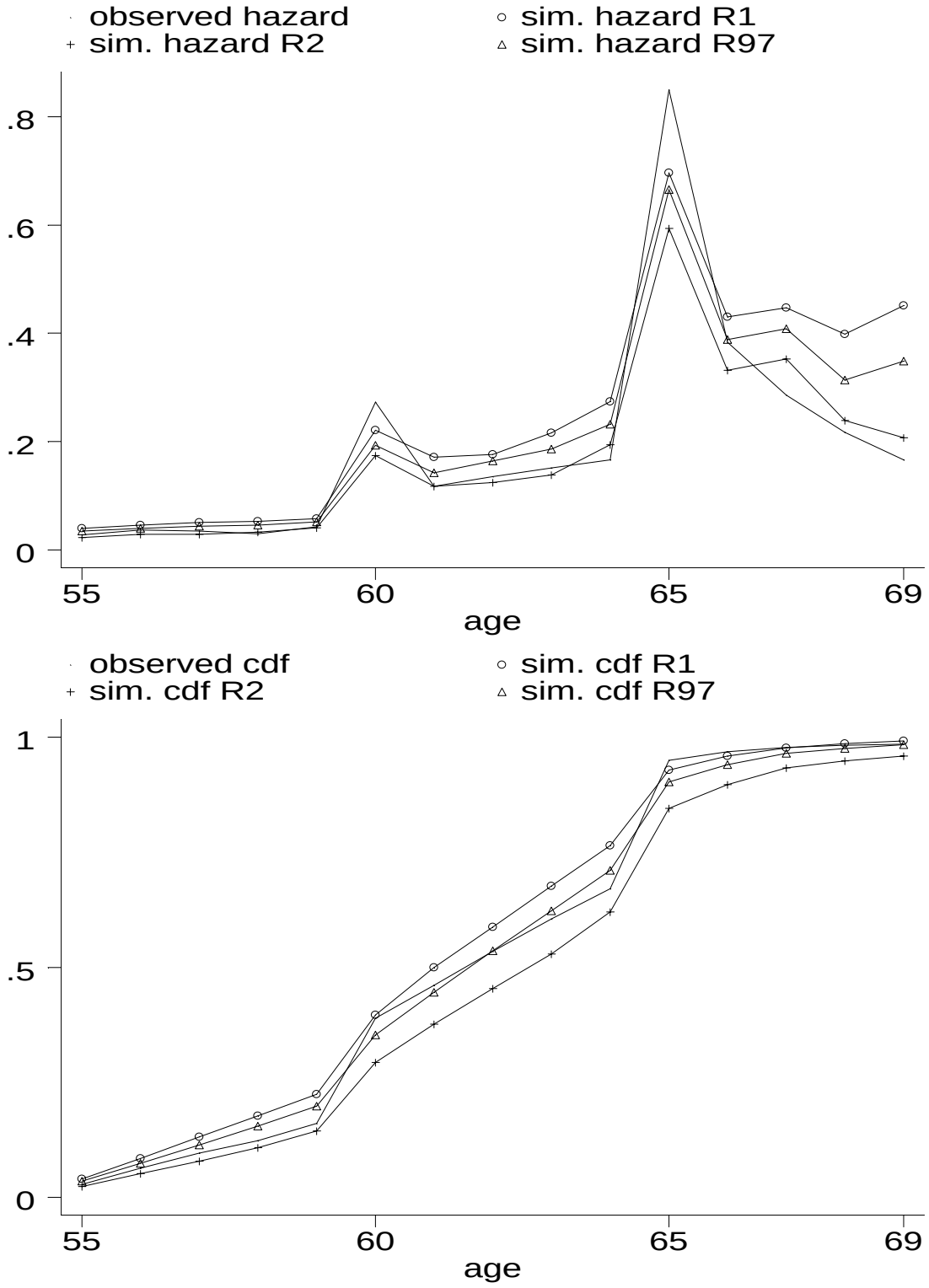

Figure 9: Male workers in the RGSS. Simulation S1: option value.

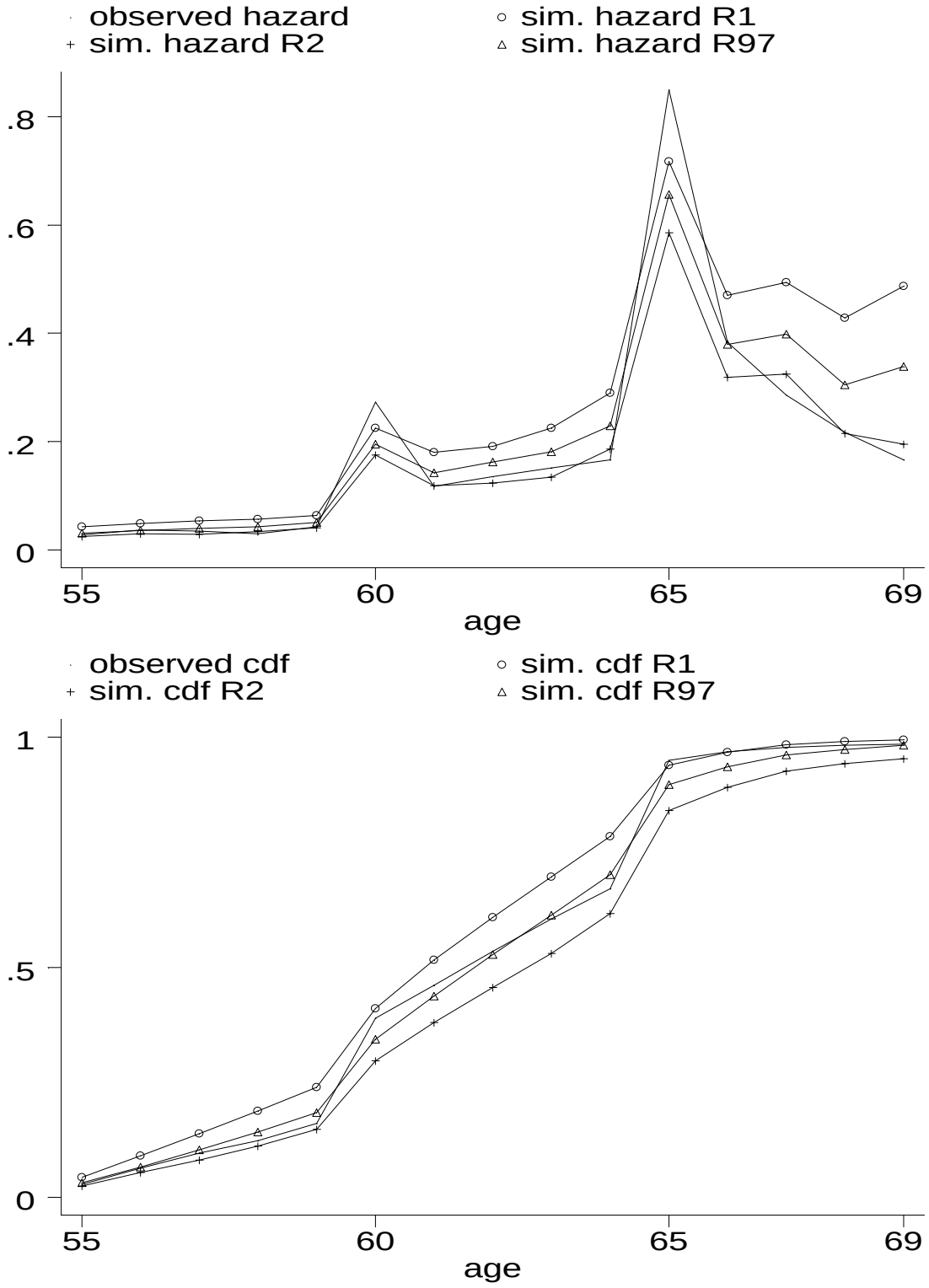

Figure 10: Male workers in the RGSS. Simulation S2: accrual.

