EVALUATING SPANISH PENSION EXPENDITURE UNDER ALTERNATIVE REFORM SCENARIOS.*

Michele Boldrin, University of Minnesota, Federal Reserve Bank of Minneapolis, and CEPR
Sergi Jiménez-Martín, Universitat Pompeu Fabra, and Universidad Carlos III de Madrid

This version: September 15, 2003

* We are grateful to the National Science Foundation, the University of Minnesota Grant-in-Aid program, the DGES PB98-1058-C03-03 and BEC2002-04294-C02-01, and the FBBVA for financial support

Contents

List of Figures

List of Tables

1 Introduction

In this paper we evaluate the quantitative impact that a number of alternative reform scenarios may have on the total expenditure for public pensions in Spain. We consider five scenarios, the first three are common also to the other countries considered in this volume, while the second two correspond to specific reforms adopted by the Spanish government, respectively, in 1997 and 2002.

Each reform scenario consists of changes to one or more of the constitutive elements of a public pension system: retirement age, replacement rate as a function of the number of contributive years, penalization for early retirement, contribution rate. The kind of reforms considered here, similarly to those debated in many advanced countries, would have been politically unthinkable twenty or thirty years ago, when most of the current work force began its contributive careers. Hence, the changes considered, should they be implemented, would certainly take most contributors "off guard" and engender, for given contributive histories and wage profiles, substantial changes in their net position toward the social security administration. While, when a reform takes place, workers are likely to react to the change of rules by modifying their behavior, it is also clear that a completely satisfactory reaction is feasible only for workers that are at the very beginning of their contributive histories. In others words, reforming pension system will mechanically affect expenditure by changing the relationship between past work histories, contributions and expected benefits in such a way that it cannot be undue by the reaction of the economic agents. We call this the "mechanical" effect, to distinguish it from the "behavioral" one. The latter is meant to measure the variation in expenditure brought about by the changing behavior of the workers facing a different incentive system. Our evaluation aims at providing a separate quantitative evaluation of these two effects.

To accomplish this, we place some effort at modelling the behavioral response of different individuals to the changing incentives provided by each reform scenario. We use the results from previous microeconometric studies of Spanish retirement patterns (especially Boldrin et al. [2001b]) to capture the behavioral responses of different individuals. Such behavioral responses have been estimated by means of a family of reduced form models of retirement behavior in which various financial measures of the incentive to retirement are used.

In keeping with the tradition of this series, we consider both some "common" scenarios, which apply equally to each country in the group, and some national scenarios, which are meant to capture hypotheses of reform historically relevant for the specific country under examination. In the case of Spain, we simulate the impact of the 1997 reform (which was fully implemented at the end of 2002) and of the 2002 amendment to the same reform; from now on, respectively, the reform and the amendment. For a summary description of these measures see Table 1.

Our quantitative findings can be summarized in two sentences. For all the reforms considered, the financial impact of the mechanical effect is order of magnitudes larger than the behavioral impact. For the two Spanish reforms, we find once again that their effect on the outstanding liability of the Spanish Social Security System is negligible: neither the mechanical nor the behavioral effects amount to much for the 1997 reform, and amount to very little for the 2002 amendment.

The reason for the firs finding is, quite simply, that the underlying behavioral model which is meant to map changes in financial incentives into changes in retirement patterns explain a very small proportion of the measured variability in actual retirement behavior: and, of that small portion, the part which is captured by the financial incentives is just a fraction. Hence, changing financial incentives does not seem to make much of a difference, at least according to our sample, the behavioral model adopted in these studies, and the estimation we have performed. The reason for the second finding is that, given the structure of the current Spanish labor force and given the

contributive histories of its members, the reform and the amendment make little difference: for most individuals, the social security wealth calculations give very similar numbers with the old and the new rules. Further, as the new rules change incentives to retirement only very slightly, we predict that people's behavior will also change only very slightly. If the reforms had been introduced to reduce public pension expenditure, then our conclusion is that they are very ineffective and badly designed. If they had been introduced to pretend something was being done without doing anything, then they can be declared a success.

2 Background of the system

2.1 Public programs for old–age workers

As customary, we provide a brief description of the system pre-1997 reform. Changes introduced by the reform and the amendment are noted later. For more details on the Spanish social security system, we refer the reader to Boldrin et al. [1999, 2001a].

Table 1 summarizes the programs available after age 50. Leaving aside private pensions, there are three public programs that affect the behavior of old age workers: unemployment benefits, disability benefits, and retirement pensions.

Unemployment benefits are generally conditional on previous spells of contributions and are available only for workers in the General Regime (RGSS) of the Spanish Social Security (S3) system.[1] There are two continuation programs for those who have exhausted their entitlement to contributory unemployment benefits: one for those aged 45+ (UB45+ program) and the other for those aged 52+ (UB52+ program). The latter is a special subsidy for unemployed people that are older than 52, lack other 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.

The S3 system provides insurance against both temporary and permanent illness or disability. Contributory disability (DI) benefits are far more generous than any other old-age program, since they are not subject to penalties for young age or insufficient years of contribution.[2] DI benefits 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 benefits after age 55. This has been achieved mainly by tightening the disability evaluation process for the temporary illness program (*Incapacidad Laboral Transitoria*) which, in the past, was most often used as a bridge to retirement.

Both the unemployment and the disability plans offer, as we will argue momentarily, a "pathway to early retirement" alternative to the "official" one (the latter consisting of early retirement at 60 and of normal retirement at 65). Such alternative pathways are taken in due account in our estimation and simulation procedures.

The retirement program we label official (or regular) offers two options: early retirement and normal retirement. Early retirement is possible from age 60 but it only applies to workers who started their contributive career before 1967. The normal retirement age is 65, although some professional groups have lower normal retirement ages (miners, military personnel, policemen and

[1] People enrolled in any of the Special Regimes (RESS) either have no access to unemployment benefits (self-employed and household employees) or have special unemployment programs (farmers and fishermen).

[2] 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. [1999].

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

	Unemployment insurance	Disability Insurance	Private pension plan	Social security benefits
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 public programs provide benefits for dependants.
(2). There are age bonuses for certain professions, allowing for retirement before 60.

fishermen are the main ones). Collective wage settlements often impose mandatory retirement at age 65, facilitate retirement at 64 with full benefits, or encourage retirement between 60 and 63 through lump sum payments.

2.2 Social Security regimes and their rules

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

- The "General Social Security Scheme" (*Régimen General de la Seguridad Social*, or RGSS) and the "Special Social Security Schemes" (*Regímenes Especiales de la Seguridad Social*, or RESS) cover, respectively, the private sector employees and the self-employed workers and professionals. The RGSS covers also the members of cooperative firms, the employees of most public administrations other than the central governments and all unemployed individuals complying with the minimum number of contributory years when reaching 65. The RESS include five 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.

- The scheme for government employees (*Régimen de Clases Pasivas*, or RCP) includes public servants employed by the central government and its local branches. In this study we do not consider this regime.

Legislation approved by Parliament in 1997 established the progressive elimination of all the special regimes but RETA by the end of year 2001. At the moment, however, this piece of legislation has not been implemented, and the special regimes are still active.

2.3 Rules of the RGSS

This subsection describes the rules governing, since 1985, the old-age and survivors pensions in the RGSS. The changes introduced by the 1997 reform (R97) and the 2002 (A02) amendment 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 2.

Financing and Eligibility

The RGSS is a pure pay-as-you-go scheme. Contributions are a fixed proportion of covered earnings, defined as total earnings, excluding payments for overtime work, between a floor and a ceiling that vary by broadly defined professional categories. Currently, eleven categories are distinguished, but the effective number of ceilings and floors for covered earnings is only four.

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 any kind of employment requiring affiliation to the Social Security system.

Benefit computation

When eligibility conditions are met, a retiring worker receives an initial monthly pension P_t equal to

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

where the benefit base (*base reguladora*) BR_t is a weighted average of covered monthly earnings over a reference period that consists of the last 8 years before retirement

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

where W_{t-j} and I_{t-j} are earnings and the consumer price index in the j-th month before retirement. Pensions are paid in fourteen annual installments, hence the division by 112 in the previous formula.

The replacement rate α_n depends on the age of the retirees and on the number of years of contribution. When age is below 60, $\alpha_n = 0$ for all n. For age equal or larger than 65, α_n is equal to

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

In the case of early retirement, i.e. for ages between 60 and 65, α_n is determined by the previous formula multiplied a penalization factor. The latter is equal to .60 at 60, and increases of .08 each year, until reaching the value of 1.0 at age 65.

Beginning in 1997, the number of reference years used for computing BR_t has been increased by one every year until 2003, to reach a total of 15 years. The formula for computing α_n has been changed to the following

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

The penalization factors have, basically, remained the same, exception made for workers with 40 or more years of contributions (details in the next subsection).

The A02 amendment allows for the possibility of α_n being greater that one when people are above 65 years of age, that is

$$\alpha_n = 1 + .02(a - 65), \qquad \text{if } 65 \leq a \quad \text{and} n \geq 35,$$

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 and the 2002 amendment when examining alternative policies (see respectively R97 and A02 in Section 7).

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

Early retirement

The normal retirement age is 65 but early retirement at age 60 is permitted as a general rule for those who became affiliated to the Social Security system (*Mutualidades Laborales*) before 1967. The replacement rate for early retirees is reduced by 8 percentage points for each year under age 65. Starting from 1997, workers who retires after the age of 60 with 40 or more contributive years are charged a penalty of only 7 percent for each year under age 65. The 2002 amendment has modified further the rules determining the replacement rate. It now reads as follows

$$\alpha_n = \begin{cases} 0, & \text{if } a < 61, \\ 1 - \kappa(a - 60), & \text{if } 61 \leq a < 65, \\ 1, & \text{if } 65 \leq a. \end{cases}$$

where,

$$\kappa = \begin{cases} 0.08 & \text{if } n = 30, \\ 0.075 & \text{if } 31 \leq n \leq 34, \\ 0.07 & \text{if } 35 \leq n \leq < 37, \\ 0.065 & \text{if } 38 \leq n \leq < 39, \\ 0.06 & \text{if } 40 \leq n. \end{cases}$$

Unless a collective labor agreement prescribes mandatory retirement, individuals may continue working after age 65. Before 2002 there were no incentives to work past age 65. As mentioned, the 2002 legislation now allows for

$$\alpha_n = 1 + .02(a - 65), \qquad \text{if } 65 \leq a \quad \text{and} n \geq 35,$$

and eliminates social security contributions for workers meeting the eligibility criteria for full normal retirement ($a \geq 65$ and $n \geq 35$) who continue working.

About ten percent of the workers enrolled in the RGSS is actually exempt from reduction in the replacement rate in case of early retirement. This applies to a number of privileged categories (bullfighters, employees of railroads, airlines, and public transportation, for example), or to workers who were laid off during cases of industrial restructuring regulated by special legislation. These exemption rights are "portable" in proportion to the number of years spent working in the privileged sector.

Maximum and minimum pension

Pensions are subject to a ceiling, legislated annually and roughly equal to the ceiling on covered earnings. The 2000 ceiling corresponds to about 4.3 times the minimum wage (*salario mínimo interprofesional*, or SMI) and about 1.6 times the average monthly earnings in the manufacturing and service sectors. If the initial old-age pension, computed as above, is below a minimum, then the minimum pension is paid. The latter is also 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 the rate of inflation. 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. The percentage of RGSS retirees receiving a minimum pension has been declining steadily, from over 75 percent in the late 1970s to 27 percent in 1995.

Family considerations

A pensioner receives a fixed annual allowance for each dependent child that is younger than 18 or disabled. In 2000, this allowance was equal to 48,420 pesetas for each child under 18, and to 468,720 pesetas (45 percent of the annualized minimum wage) for each disabled child.

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 working, 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 the last earnings.

The surviving spouse gets 45 percent of the benefit base of the deceased (46 percent after the 2002 amendment, fraction that will be increased further in the forthcoming years). 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.

Each of the surviving children gets 20 percent of the benefit base until the age of 18 (amount raised to 23 per cent in 1997). An orphan who is the 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 the 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.

2.4 Special schemes

In this section we sketch the main differences between the general and the special schemes. Whereas rules and regulations for sailors and coal miners are very similar to the ones for the general scheme, special rules apply to self-employed, farmers, agricultural workers, domestic helpers and a few

other categories not discussed here, such as part-time workers, artists, travelling salespeople, and bullfighters. Beside differences in the SS tax rate and the definition of covered earnings, an important difference is the fact that the affiliates 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 farmers (REA), which together represent 93 percent of the affiliates to the special schemes, and 86 percent of the pensions 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 2000), 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 until they reach age 50. After that age one observes a sudden increase in reported covered earnings. This behaviors exploits the "finite memory" in the formula for the calculation of the initial pension.

In 2000, the RETA contributive floor and ceiling were equal to 116,160 pta and 407,790 pta per month respectively, corresponding to 1.4 and 5 times the minimum wage, and to .5 and 1.9 times the average earnings in manufacturing and services. To reduce misreporting of earnings on the part of the self-employed, a different ceiling applies to self-employed aged 50+ who had not reported higher earnings in previous years. In 2000 the later was only 219,000 pta per month, roughly equal to 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.

Other important provisions are the following: RETA only requires 5 years of contributions 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 the 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 19.75 percent of a tax base that is legislated annually and is only weakly related to average earnings. In 2000, this was equal to 91,740 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 also 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.

3 Key ingredients of the retirement models

In this section we review the main steps taken in order to estimate reduced form retirement models. First we describe the sample and the characteristics of the earning processes. Then we construct

Table 2: Pension provisions, institutions and systems

Institutions	RGSS System 1985–1996	RGSS System after 1997
Provisions affecting all individuals		
A. Basic ingredients		
A1.The benefit base formula	$\frac{1}{96}\left(\sum_{j=1}^{24} BC_{t-j} + \sum_{j=25}^{96} BC_{t-j}\,\frac{I_{t-25}}{I_{t-j}}\right)$	$\frac{1}{180}\left(\sum_{j=1}^{24} BC_{t-j} + \sum_{j=25}^{180} BC_{t-j}\,\frac{I_{t-25}}{I_{t-j}}\right)$
–Contribution period	8 years	15
–Fraction actualized	6 years	13
A2. Fiscal system		
–Income tax	[progressive]	id.
–labor tax	linear (regime and group specific)	id.
B. Replacement rates		
- Function of contributive years	$\begin{cases} 0, & \text{if } n<15,\\ .6+.02\,(n-15), & \text{if } 15\le n<35,\\ 1, & \text{if } 35\le n. \end{cases}$	$\begin{cases} 0, & \text{if } n<15,\\ .5+.03\,(n-15), & \text{if } 15\le n<25,\\ .8+.02\,(n-25), & \text{if } 25\le n<35,\\ 1, & \text{if } 35\le n. \end{cases}$
- Function of age	$\begin{cases} 0, & \text{if } a<60,\\ .6+.8(a-60), & \text{if } 60\le a<65,\\ 1, & \text{if } 65\le a. \end{cases}$	exception for $n\ge 40$: $\begin{cases} 0, & \text{if } a<60,\\ .65+.07(a-60), & \text{if } 60\le a<65,\\ 1, & \text{if } 65\le a. \end{cases}$
Provisions affecting particular individuals		
C. Income tax exemptions		
–Max pension exempted	$\propto$ Minimum wages	id.
–Max income exempted	$\propto$ Minimum wages	id.
D. Min/Max contributions		
–Min level of contribution	(specific for 12 group)	id.
–Max level of contribution	(specific for 12 group)	id.
E. Min. and Max. pensions		
–Min pension	$\propto$ minimum wages and family specific	id.
–Max pension	4.3 minimum wage (in 1995)	id.
F. Age bonuses	YES (occupation specific)	id
G. Survivor benefits	0.45 × (benefit base)	id
H. Dependant benefits	18, 22 (means tested)	18, 23 (means tested)

Eligibility	2 years contrib. last 10 years	2 out of last 15 years
Pension computation	$b_t = max\{min\{\tilde{b}_t[n,e,BR(BC,I)]\,,\,\bar{b}_t\}\,,\,\underline{b}_t\}$ 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.	

2002 Amendment	
-Scheme for early retirement	$\alpha_n = \begin{cases} 0, & \text{if } a<61,\\ 1-\kappa(a-60) & \text{if } 61\le a<65,\\ 1 & \text{if } 65\le a. \end{cases}$ where $\kappa = \begin{cases} 0.08 & \text{if } n=30\\ 0.075 & \text{if } 31\le n\le 34\\ 0.07 & \text{if } 35\le n\le< 37\\ 0.065 & \text{if } 38\le n\le< 39\\ 0.06 & \text{if } 40\le n. \end{cases}$
-Premium for late retirement	α_n= 1 + 0.02 (a-65)iff $n\ge 30$
-Social Security contributions:	No contributions for workers 65+, provided $n\ge 35$
-Survivor benefits	0.46 × (benefit base)

the various measures of Social Security incentives. In the last part we review the results from the estimated models.

3.1 The Sample

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 consists of 250,000 individual work histories randomly drawn from the historical files of SS affiliates (*Fichero Histórico de Afiliados* or FHA). The sample includes only individuals aged 40+ on July 31, 1998, the date at which the files were prepared. The sample contains individuals from the RGSS and the five special regimes, RETA, REA, REEH, RTMC and RTMAR. As we mentioned above, civil servants and other Central Government employees are not covered by the SS Administration and are not considered in this study.

The data set consists of three files. The first file ("History file", or H file) contains the work history of the individuals in the sample. Each record in this file describes a single employment spell of the individual. As we argue below, the work histories are very accurate for spells or histories which began after the mid–1960s. The second file ("Covered Earnings file", or CE file) contains (annual averages) of covered earnings (*bases de cotización*) from 1986 to 1995. The third file ("Benefits file", or B file) contains information on the lifetime SS benefits received by the individuals in the sample. Benefits are classified by function (retirement, disability, survival, etc.) and initial amount received. To be more precise, the benefits file contains the initial benefit amount and the length of the period during which the benefit was received. A fourth file ("Relatives file", or R file) is also available; it reports some benefits 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 file reports the annual average of covered earnings together with the contributions paid. For individuals enrolled in either the RGSS or the RTMC, covered earnings are a doubly censored (from above and below) version of real earnings. This is due to the existence of legislated ceilings and floors, as reported earlier. For people enrolled in SS regimes other than RGSS and RTMC, covered earnings are chosen by the individual within given ceilings and floors (see Section 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 HLSS-H file, we know age, sex and marital status of the person, the duration of the spell (in days), the type of contract (in particular, we can distinguish between part-time and full-time contracts), the social security regime, the contributive group, the cause for the termination of the spell, the sector of employment (4-digits SIC), and the region of residence (52 Spanish provinces). For each individual in the H file who has received some benefits at any point in time, we know most of the information that the SS Administration uses to compute the monthly benefits to be paid. In particular, we know the initial and current pension, the benefit base (*base reguladora*), the number of contributive years, the current integration toward the minimum pension (*complementos por el mínimo*), the date pension was claimed, the date it was awarded, the type of benefits, etc. See Boldrin et al. [2001b] for a description of the demographic characteristics of the sample and the sample selection rules.

3.2 Earnings distribution, earnings histories and projections

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 very weakly related to true earnings for workers in the RETA because of the presence of both legislated tariffs and widespread tax fraud.

RGSS and RTMC

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

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

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

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

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

  We further correct backwards the log of average earnings to control for the variation of the average productivity of the Spanish Economy in the period 1960-1985, that is the time horizon of our backward projection.