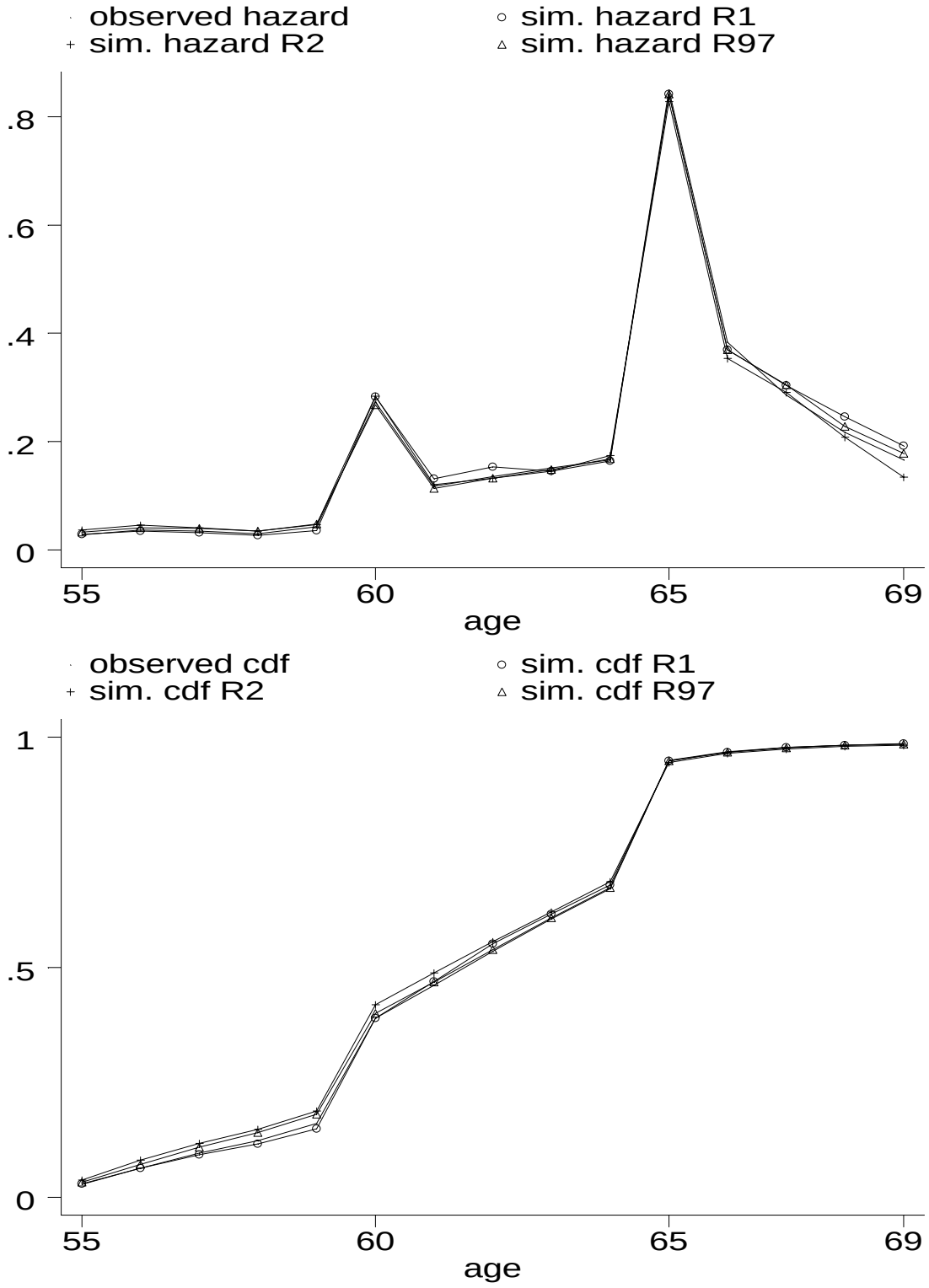

Figure 11: Male workers in the RGSS. Simulation S2: peak value.