RETA

As already pointed out, for individuals enrolled in the RETA, covered earnings are very weakly related to true earnings. The self-employed are free to choose their benefit base between an annual floor and a ceiling and, practically, all of them choose the floor. This implies that there is no way in which true earnings for the self-employed can be recovered from the HLSS data set. We are therefore forced to assume that the earnings and the contributive profile coincide. Thus, we project (real) earnings given the observed profile of (real) contributions as follows:

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

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

It is important to recall, from Section 2, that current Spanish legislation allows the self-employed to begin drawing retirement pensions without retiring, at least as long as they keep managing their own business. Hence, in the dynamic choice of the self-employed, the opportunity cost of retiring is not measured by the loss of future earnings but, instead, by the fact that contributions cannot longer be accumulated to increase future pensions, and marginal income taxes must be paid on pensions. This implies that, for the self-employed, maximization of the (net of taxes) Social Security payoff is a very reasonable objective function.

3.3 Evaluation of Social Security incentives

Assumptions

For every male worker in the "wage sample" who is enrolled either in the RGSS or in 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 benefits, (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 age 65, there are three pathways to retirement: the UB52+ program, DI benefits and early retirement. At each age, an individual has an age-specific probability of entering retirement using any of these three programs. However the following restrictions are important in characterizing the actual usage of the three pathways to retirement:

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 benefits.
3. A self-employed person enrolled in RETA can never claim UB52+ benefits.

This implies that, in practice, pathways for retirement are relatively simple. For people in the RGSS either they retire before 60 via the UB52+ or the DI benefits program or they retire after 60 via the DI (most unlikely, though, since 1992) or the R program. People in the RESS either go via the DI benefits or the R program, with the likelihood of the former being low and decreasing from age 60 onward.

Calculating SS incentives

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

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

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 define three incentive variables for a worker of age a:

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

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

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 flow of pension benefits is greater than the expected present value $\rho_{a+1}B_{a+1}(a)$ of the

pension benefit foregone by postponing retirement. If the increments $B_s(a+1) - B_s(a)$ are small, as it is usually the case, then the SSA is negative. The re-scaled negative accrual $\tau_a = -\,\mathrm{SSA}_a\,/W_{a+1}$, 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* $\mathrm{PV}_a = \max_h\{\mathrm{SSW}_h - \mathrm{SSW}_a\}$, $h = a{+}1, \ldots, R$, where R is a mandatory retirement age (which does not exist in Spain, but given the retirement evidence we find it reasonable to assume $R = 70$). Thus, the peak value is the maximum difference in SSW between retiring at any future age and retiring at age a.

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

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

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

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

is the total expected utility of retiring at age $h > a$. Thus, the option value is the maximum utility difference between retiring at any future age and retiring at age a. We parameterize the model by assuming $\beta = .97$, $\gamma = 1$ and $k = 1.25$. Under our assumptions, $V_a = 1.25\ \mathrm{SSW}_a$ and

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

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

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

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

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 benefits, DI disability benefits and R the retirement programs) as follows

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

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+ benefits, the combined incentives from age 55 to age 59 for members of this group change to

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

We have followed a regression based approach to compute the unconditional probability of qualifying for a disability pension (see Boldrin et al. [2001b] for a description).

Table 3: 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	-1.848	.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	-2.457	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

m.e.: marginal effect; M1: model with a linear age trend; M2: model with age dummies

3.4 The reduced form retirement model

This section briefly illustrates the explanatory power of our incentive measures (accrual, peak value, and option value) for retirement behavior. The results reported here are distilled from the extensive econometric analysis conducted in Boldrin et al. [2001b], to which the reader is referred for all relevant details.

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

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

where R is a binary indicator of retirement, Φ is the distribution function of a standard normal, I denotes the incentive measure, and X is a vector of predictors which include individual earnings and socio-demographic characteristics. The socioeconomic and earnings information is richer for the RGSS than for the RETA. This, coupled with the widespread mis-reporting of earnings that characterizes the affiliates to RETA, makes a quantitative analysis of their retirement patterns a very difficult task. Regression results for RETA, in fact, are much poorer than those for RGSS and, in any case, should be taken with caution.

For each one of the three incentive measures (accrual, peak and OV) we have used the following specification for the set of predictors X. The latter contains, an eligibility dummy for attainment of a minimum of 15 years of contributions; three industry-specific variables: the fraction of collective wage settlements having a clause favoring early retirement, the presence of rules permitting retirement at age 64 without penalty, and the existence of mandatory retirement at age 65; different measures of seniority on the job and in the labor market (length of the current employment spell and its square, number of years of contribution and its square, number of years since first employemnt); dummies for schooling level and contributive group (only for people in the RGSS); dummies for part-time work and sector of occupation (only for people in the RGSS); the expected wage and our estimate of the lifetime earnings net present value, and their squares; the net present value of expected wages until the year in which either the peak value or the option value reach their maximum.

A summary of estimation results

The results obtained for each incentive measure are presented, separately by sex and Social Security regime, in Table 3. In each case we have considered two specifications for the age effect: a linear time trend (M1) and age-specific dummies (M2). The models have been fit 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. 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.

Quite obviously, M2 provides a uniformly better fit than M1 and, in particular, captures the hazard peaks at 60 and 65, which M1 fails to fit; on any other respect, though, the qualitative and also most of the quantitative performances of the two models are equivalent. Hence, the comments that follow apply, unless stated otherwise, to both specifications. The SSW term is positive and significant in all cases. Contradictory results are obtained instead for the three incentive variables. In fact, while the accrual usually shows the expected (negative) sign, both the peak and the

option value show the wrong (positive) sign. Further, neither SSW nor the incentive variables are significant for people enrolled in RETA, indicating that the SSW and the financial variables do not capture retirement incentives for individual enrolled in RETA. Measures of fitness, as the R^2 are either mediocre or poor, suggesting that a great deal of retirement variability cannot be captured by our incentive indicators. This is particularly true for people enrolled in the special regimes (RETA). These, relatively poor results are discussed at length in Boldrin et at. [2001b] and we will not go back to them here. They do suggest, though, that the quantitative impact that a change in the financial incentives may have on the predicted retirement behavior, is bound to be either negligible or small. The implied probability effects are minuscule, suggesting that only abnormally large variations in the incentive measures may be able to have a quantitatively sizable effect on early retirement. As a consequence of this fact, when evaluating the policy reforms we concentrate our attention mostly on changes in SSW and on the effect of variables other than the pure financial incentive variables. As the forthcoming analysis underlines, reforming the legislated early and normal retirement age appear to be the most reliable and effective way of altering existing retirement patterns.

4 Simulation methodology

4.1 Policy Simulations

The main aim of this paper is to investigate the budgetary implications of pension system reforms. In the simulations we consider five policies, of which the last two are specific to the Spanish case:

R1: 3-year reform. A reform of the existing system consisting of a three-year increase in both the Early and the Normal Retirement Age (or ERA and NRA respectively), while keeping all other aspects of the Spanish SS system unchanged.

R2: Actuarial Adjustment reform. This reforms introduces the following change to the base Spanish pension system: a 6% annual actuarial adjustment per year away from the Normal Retirement Age. Benefits become available at the existing ERA (60), and retirements after the NRA receive a positive 6% adjustment per year. This actuarial adjustment is also applied to disability benefits.

R3: Common reform. This reform implies the following changes to the base system: (i) ERA at 60, (ii) NRA at 65, (iii) a replacement rate at age 65 equal to 60 percent of the gross (but net of the employers contributions) average lifetime earnings (on the best 40 earnings years before retirement or the first age of elegibility, whatever comes first), and an actuarial adjustment of 3.6 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. Also, 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 retirement regime created by the 1997 Spanish reform.

A02: The previous regime as altered by the amendment introduced in 2002.

We recall that the 1997 reform, described in Section 2, implies the following changes in the basic benefit formula and in the penalties related to age and contributive history: (i) the number of years of contribution used to construct the benefit 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 insufficient contributions is such that the replacement rate (ratio between pension and BR) is

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

The 2002 amendment has introduced the following changes, which are also illustrated above in Section 2: (i) a generalized penalization rule for early retirement, starting at age 61; (ii) a new incentive scheme for those retiring after the age 65 with, at least, 35 years of contributions; (iii) an increase in survivor benefits.

For each of the five policies we carry out the following simulations:

S1: Starting from the model with a linear trend (M1), we modify the SSW and incentive measures in accordance with the new policy. Specifically, in the calculation of SSW we increase by three years the early and the normal retirement ages and shift by three years the age-specific probability of receiving DI-UI benefits.

S2: Starting this time from M2, we modify the SSW and incentive measures according to the assumed policy changes. We also change the probabilities of receiving DI benefits, by setting them to zero after age 60, but leave untouched the coefficients on the age dummies.

S3: Again using M2, in addition to the changes described in S2, we also shift the coefficients on the age dummies by three years, so that the entire age-profile of the retirement hazard shifts forward by three years. Specifically, in the calculation of SSW we increase by three years the early and the normal retirement ages, and shift by three years the age-specific probability of receiving DI-UI benefits.

4.2 Simulation sample

We use individuals born in 1940 (aged 55 in 1995) extracted from the sample described above, since the zero real growth assumption seems to be very unrealistic for younger cohorts. We have concentrated on workers enrolled in either the General Regime (RGSS) and the Self-employed regime (RETA). These two groups cover practically 90 percent of the affiliates to the Spanish Social Security.

Given that the base sample (HLSS) is not completely representative of the regional distribution of Spanish employment, we have constructed a balanced random sample by sampling (with replacement) from the HLSS using the population weights of the six territorial areas in which Spain is divided by EPA (Labor Force Survey). The re-balancing procedure has been further refined by taking into account, within each of the six regions, the composition of the labor force by sex and by contributive regime. In a second step ,weights have been assigned to each observation in order to replicate the population number of workers born in 1940 who where active in the labor market in 1995 (farmers and civil servants excluded).

4.3 Baseline case and family assumptions

Our baseline case makes the same assumptions as in Boldrin et al. [2001b] with regard to interest and mortality rates. The other assumptions are illustrated next.

Marital status assumptions

We have used family data from the Spanish Labor Force Survey (EPA) to obtain information on the marital status of individuals born in 1940. The main findings, which we try to replicate in our simulations, are the following:

- **Male:** 95 percent married and 5 percent single. Among those married, 75.2 percent have a non-working spouse and the rest a working spouse. In both cases the (average) spouse is born in 1943 (aged 52).
- **Female:** 74 percent married and 26 percent single. Among those married, 34.5 have a non-working spouse (presumably retired) and the rest a working spouse. In both cases the (average) spouse was born in 1937 (aged 58).

Two remarks are relevant with respect to the way in which the benefits of survivorship are handled in the simulation exercises.

a) Since survivor and retirement benefits are fully compatible (up to the amount of the maximum pension) there is no necessity to correct for double counting in the Spanish case. Whenever the maximum pension ceiling is supposed to take effect, this is applied to the total pension payments accruing to the survivor.

b) Survivor benefits accruing to members of the 1940 cohort in force of their having a working spouse are not accounted for (i.e. are not included in the computation of the SSW for a member of the 1940 cohort) since they are included in the computation of benefits for the cohort the spouse belongs to.

Dependant assumptions

As noted previously, our data set does not provide sufficient information either on marital status or on the number and age of dependants. In our projections we handle this inconvenience by using information extracted from the Spanish Labor Survey over the 1995-2001 period. From such data we compute the average number of dependants (per worker) in each of the six regions (Catalonia, South, Centre or Castilla, Madrid, East and North). We also distinguish by sex and age of the individual worker. In other words, we assume that the factors determining the number of dependants are: age, sex and region of residence. Then we regress the data so collected, for each one of the seven years comprised by the EPA sample, and for each region of residence and sex cell, with respect to the age of the worker and its square. Next, we use these regressions to predict, for people born in 1940, the average number of dependants when they reach the age between 55 and 70. After that age we assume that the number of dependants (spouse excluded) drops to zero. In order to impute the benefits for dependants in the calculation of the SSW, we assume that all of them receive the legislated minimum (see Boldrin et al. [2001a] for data and legislation).

4.4 Computing expected expenditure for those that retire before 55

The target here is to estimate the total expenditure for pension payments to those members of the 1940 cohort that retired before the year 1995 (i.e. before reaching the age of 55) and whose retirement behavior we will not try to model. While during the 1980s and early 1990s the number of Spanish workers retiring before age 55 was considerable, this practice has been dropping remarkably fast during the last decade. As we have already pointed out elsewhere, this is due to a substantial tightening of the requirements for accessing DI benefits and the sharp reduction in the usage of subsidized early retirement as an instrument for handling industrial restructuring.

The relevant information in our sample has the following form. We have the information on the initial benefits for all the workers belonging to the 1940 cohort who retired before 1998 (age 58). This allows us to reconstruct the SSW of those workers in pesetas of the reference year (1995 in our case). To proceed further we need three additional assumptions

- Anybody retiring before the age of 55 did it through the DI program.
- None of the five reforms being considered will affect the benefits of those workers who retire before the age of 55 by means of the DI program.
- The marital status and the number of dependant entitled to benefits for people in this group are the same as for the average member of the cohort.

This allows us to estimate the (after income taxes) net present value, in million of 2001 Euros, of the SSW attributable to members of the 1940 cohort who retired before the age of 55. This is EURO 1,360.4 and 289.6, for male and females, respectively. These values are to be added to those obtained in tables 9 and 10.

4.5 Computing expected expenditure

Our aim is to compute the lifetime NPV of the pension expenditure for a given cohort C aged a in year t. We are endowed with a sample of N observations from which we want to project expenditure for a working population of size M. There are two ways of leaving the labor force: retirement and death. Under such circumstances, the expected net present value of the benefits payments for person i of cohort C is given by:

$$NPVBP_i = \sum_{h=a}^{S} [\pi_{hi}(R;X)\,\mathrm{SSW}_{hi} + \pi_{hi}(d;X)\,\mathrm{SSW}^d_{hi}]; \quad i = 1,..,N$$

where $\pi_{hi}(R;X)$ and $\pi_{hi}(d;X)$ are, respectively, the conditional probabilities (at age a) of retirement and death at age h. Both or them may depend or not from individual characteristics (X). In our exercise the retirement probabilities do depend on individual characteristics and the probability of dying does not (except for the sex of the individual). Obviously, the retirement probabilities at each age depend on individual characteristics in accordance with the retirement probabilities estimated above.

Selecting the adequate weights (which depend on individual characteristics) for each observation and summing up over individuals we obtain the projected benefits payments for a given cohort C:

$$NPVBP_C = \sum_{i=1}^{N} NPVPE_i \cdot W_i(X); \quad i = 1,..,N$$

Table 4: Population factors for the 1940 cohort in 1995.

	Work Force	Fraction	Work Force	Fraction
RGSS:	Male		Female	
Catalonia	2427278	.1920417	862297	.1806272
South	2655976	.2101359	1299916	.2722962
Castilla	888563	.0703015	476717	.0998589
Madrid	2441918	.1932	71427	.1496197
East	2063698	.163276	813333	.1703706
North	2161893	.171045	607372	.1272275
RETA:	Male		Female	
Catalonia	623986	.1615313	85814	.0700625
South	989671	.2561962	312326	.2549975
Castilla	308444	.0798469	148902	.1215705
Madrid	497341	.1287467	242192	.1977368
East	767909	.1987886	249680	.2038504
North	675591	.1748903	185906	.1517823

where $W_i(X)$ is the share of individuals of type i in the population, according to the vector of characteristics X.

The net present value of Social Security contributions is given

$$NPVTP_C = \sum_{i=1}^{N} NPVTP_i \cdot W_i(X); \quad i = 1, .., N$$

where the net present value of Social Security contributions for an individual of type i in cohort C has been computed as

$$NPVTP_i = \sum_{h=a}^{S} (1 - \pi_{hi}(R; X) - \pi_{hi}(d; X))C_{hi}^d),$$

and C_{hi}^d are the social security contributions paid at age h by and individual of type i. Finally, the projected expenditure (benefits - taxes) is given by

$$NPVPE_C = NPVBP_C - NPVTP_C$$

4.6 Elevation to the population

As noted previously (see Boldrin et al. [2001b]) the HLSS data source is not completely representative of the Spanish population. In Table 4 we present the set of population factors we have used in order to make our sample representative of the working population under study. The source of the weights is the 2nd quarter wave of the 1995 Spanish Labor Force Survey (EPA). We distinguish individuals according to two Social Security regimes (RGSS, RETA), six regions (Catalonia, South, Centre or Castilla, Madrid, East and North) and by their sex, for a total of twentyfour different types.

4.7 Income tax and indirect taxes

A full evaluation of the fiscal impact of a social security reform cannot be restricted to the impact that the latter may have on the budget of the Social Security Administration alone. While in many countries, Spain being one of them, the Social Security Administration formally runs a separate budget from that of the central government, such separation is only formal and continuously violated in practical circumstances. So, for example, in the Spanish system the employees of the central government belong to a pension system that is managed directly by the Spanish Treasury and which is financed by general taxation. While the RGSS has been running a current account surplus during the last few years this was not the case in the past and, most likely, will not be the case again in the near future. In previous years, the annual deficits of the RGSS (and of the various regimes listed in the RESS) were covered by transfers from the central government. In fact, part of the current surplus of the RGSS is due to the fact that, progressively, since the 1985 reform a number of functions pertaining originally to the RGSS have been transferred or are being financed directly by general taxation (INSERSO, non contributive pensions, part of the minimum pension payments, some disability payments, etcetera). More generally, it is quite obvious that surpluses and deficits of the public pension system are surpluses and deficits of the central government, which guarantees the payment of future pensions via its power of taxation, and which considers the net present value of current and future pension entitlements as part of the public debt. This implies that a full picture of the fiscal effect of a reform can be achieved only by adding to the net present value calculations we just illustrated, the impact of changing work and retirement patterns on other sources of fiscal revenues.

Among the latter, income taxes take the lion share. By retiring, not only an individual stops contributing to the pension system and starts drawing a pension; it also starts paying income taxes on a pension which is usually substantially smaller than the previous labor income. This effect is further magnified by the existence, in many countries, of a strongly progressive income taxation and a number of exemptions for low incomes, among which pensions loom large, at least in the case of Spain. Finally, moving from work to retirement implies also a number of changes in the consumption habits of an individual, which may also affect his or her exposure to other forms of taxation, such as VAT. While we do take this effect into account in our estimations, a word of caution should be added. Most of the VAT impact is due not so much to changes in the composition of consumption baskets (VAT rates are fairly homogenous) but to the lower income level of pensioners. One is therefore lead to assume, as we do here, that a relatively stable relationship exists between income and sales/consumption taxes. While this may be a correct first order approximation, it should be interpreted with care as it may easily overestimate the reduction in indirect taxation that follows retirement. The reason is obvious: VAT is a consumption tax, hence the portion of disposable income which is saved is not burdened with VAT. Saving propensities drop substantially after retirement, which may imply that the amount of VAT paid, as a percentage of one's income or income taxes does not stay constant bur increases after retirement.

These caveats notwithstanding, we proceeded as follows. For each individual in the 1940 cohort, and for each age from 55 onward, we computed the total income taxes paid; that is the sum of the income taxes paid as an active worker (assuming that our estimated labor income at that age, and in that year coincided with the totality of his/her income) and as a retiree (again, assuming the pension received coincided with her/his total income). Additionally, we have tried to impute the VAT taxes paid starting from the income taxes and multiplying by a VAT factor defined as :

$$VAT = PT/T$$

where PT consists of VAT plus other sale and consumption taxes, and T are total income taxes. The resulting VAT factor, using National Accounts data for 1995-2001 (source: Bank of Spain website www.bde.es) is 0.92.

The total tax receipts from a pension system, ignoring the general equilibrium effects, are therefore given by:

Total Taxes = SS contribution + (1+ VAT) Income Taxes

The difference between Total Taxes under the base case and under each of the five reforms quantifies the fiscal impact of that reform.