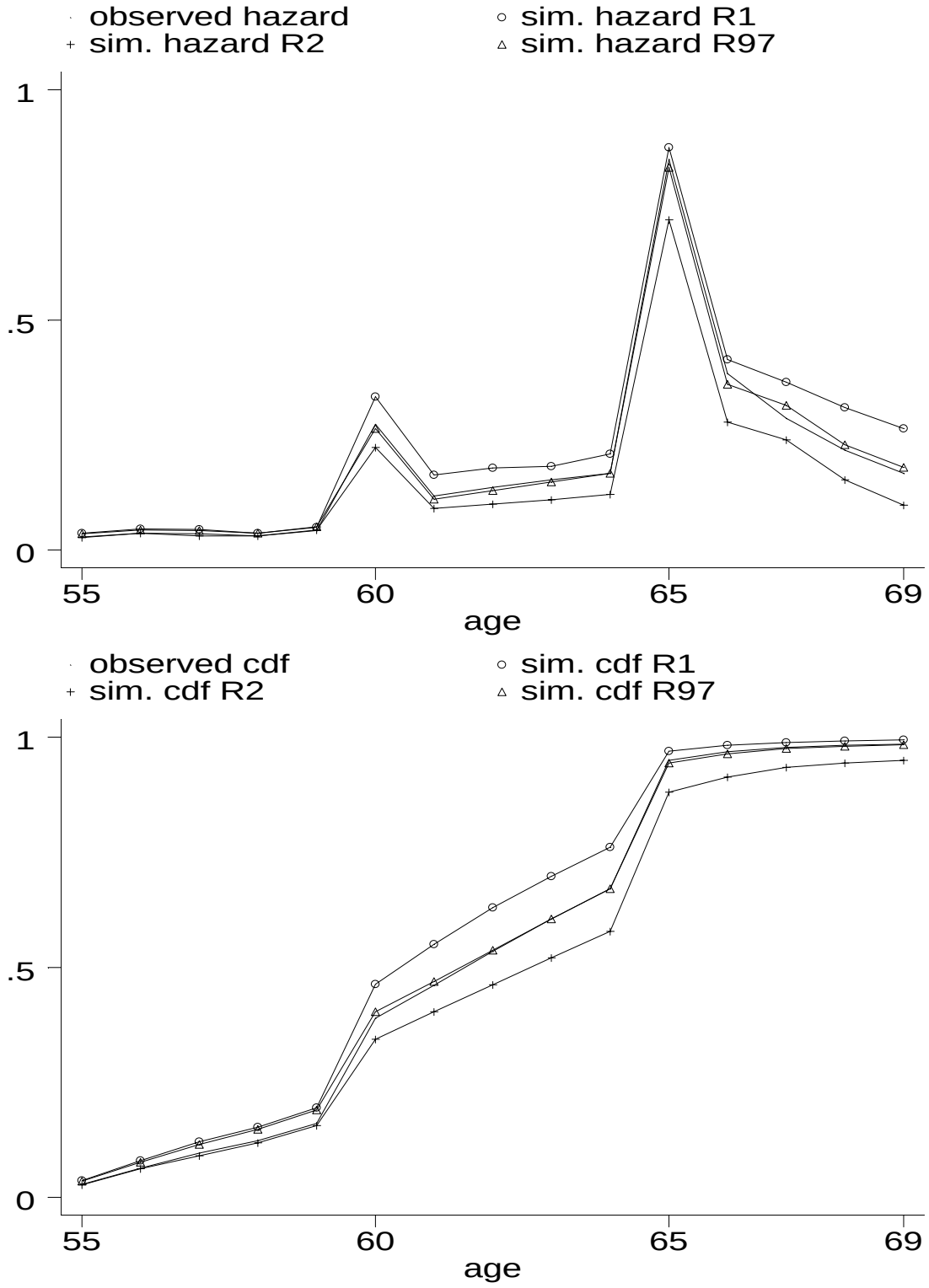

Figure 12: Male workers in the RGSS. Simulation S2: option value.

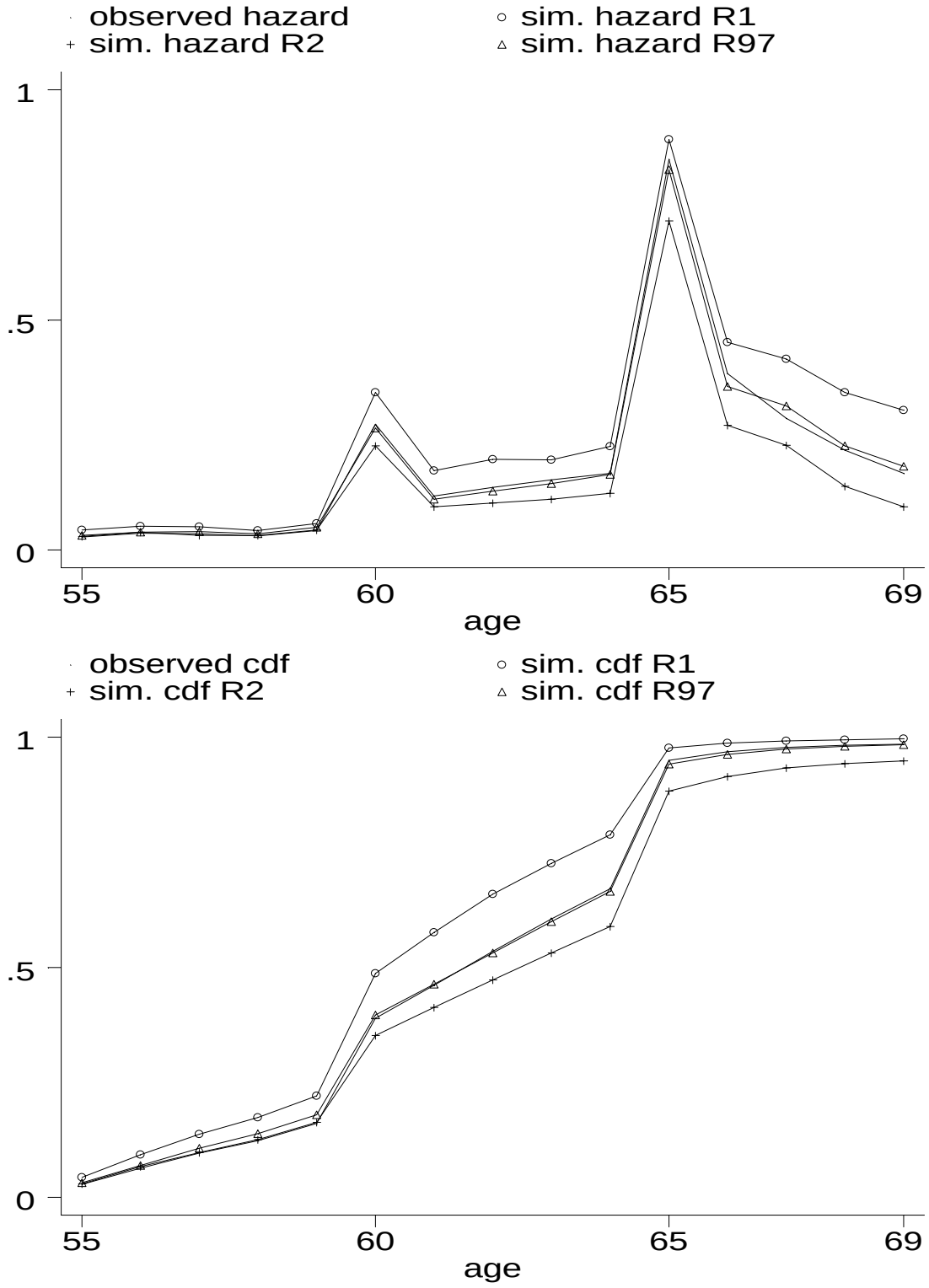

Figure 13: Male workers in the RGSS. Simulation S3: accrual.

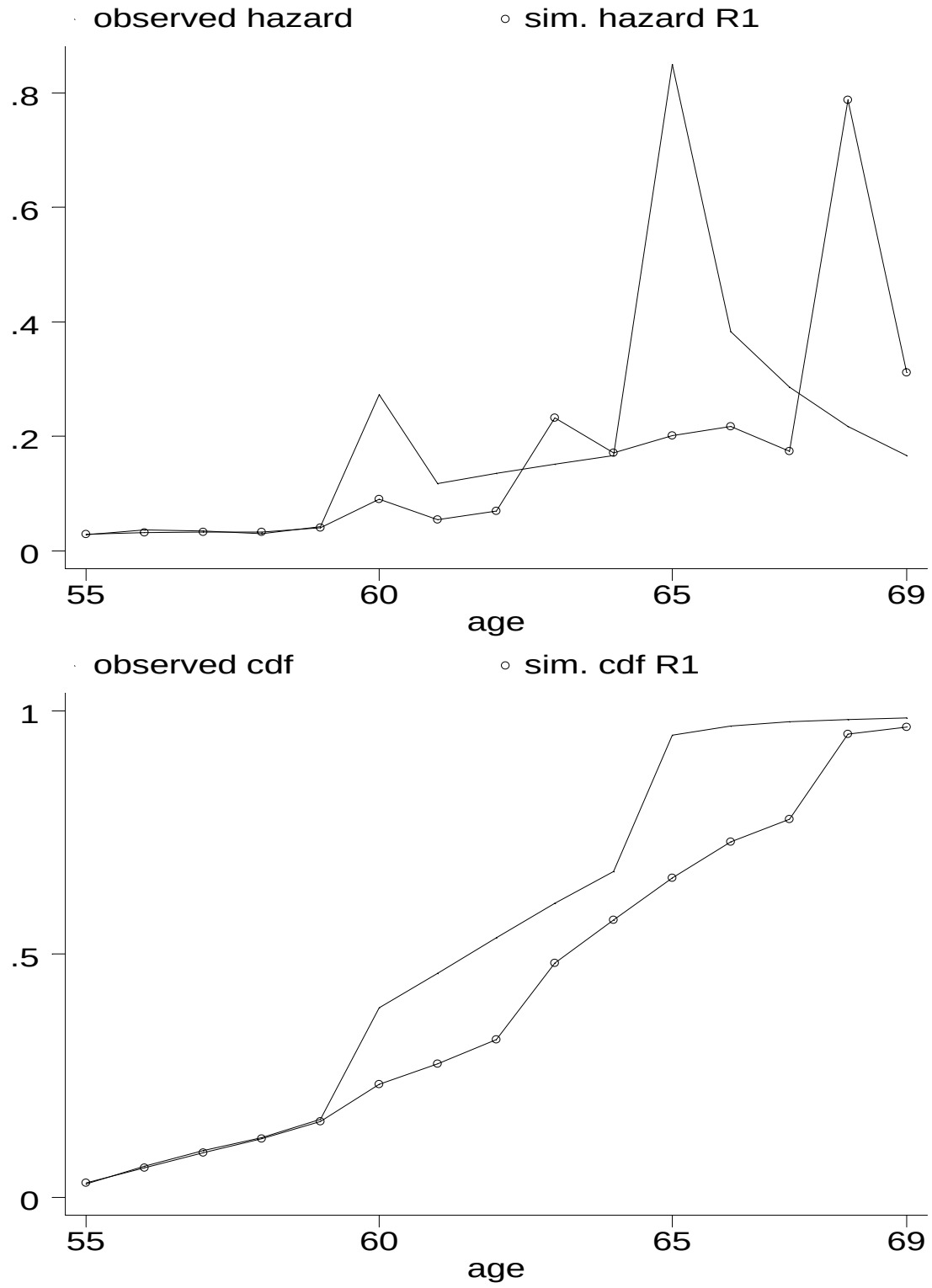

Figure 14: Male workers in the RGSS. Simulation S3: peak value.

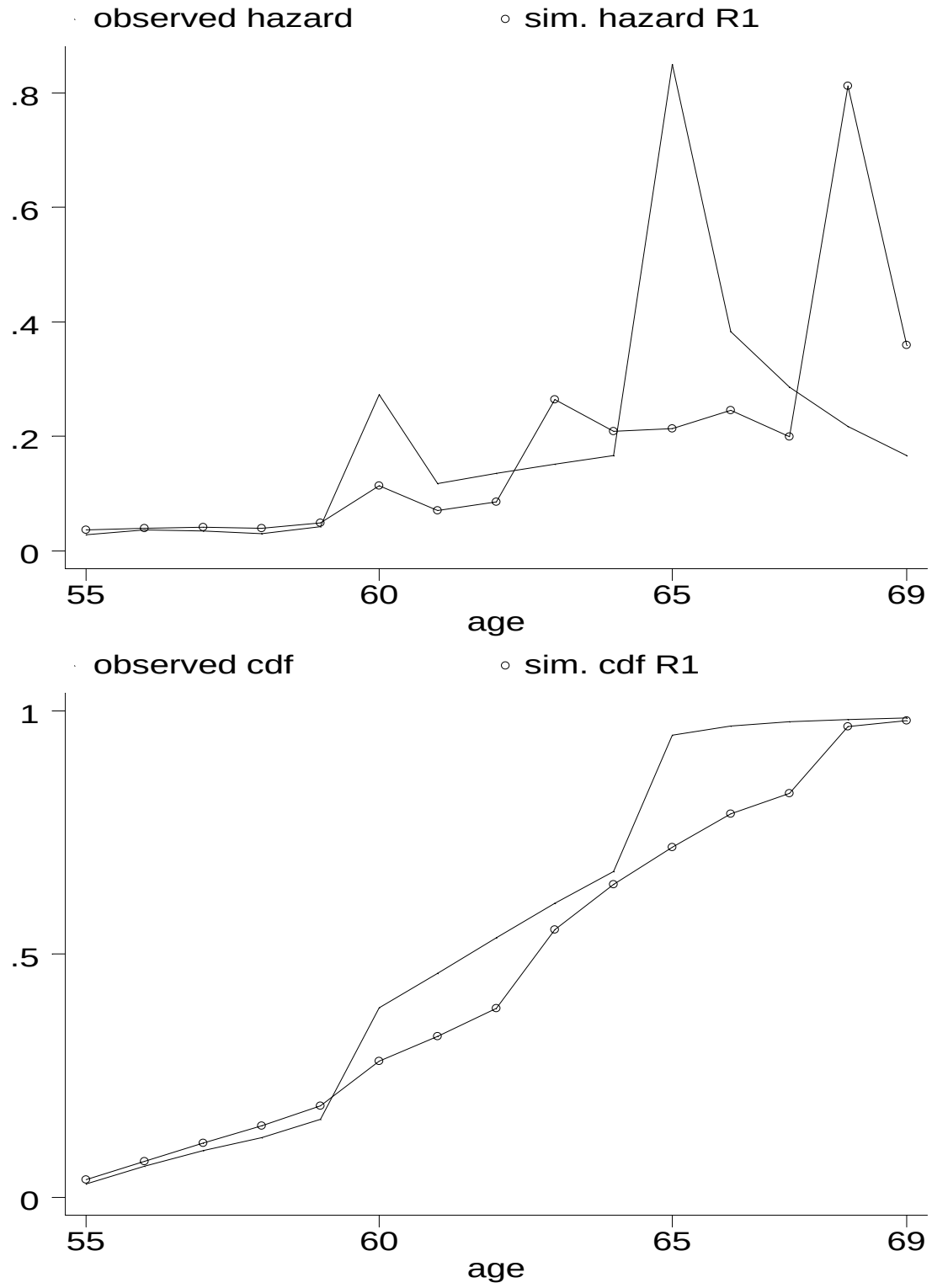

Figure 15: Male workers in the RGSS. Simulation S3: option value.