5 Results

Overall the results are mixed and, in a sense we should make clear as we proceed with the discussion, not fully satisfactory. Recall our distinction (see introduction) between a mechanical and a behavioral effect of a policy reform. As we argued there, to the extent that individuals which are in the middle, or toward the end, of their working history are faced with a change of rules to which they cannot respond appropriately, the first effect is always present. The second will come around only if two conditions are simultaneously realized: (i) the reform affects the financial incentives to either retire or continue working; (ii) people respond strongly to variations in such financial incentives.

Basically, as one would have expected from the low ability of our reduced form estimations to capture the variability of retirement behaviors, while the five reforms do affect the two incentive indicators, the latter do not induce strong behavioral responses on the part of workers. More precisely, the fraction of workers whom, we estimate, would postpone retirement age is quite small, and the number of years by which retirement is postponed is also small. As a consequence, the overall fiscal impact of the various reforms is due mostly to the mechanical component, with little being added by the change in workers' behavior. While this statement should (and will, see the analysis of individual reforms, regime by regime, in the rest of this section) be qualified, we think it summarizes decently well the overall picture. We are inclined to say that, if our estimations of the behavior of Spanish workers past age 55 were to be taken at face value, then the most effective way of postponing retirement would be, simply, to legislate a shift in the early and normal retirement ages, without bothering to modify the other rules.

5.1 Results by regime and gender

Since the results are fairly homogeneous across sexes, we present only detailed results for males. Results for females are available on request. However, our comments cover both groups without distinguishing among them. Obviously, as female's labor force participation is still substantially low in Spain, the actual magnitude involved are rather different between men and women.

5.1.1 RGSS

We begin our analysis of results from the RGSS. Figure 1 reports SSW by age for the S3 model. We have collected the five reforms in three groups, one for each panel; to allow for easiness of comparison with the status quo, the latter is reported in each panel. In the first panel we compare the status quo with the R1 reform in its two versions, S2 and S3. As S3 differs from S2 only in the retirement hazard, SSW estimates are identical. They are both lower than in the base case, especially at the crucial ages between 55 and 65. The reduction is substantial and, in particular, this reform also

Figure 1: SSW by age of labor force exit. RGSS. Option Value. S3 model.

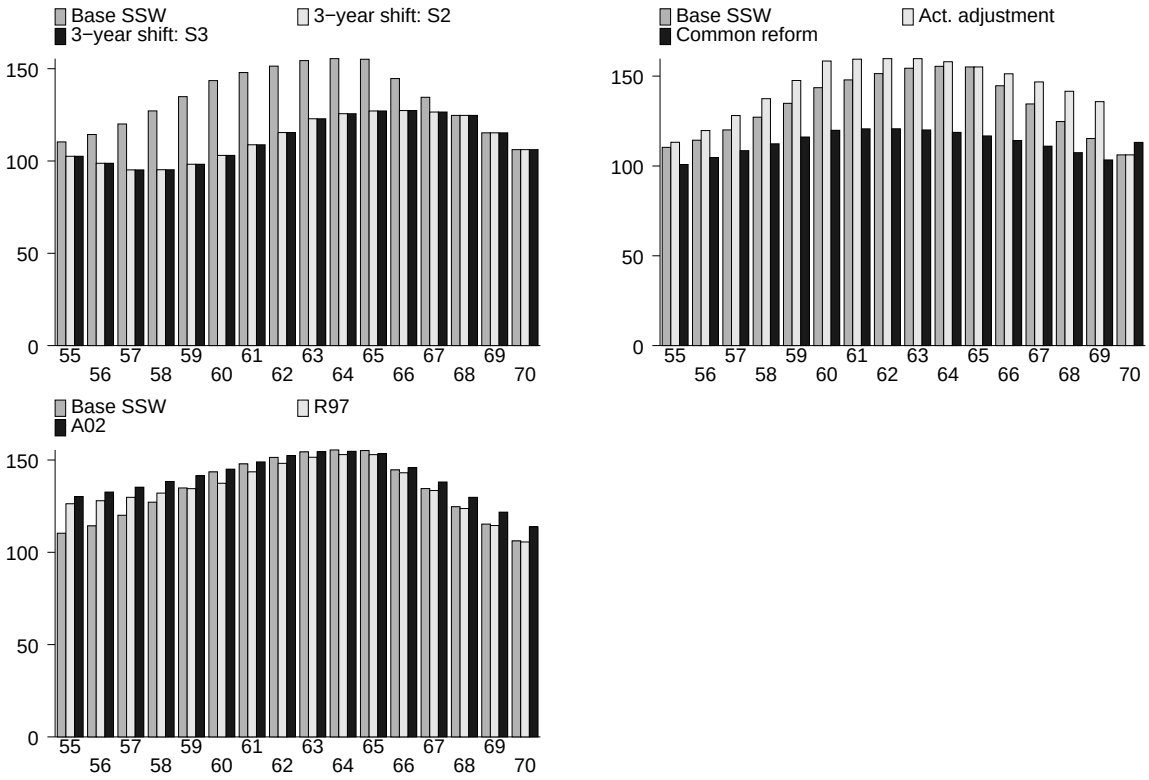
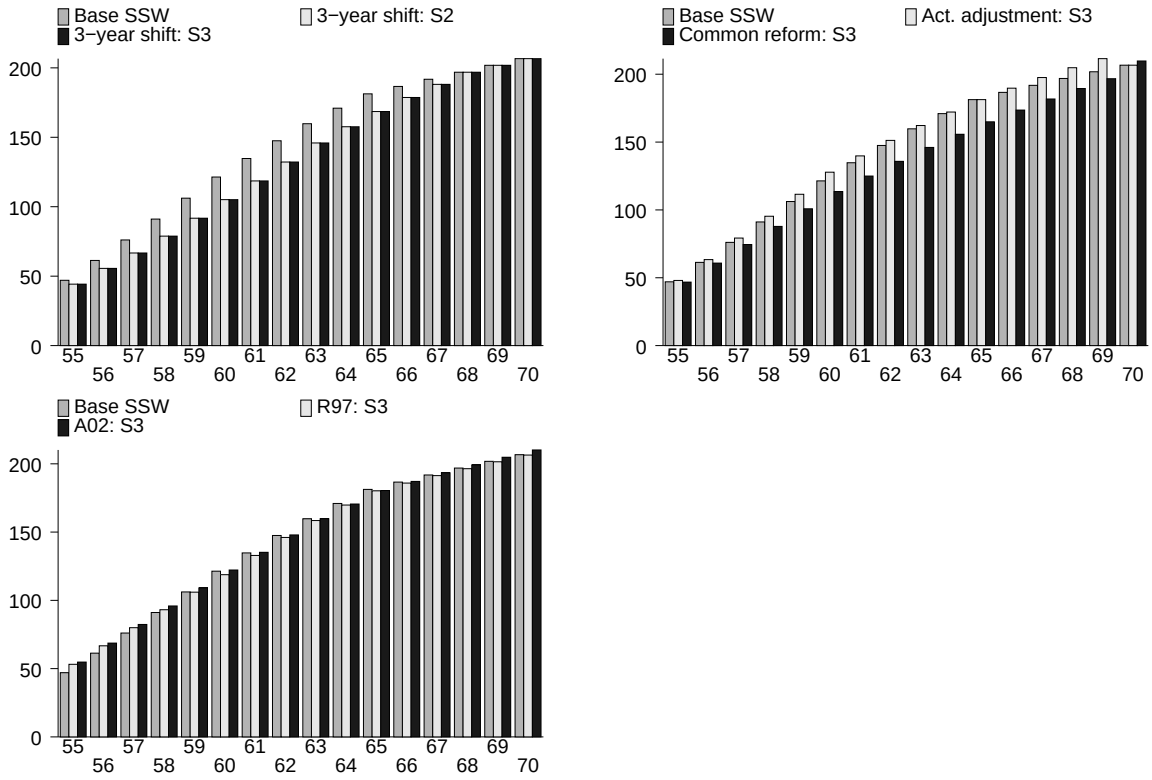


Figure 2: Taxes by age of labor force exit. RGSS. Option Value. S3 model.