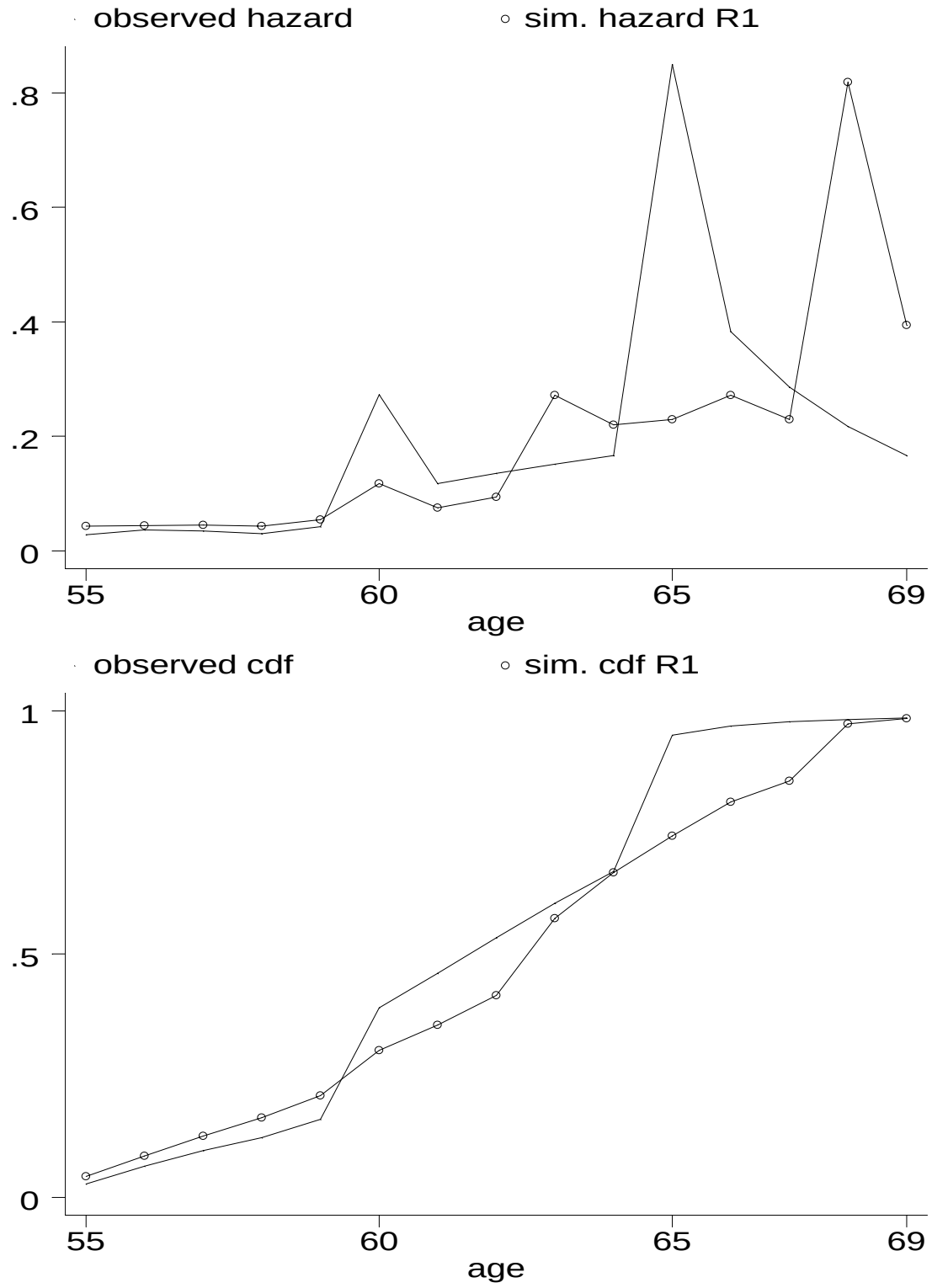

Figure 16: Female workers in the RGSS. Simulations S1.

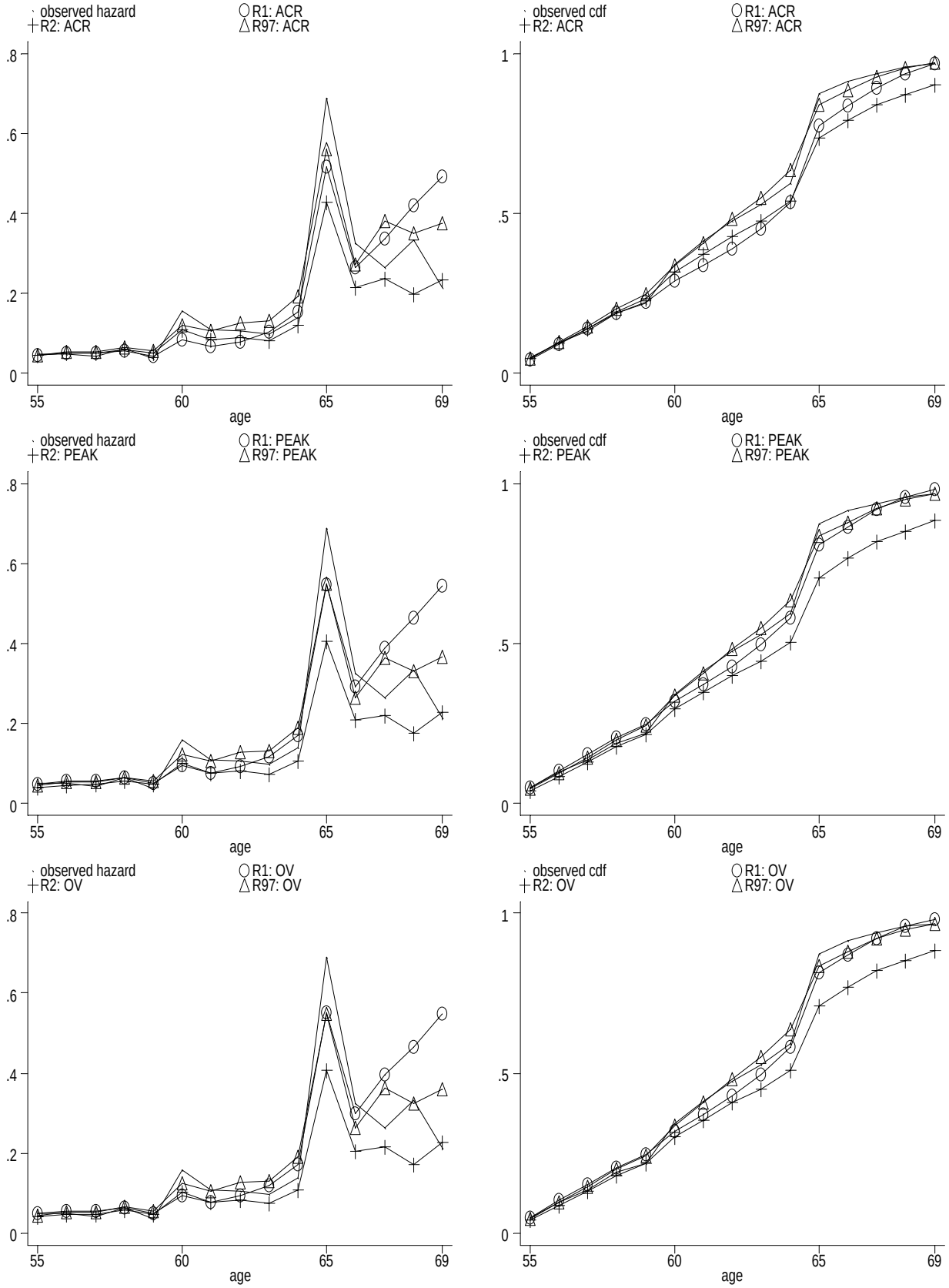

Figure 17: Female workers in the RGSS. Simulations S2.

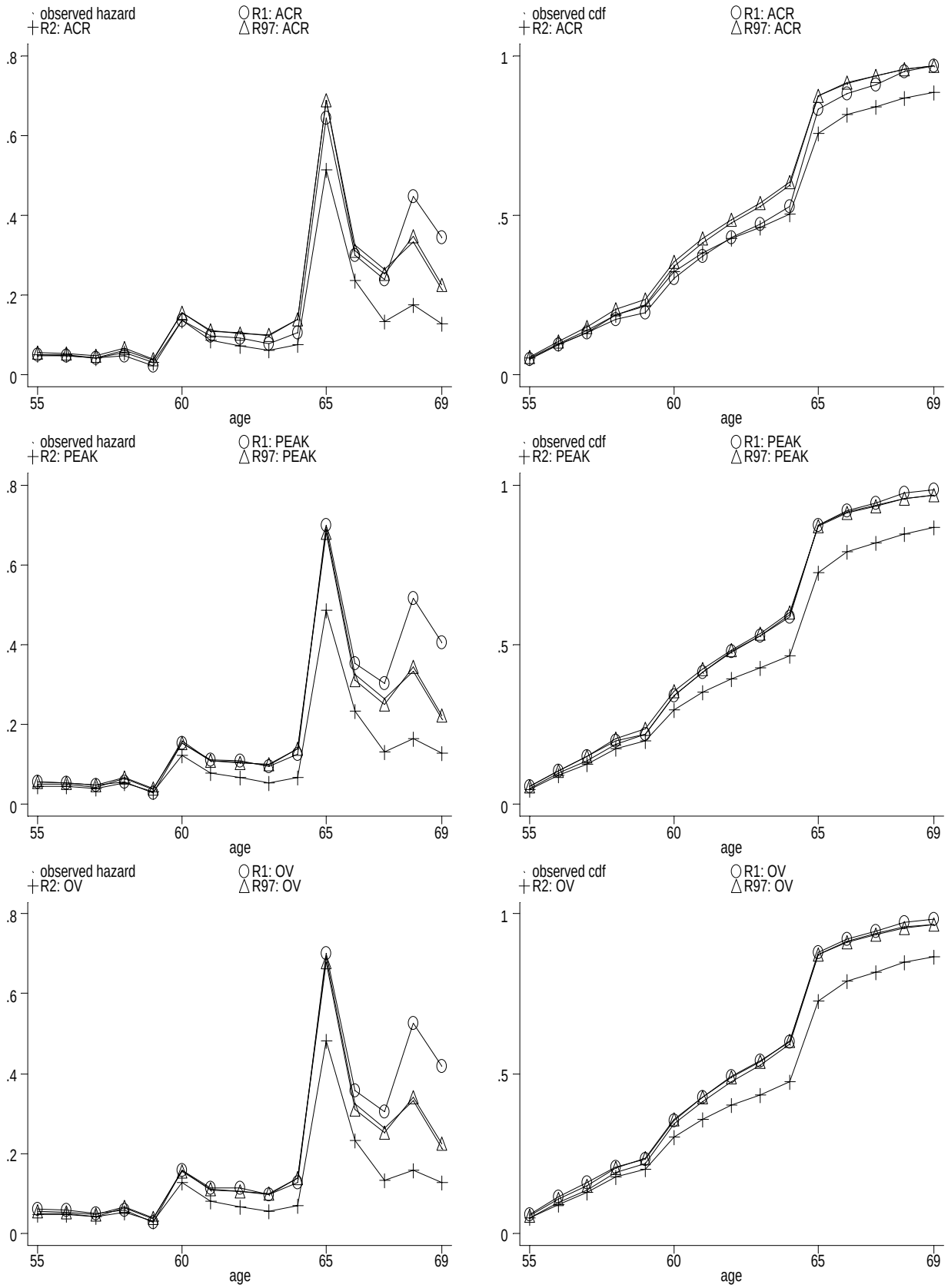

Figure 18: Female workers in the RGSS. Simulations S3.