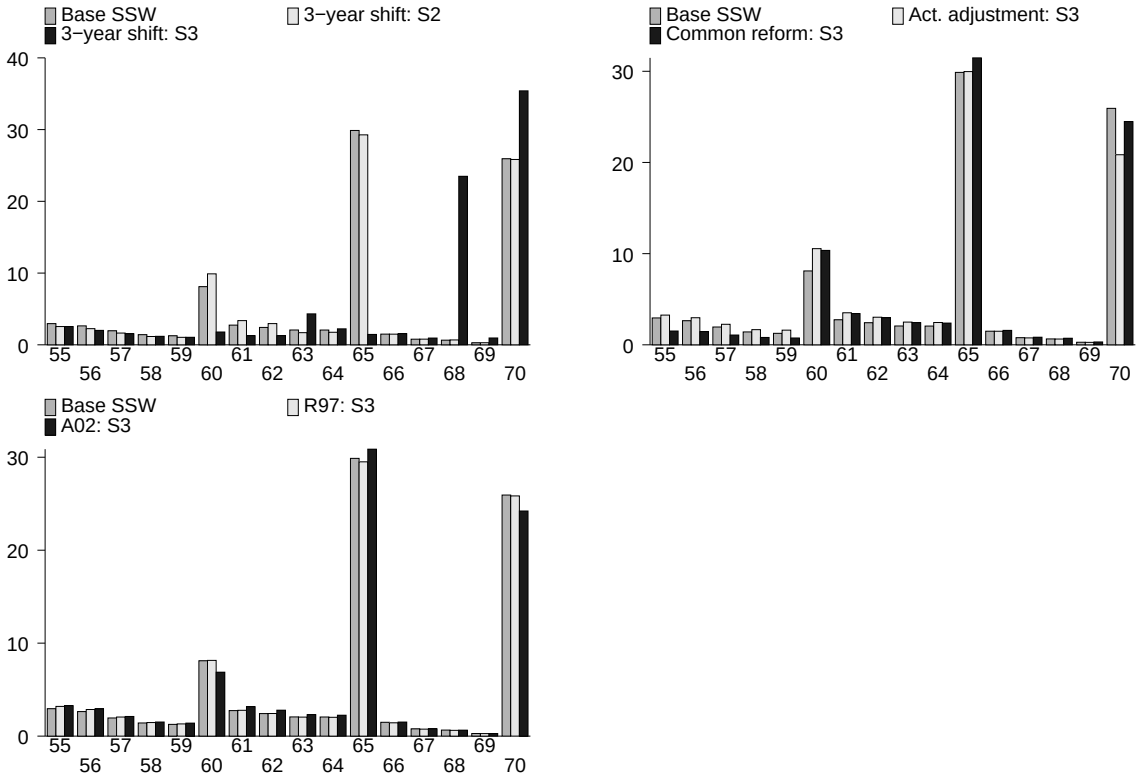
shifts forward the SSW age profile, in such a way that the maximum is now reached at a later age, around 65-67, instead of the current 63-65. A similar, but somewhat less strong reduction in SSW is obtained by the Common Reform R3, while the impact of the Actuarial Adjustment reform, R2, is small. Further, neither R2 nor R3 succeed at shifting forward the age at which SSW is maximized, thereby leaving this incentive to retirement basically unaltered. Things are even less satisfactory for the two Spanish reforms, R97 and A02, reported in the third panel: the age profile of SSW is left unchanged by these reforms. This behavior of the SSW indicator is reflected in that of (cumulated) taxes paid at each retirement age, which are reported in Figure 2. The aggregate behavior seems simple enough to be understandable without comments. The disaggregation of the fiscal impact of reforms is discussed below. In the two upper panels of Figures 5, 6, and 7 we report, by age and for each reform, the estimated total change in gross and net SSW. The reader should not be confused by the different scales used in the various panels. The top two panels of Figure 5 show that the impact of R1 is much stronger on gross SSW under S3 than S2, while the result is mixed, or even reversed, for net SSW. As shown in Figure 6, the impact of R2 is either irrelevant (as it reduces gross SSW only for people retiring very late, while at the same time increasing their net SSW) or it goes in the wrong direction, slightly increasing SSW at earlier retirement ages. Reform R3, instead, does reduce SSW substantially at the normal retirement age and, by an almost negligible amount, at earlier dates (Figure 8, top panels). Finally, top panels of Figure 7, the two Spanish reforms seem to cause a negligible, and most of the time undesired, effect on SSW wealth at all retirement ages considered.

The impact of the five reforms on the distribution of retirement ages can be found in Figure 3, which is also structured in three panels to facilitate comparison. Results are straightforward: R97 and A02 have no impact on retirement ages; both the Actuarial Adjustment and the Common Reform shift the distribution only very mildly to the right, making the peak at age 65 more pronounced. The R1 reform has a much stronger impact, in the S3 version in particular, on the distribution of retirement ages. This is not very surprising. The current peaks at 60 and 65 are moved to 63 and 68, respectively, while the rest remains roughly the same.

Let us now consider closely the fiscal impact of the various reforms. This can be done by studying Tables 5-6. A large amount of information is reported in this tables, hence we outline only the main features. In Table 5 we have reported, for each reform, a breakdown of the different components of the total fiscal impact: reduction in benefits, increase in payroll taxes, variation in income and VAT taxes. The breakdown is calculated for three models (S1 to S3) and using two different financial measures of retirement incentives, the peak and option values. Table 6 summarizes the decomposition of the fiscal effects into the behavioral and the mechanical components, which were discussed earlier in the chapter. The main findings are strikingly simple. First off, neither of the two Spanish reforms make any difference[3], variations are of the same magnitude of rounding errors, and are completely accounted for by the sample uncertainty of our estimations. Among the other three reforms, the Common Reform is the one with largest negative impact on both benefits paid to retirees and tax revenues; the total effect on government revenues is positive because the drop in benefits is about three times larger than the drop in tax revenues (Table 6). While the quantities estimated differ, both the option and the peak value indicators provide the same ranking of effects, and the estimated changes in government revenues and outlays are comparable. Next, in terms of total impact, comes the R1 reform under the S3 simulation procedure, i.e. assuming that retirement ages are effectively shifted three years down, pretty much by fiat. This reform also yields an important improvement of the government net position; most of it comes from

[3]See Jiménez-Martín (1999) or Abío et al. (1999) for previous evaluations. In both cases the estimated effects are of small magnitude

Figure 3: Distribution of age of labor force exit. RGSS. Option Value. S3 model



a reduction in the net present value of benefits, with a small residual due to increase in total taxation. In particular, the substantial increase in payroll contributions generated by the longer work-life is almost completely balanced by the reduction in income and VAT revenues that the reform induces. Next, in terms of change in the fiscal position, is the R1 reform as estimated under the S2 hypothesis; directions of change are the same as in the S3 version but, obviously, the quantities are much smaller. Finally, R2 is predicted to have a negative impact on the fiscal position of government as the small increase in tax revenues it induces is more than compensated by an increase in benefits paid, leading to a small but visible worsening of the government net position.

A second look at table 6 also shows that, as anticipated earlier, the behavioral impact of the reforms we consider is rather limited. Most of the savings comes from the mechanical aspects of the change, i.e. the fact that by suddenly reducing benefits or lenghtening working lifes one captures the workers "off-guard", especially the older workers, and this leads to substantial savings for the public purse. For this reason, mechanical effects are orders of magnitude larger than the behavioral ones, uniformly across reforms and independently of the financial indicator adopted. Notice that, at least in the case of R3 and R1+S3, the relative reduction of government net outlays is substantial, oscillating between -18.0 and -30.0 percent, depending on the financial indicator adopted.

Figure 4: Distribution of age of labor force exit. RETA. Option Value. S3 model

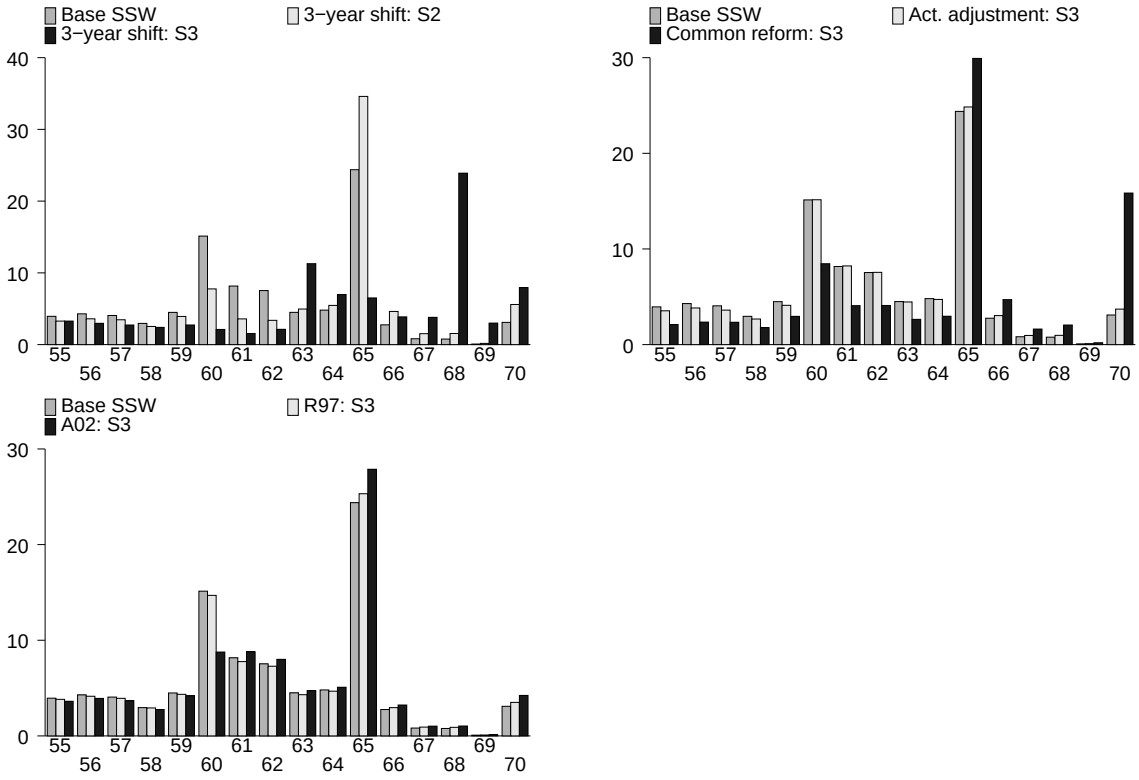
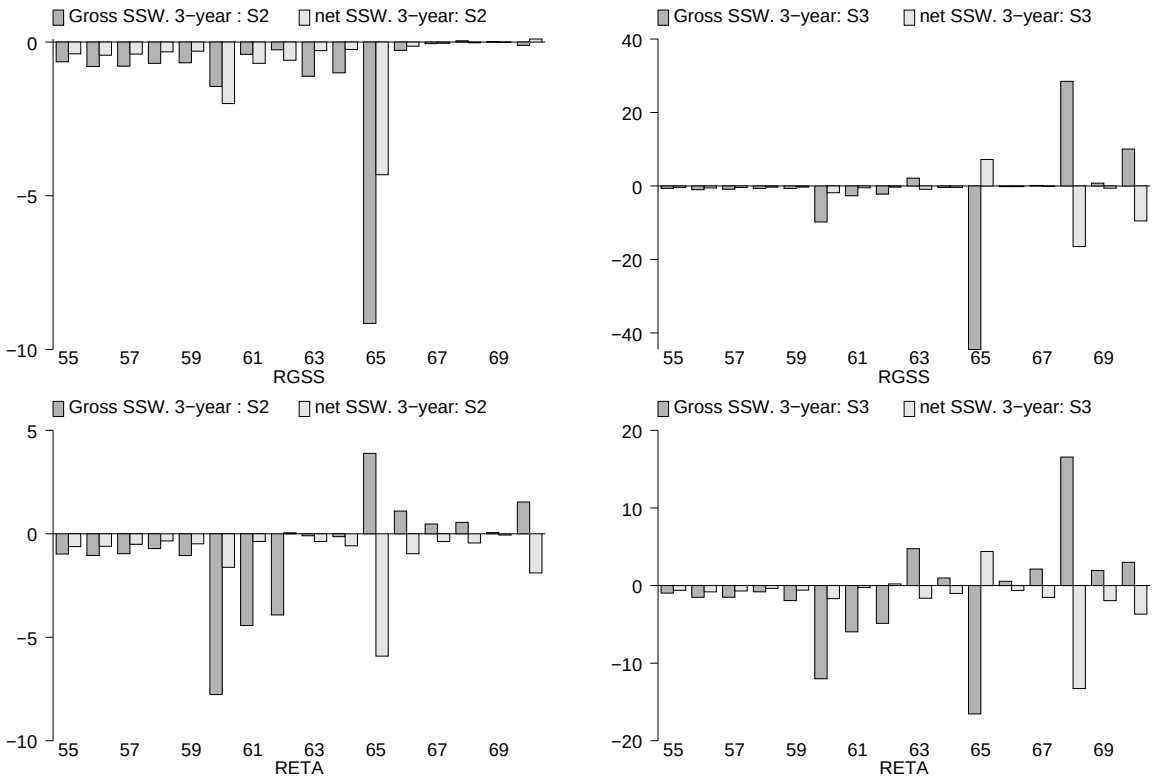