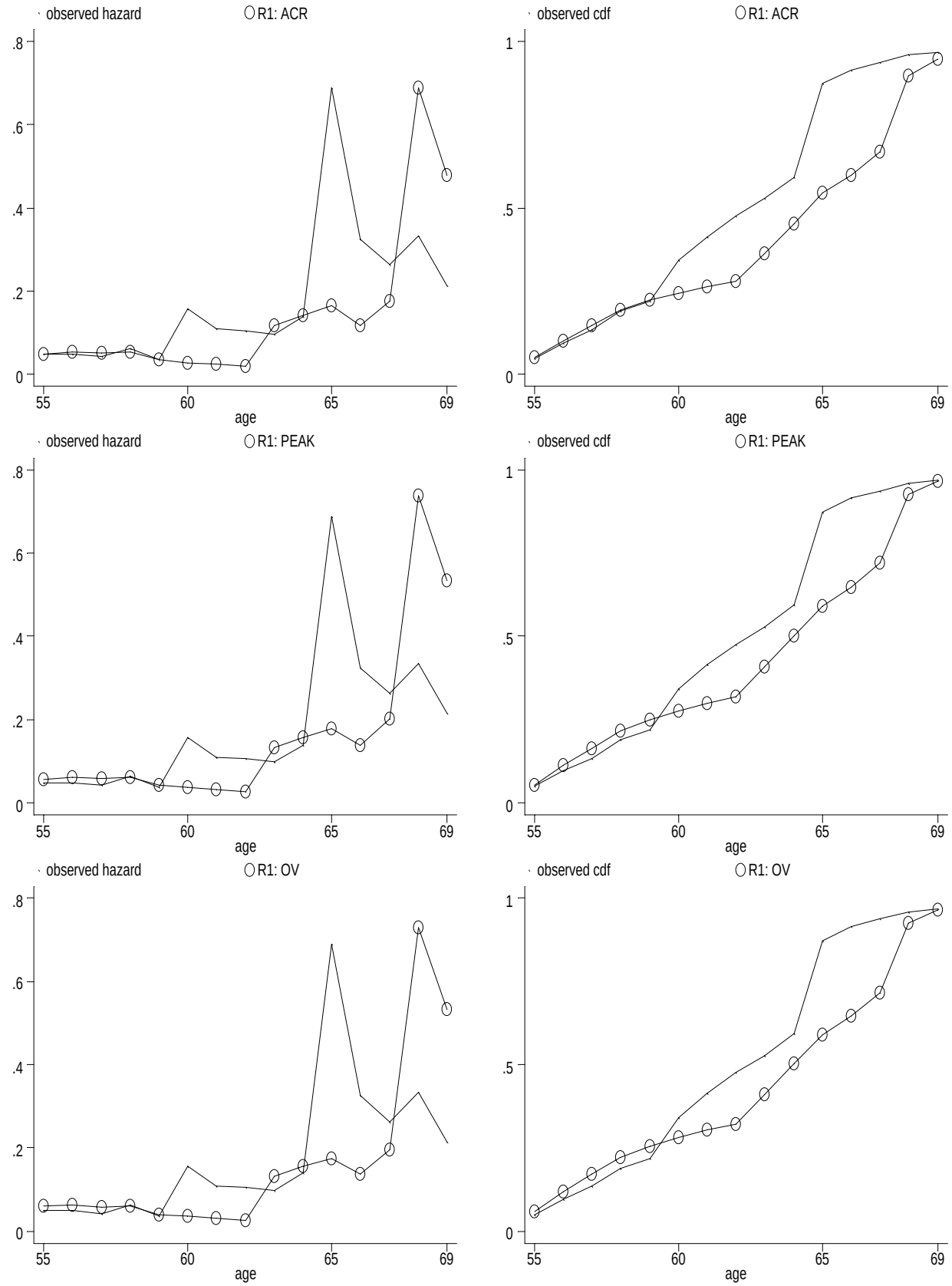

Figure 19: Male workers in the RETA. Simulations S2.

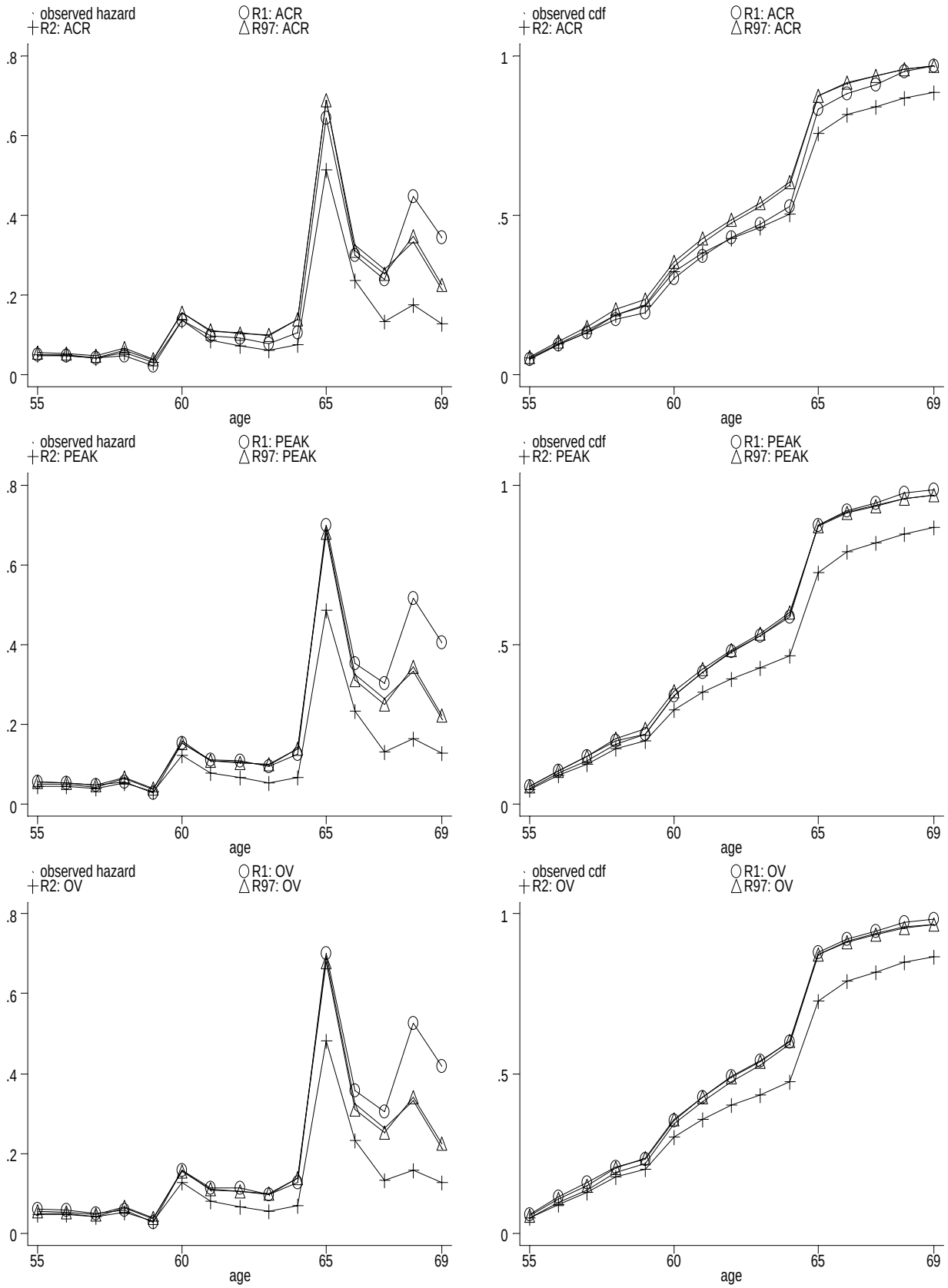

Figure 20: Male workers in the RETA. Simulations S3.

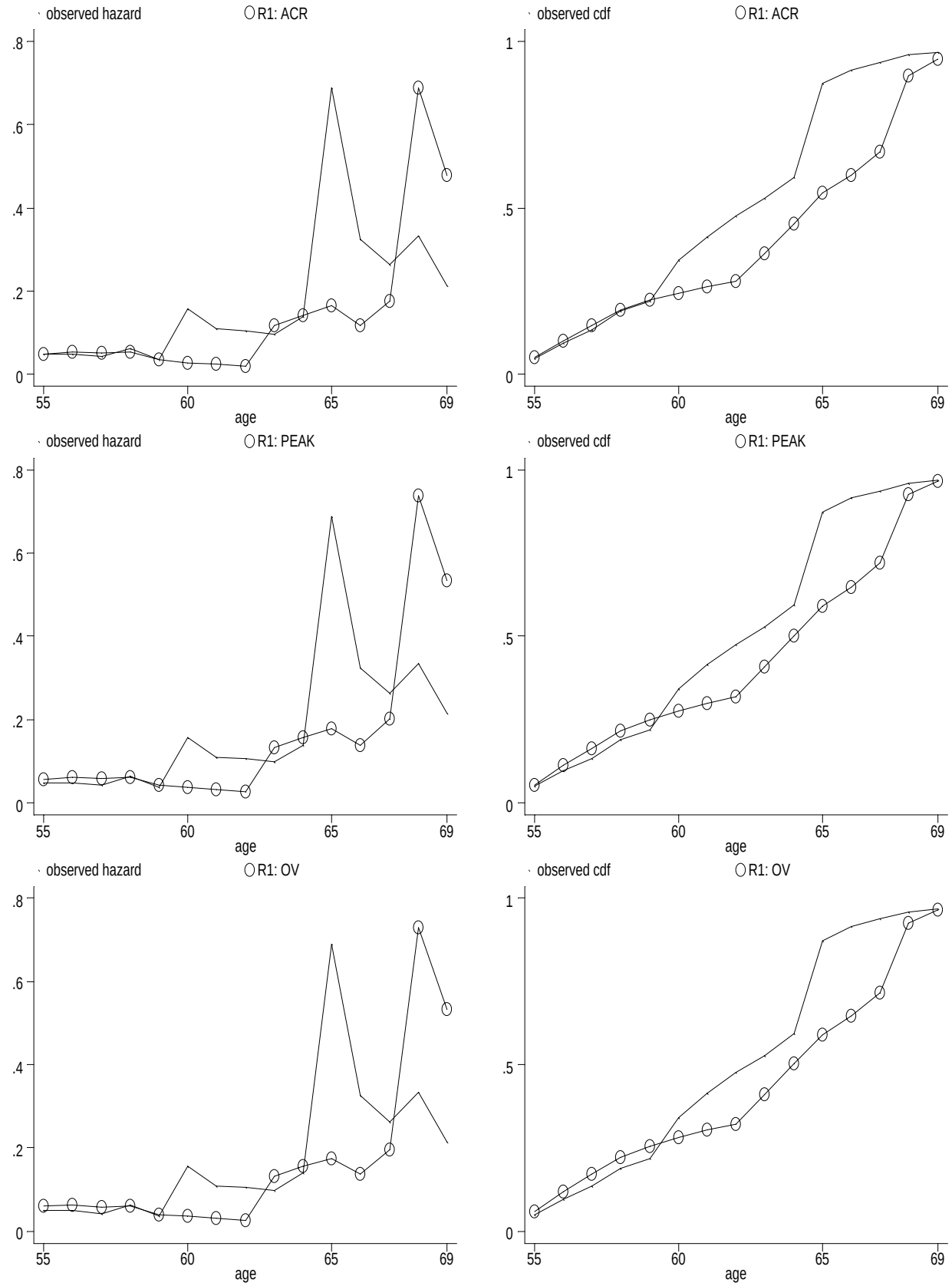

Figure 21: Policy Simulations. Female in RETA. S2

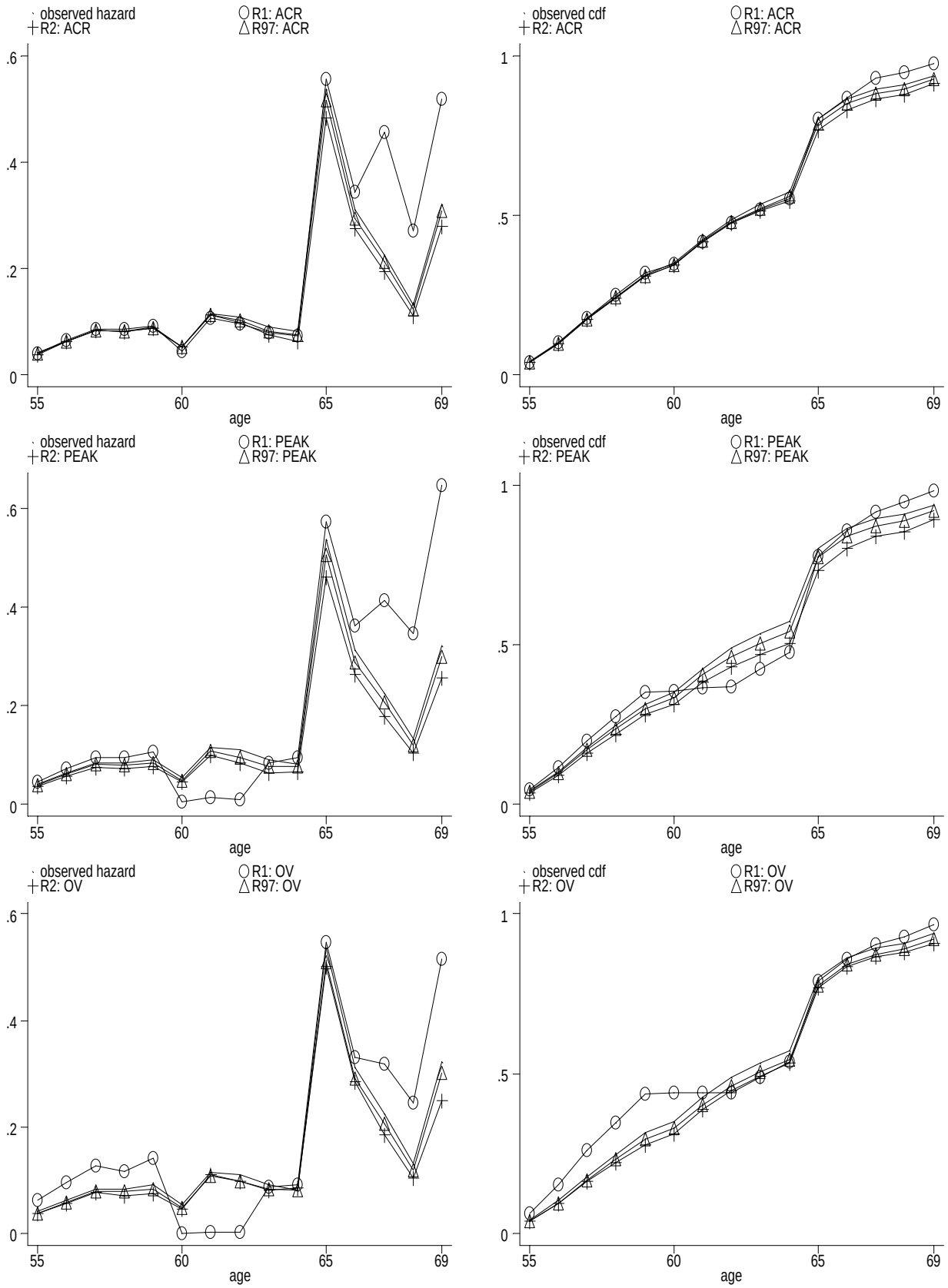

Figure 22: Policy Simulations. Female in RETA. S3