Figure 5: Total effect by age of retirement and regime. 3-year reform. Option Value. S2 and S3 models



5.1.2 RESS

Move next to estimates for workers enrolled in the special regimes, of which RETA is by far the most important, and upon which most of our data rely upon. Results here are dirtier, especially when it comes to forecasting the impact of each specific reform on retirement patterns by age. This is due, as discussed above, to the very low explanatory power of our financial measures of incentive to retirement, which in the case of the self-employed capture a small portion of the actual retirement patterns. In any case, the analysis proceeds in the same fashion as for the RGSS and results are organized likewise. However, we omit the corresponding SSW and tax figures.

The two lower panels of Figures 5-7, contain the relevant information. In Figure 5 we see that, similarly to RGSS, the impact of R1 on gross SSW is substantially stronger under S3 than S2, and that, contrary to RGSS, the same ranking of relative impact applies to net SSW. The impact of R2 is either irrelevant (as it reduces SSW only for people retiring either very early or very late) or it goes in the wrong direction, slightly increasing SSW at currently observed retirement ages (between 60 and 69). Reform R3, instead, does reduce SSW substantially and across the whole spectrum of possible retirement ages, with a somewhat stronger impact at 60 and 65. (Figure 6, bottom panels). Finally, bottom panels of Figure 7, the two Spanish reforms appear to have a small impact, in the correct direction, on the SSW of self-employed people, in particular before and around the normal retirement age of 65. It is important to notice, though, that the amounts involved in this case are quite small, and that the likely impact on retirement behavior is probably negligible.

The likely effect of the five reforms on the distribution of retirement ages can be found in Figure 4. Results in this case seems to be slightly more positive than in the RGSS case, but only by small amounts. The two Spanish reforms, R97 and A02, appear to have some impact on retirement ages, which are pushed slightly to the right; the Actuarial Adjustment instead does not shift the distribution of retirement ages, while the Common Reform moves it visibly to the right, making the peak at age 65 even more pronounced than it already is. The R1 reform has a strong impact, in particular in the S3 version. Compared to the RGSS case of Figure 3, the impact is weaker, still it is the most substantial among those produced by the five reform scenarios.

Finally, we can see the disaggregation of the fiscal effects in Tables 7-8. As before for the RGSS, in Table 7 we have reported, for each reform, a breakdown of the different components of the total fiscal impact: reduction in benefits, increase in payroll taxes, variation in income and VAT taxes. Again the breakdown is calculated for three models (S1 to S3), and using two different financial measures of retirement incentives, the peak and option values. Similarly, in Table 8 we report the decomposition between mechanical and behavioral components. There are quantitative, but not qualitative, differences with the RGSS case described earlier (Tables 5-6). The two Spanish reforms now have a somewhat more visible impact on the fiscal position, which (Table 8) is predicted to improve slightly. The magnitudes involved, though, are quite small (less than 5 percentage points) and may still be accounted for by the sample uncertainty of our estimates. Among the other three reforms, the Common Reform is the one with largest negative impact on both benefits paid to retirees and tax revenues; the total effect on government revenues is substantially positive. In fact, (Table 8) the percentage variations involved are much larger (about twice the size) than those we estimated for the RGSS. Next, in terms of total fiscal impact, comes the R1 reform under the S3 simulation procedure. This reform also yields an important improvement of the government net position; slightly more than half of it comes from a reduction in the net present value of benefits, with the rest coming from an increase in taxation, in particular a substantial increase in payroll contributions due to the longer work-life. Next is R1 under the S2 hypothesis; directions of change

are the same as in the S3 version but, obviously, the quantitative impact is much smaller are people are not forced to shift ahead of three years that part of their retirement behavior which is captured by age dummies. Finally, R2 is predicted to have a negative impact on the fiscal position of government as the small increases in tax revenues it induces is more than compensated by an increase in benefits paid, leading to a small but visible worsening of the government net position.

5.2 1940 Cohort results for RGSS and RETA

A second look at Table 6 also shows that, as anticipated earlier, the behavioral impact of the reform scenarios we consider is rather limited. Most of the savings come from the mechanical aspect of the changes: reforms that unexpectedly reduce benefits (such as the common reform) do have a positive impact on the government fiscal position, while reform that legally force workers to retire later, like the R1 especially in the R3 simulation, have a strong impact on retirement patterns and, consequently, benefits paid out. For this reason, mechanical effects are orders of magnitude larger than the behavioral ones, uniformly across reforms and independently of the financial indicator adopted. Notice that, at least in the case of R3 and R1+S3, the relative reduction of government net outlays is substantial, oscillating between -18.0 and -30.0 percent, depending on the financial indicator adopted. These conclusions are summarized in Figures 9-11. Figure 9 reports the fiscal effect of each reform by gender and regime, using simulation S3; Figures 10 and 11 report the total (RGSS plus RETA) fiscal effect of each reform for both simulations S1 and S3. We distinguish, in each case, between mechanical and behavioral effect. The same information is reported, in numerical form, in Tables 9 and 10. All the quantities reported in these tables and Figures, we recall, are relative to the 1940 cohort; that is to say: we compute the positive/negative variations in pension expenditure and tax revenues which are induced by applying each of the five reforms to the 1940s cohort only. At the same time, it should also be noted that the numbers we report are Net Present Value estimations, i.e. they correspond to the net present value, at the time of reform, of the variations induced by the reform itself over the remaining life of the cohort. They do not correspond, therefore, to variations in annual flows.

Our model predicts that the two Spanish reforms, R97 and A02, have a negligible total fiscal effect, that the Actuarial Adjustment (R2) reform would worsen the fiscal position of the government, and that, finally, the R1 and the Common Reform (R3) would improve it. The largest effect is predicted for the R1 reform under the S3 simulation scenarios, i.e. when that portion of current retirement patterns that is captured by age-dummies is shifted to the right of exactly three years. The net amount saved, in this case, is substantial: about 0.80 percentage points of GDP. In the other two cases, R1 without the impact of age dummies and R3, the amounts saved are respectively around 0.35 and 0.55 percentage points of GDP. While these are large amounts, they are not so large in relation either to the annual expenditure for Social Security pensions (which is about 10 percentage points of GDP) or to the size of outstanding Spanish "pension debt", which is estimated to range around 200 percentage points of GDP. Even by multiplying these quantities by a factor of fifty (that is: even assuming that savings of similar size can be achieved during the next fifty year for each cohort born between 1940 and 1990) we would still be projecting total savings equal to, at best, 20 percent of the outstanding pension debt. From this perspective, the savings which can be achieved via the reforms considered here are somewhat modest and, probably, still below the level which appears to be desirable. Finally, we should note that, in all cases but R2+S3, most of the savings come from the mechanical aspect. Only R2+S3 shows a large behavioral effect, which is due to the fact that, by shifting the age-dummies to the right, we are in fact assuming that Spanish workers will voluntarily choose to translate their age-related retirement patterns forward of three

years. One should keep in mind that, once a reform is implemented, workers will adjust their behavior optimally (from their view point) to the changed circumstances. After a few years, such adjustment is likely to eliminate or at least greatly reduce the saving that we estimate to accrue via the mechanical channel. This would leave, in the long run, only the impact of the behavioral channel. And, as we have seen, the savings one can obtain via the behavioral channel are estimated to be quite small for each and everyone of the reforms we have considered in this chapter. It is in this sense that, as mentioned at the beginning, we find the quantitative results of our exercise unsatisfactory and, in some sense, worrying. They say that, to the extent one can predict using advanced econometric techniques, even serious and somewhat draconian reforms of the Spanish pension system such as those considered here, are not likely to reduce pension expenditure of any significant amount in the long-run.

6 Distributional issues

Distributional issues always loom big in the discussions about pension reforms. They also happen to be among the least simple to handle. To the extent that, given the historical circumstances, all reform proposals aim at either reducing benefits for future retirees or to postpone the age of retirement or both, it is clear that some redistribution away from future retirees is being planned. So much is clear, and the calculations reported in the previous section, especially at the very end, summarize the amount of redistribution planned, in the aggregate, from the retiring cohort to the rest of society. The natural question, at this point, is one of equal treatment within the retiring cohort: which group of workers, within the 1940's cohort, is going to foot the bill? Is the cut going to be uniform across sexes, educational levels, regime of affiliation, and so on?

It would be surprising if the kind of reforms we have been considering were affecting all workers in the same way and to the same extent. In fact, they do not. In order to provide a first assessment of such differential impact we have classified the individuals in our sample according to the quintile of the Spanish labor income distribution to which they belong. We have then used the simulated results from the various policy scenarios to estimate, in the usual manner, the impact that each reform would have on the average member of each quintile. We measure the impact on both benefits and taxes. The summary measure is the net impact of the reform in both absolute and relative terms. A summary of our findings is reported in Tables 11 (S1 model) and 12 (S3 model) for the comparative reforms and Table 13 for the Spanish specific reforms (S3 model only).

Consider first R1-R3. The impression is striking. For all measures of financial incentives the burden falls rather unevenly on different income groups. More importantly: different reforms affect different groups quite differently, so that some reforms are "regressive" (redistribute away from the poorest quintiles more than from the richest quintiles) and other "progressive" (achieve the opposite). The following is a summary, reform by reform.

R1: The reduction in the absolute amount of benefits is monotone increasing from the lowest to the highest quintile, and almost monotone as a percentage of current benefits. The same is true for the net change, which takes into account also the variations in contribution and taxes the reform would bring about. The percentage reduction for people in the highest quintile, though, is lower (about minus 10.0 percent) than for the second and third higher. From the 12 percent reduction for the second quintile the effect decreases to minus 9 percent for the lowest. When the S3 shift is added (the R1+S3 case), then the reduction in gross and net benefits more than doubles. The progressivity, which was already very mild, disappears almost completely in this case.

R2: The Actuarial Adjustment reform has a small but sizeable reverse effect on the net benefits, as the latter increase on average. It is also fairly regressive, as both the absolute value and the percentage by which benefits increase is actually decreasing with the level of earnings.

R3: As we pointed out, the Common Reform would imply a substantial cut of benefits in the case of Spain. While it changes retirement ages only mildly, it cuts initial benefits across the board, and of an amount equal to roughly 30 percent of current pension payments. Together with the forward shift in the early retirement age. which our model predicts as a consequence of the reform, R3 has the effect of drastically reducing the SSW of the lowest paid individuals. The amounts involved are very large, and they appear most definitely unrealistic, at least from a socio-political point of view: a cut in net benefits of about 50 percentage point does not seem to be in the cards of any political coalition. Also in this as in the previous case, the impact is regressive: higher paid workers would bear a smaller burden, at least in percentage. In fact, the degree of regressivity that R3 displays is quite substantial.

The two Spanish reforms, we already pointed out, have a practically insignificant impact on aggregate quantities. The same is true for the five quintiles.

R97; Beside doing little, which was already clear from the aggregate analysis, this is the only reform which affects almost all groups equally. If anything, it leans slightly more heavily on the lower wage groups, like all other reforms but R1. In either case, the variations are estimated to be of the order of plus or minus 1 percentage point of current benefits.

A02: In this case the aggregate impact is somewhat larger and the distributional one becomes pronouncedly regressive. The total difference between the percentage gains of the highest paid quintile (about 5 percentage points) and the losses of the lowest paid one (minus 2 percent) is quite large and, in some sense, surprising as the A02 modification to the R97 reform was arranged and agreed upon, in some sense: requested by, the Spanish trade unions.

7 Concluding remarks

We summarize here the main findings, with an eye to policy implications and possible reforms. As pointed out in the main text, some of the quantitative estimates reported should be taken with (more than) the usual grain of salt as they are based on estimations of reduced form behavioral equations that appear to have only a limited power to capture observed retirement patterns. This caveat is particularly important for the affiliates to the RETA, for which none of the financial measures of retirement incentive seems to play a major role in affecting decisions. Once this is understood, our findings can be summarized, reform by reform, as follows.

The Actuarial Adjustment reform is probably the least effective among the three comparison reforms considered in the volume. This evaluation applies both in terms of expenditure, retirement patterns, and redistributional effect. Furthermore, most of the fiscal gains are accrued via the mechanical channel, which suggests that little would be gained in the long run by implementing the Actuarial Adjustment reform in Spain.

The 3-year shift reform may have an impact, which is likely to become quite strong if, by changing legislation, one also affects in the same direction the behavioral component of retirement, which seems to be captured purely by age dummies. In other words, if legislating 68 as the common retirement age, leads most of the people that now retire at 65 to retire at 68, then the gains in labor force participation of the elderly achievable via the R1 scenario could be substantial.

Correspondingly, also the fiscal gains could be sizable even if, as we argued above, once we compare the magnitude of these fiscal gains to the outstanding implicit social security debt of Spain, the actual reduction would be likely to be around 15 percentage points at most. Further, some redistributional aspects of the R1 reform need to be adjusted to make it politically acceptable. The direction in which it redistributes wealth, from the future retirees to the working population, is probably acceptable but the distribution of that burden within the retiring cohorts seems much less acceptable as it falls disproportionately on the lowest earning groups. This is an aspect which deserves further examination.

The same goes for the Common Reform. The latter does not really shift retirement patterns uniformly but, rather, cuts in a about a half the exit rate at age 60 (which corresponds to early retirement in Spain) and which is mostly used by the lower wage earners. At the same time, it reduces benefits, and therefore: outstanding SSW, quite drastically. Also, this reform, like the previous one, suffers of a very regressive bias which makes it politically unfeasible. The fiscal gains accrued entails drastic reductions in the SSW and in the yearly pension payments of workers belonging to the lower 60 percent of the wage distribution.

The two Spanish reforms are the least effective of the group. In both cases the total SSW varies very little, retirement patterns remain almost identical (a very mild shift to the right is predicted for the RETA affiliates), and the net fiscal effect is tiny. Also, these reforms are regressive when one looks at within cohorts redistribution. The amount of regressivity is, naturally, limited by the small reduction in aggregate SSW. Still, and quite paradoxically, the 2002 Amendment seems to make the overall Spanish reform more regressive than it was after the 1997 change. In any case, there is no reason to believe that the very minor improvement in the government fiscal position that A02 engenders will be sufficient to contain the forthcoming Spanish pension deficit.

Table 5: Fiscal impact of reforms by regime: Males in RGSS. In 10^6 2001 Euros.

	PDV				Change rel. to base		
	Base (A)	+3-year (B)	Act.Adj. (C)	Common (D)	B/A	C/A	D/A
COMPARATIVE REFORMS							
Peak Value: S1							
Benefits	11700	9989	12147	7987	-14.6	3.8	-31.7
Taxes: Payroll	5526	5796	5702	6291	4.9	3.2	13.8
Taxes: Income	2257	1903	2389	1548	-15.6	5.9	-31.4
Taxes: VAT	1757	1540	1804	1279	-12.4	2.7	-27.2
Taxes: Total	9540	9239	9896	9118	-3.2	3.7	-4.4
Peak Value:S2							
Benefits	12000	10061	12280	8032	-16.2	2.3	-33.1
Taxes: Payroll	5558	5730	5698	5989	3.1	2.5	7.8
Taxes: Income	2341	1902	2426	1529	-18.8	3.7	-34.7
Taxes: VAT	1791	1553	1820	1293	-13.3	1.6	-27.8
Taxes: Total	9689	9185	9944	8811	-5.2	2.6	-9.1
Peak Value:S3							
Benefits	12000	9730	12280	8032	-18.9	2.3	-33.1
Taxes: Payroll	5558	6491	5698	5989	16.8	2.5	7.8
Taxes: Income	2341	1968	2426	1529	-15.9	3.7	-34.7
Taxes: VAT	1791	1478	1820	1293	-17.4	1.6	-27.8
Taxes: Total	9689	9937	9944	8811	2.6	2.6	-9.1
Option Value: S1							
Benefits	11507	9995	12432	8023	-13.1	8.0	-30.3
Taxes: Payroll	5654	5793	5349	6008	2.5	-5.4	6.3
Taxes: Income	2233	1903	2410	1517	-14.8	7.9	-32.0
Taxes: VAT	1728	1541	1850	1295	-10.8	7.0	-25.1
Taxes: Total	9615	9237	9609	8820	-3.9	-0.1	-8.3
Option Value: S2							
Benefits	11829	10119	12572	8009	-14.5	6.3	-32.3
Taxes: Payroll	5654	5658	5303	5516	0.1	-6.2	-2.4
Taxes: Income	2316	1904	2441	1466	-17.8	5.4	-36.7
Taxes: VAT	1766	1563	1867	1305	-11.5	5.8	-26.1
Taxes: Total	9735	9125	9611	8287	-6.3	-1.3	-14.9
Option Value: S3							
Benefits	11829	9676	12572	8009	-18.2	6.3	-32.3
Taxes: Payroll	5654	6494	5303	5516	14.9	-6.2	-2.4
Taxes: Income	2316	1955	2441	1466	-15.6	5.4	-36.7
Taxes: VAT	1766	1472	1867	1305	-16.6	5.8	-26.1
Taxes: Total	9735	9920	9611	8287	1.9	-1.3	-14.9
SPANISH SPECIFIC REFORMS							
	Base	R97	A02				
Peak Value: S3							
Benefits	12000	11922	12392		-0.6	3.3	
Taxes: Payroll	5558	5512	5601		-0.8	0.8	
Taxes: Income	2341	2302	2454		-1.7	4.8	
Taxes: VAT	1791	1783	1832		-0.4	2.3	
Taxes: Total	9689	9597	9886		-1.0	2.0	
Option Value: S3							
Benefits	11829	11829	12427		0.0	5.0	
Taxes: Payroll	5654	5629	5584		-0.4	-1.2	
Taxes: Income	2316	2297	2460		-0.8	6.2	
Taxes: VAT	1766	1768	1837		0.2	4.0	
Taxes: Total	9735	9694	9881		-0.4	1.5	

Table 6: Decomposition of the total effect by regime: Males in RGSS. In 10^6 2001 Euros.

	Change in PDV								
	+3-year			Act			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
COMPARATIVE REFORMS									
Peak Value: S1									
Benefits	-1790	80	-1710	549	-102	447	-3727	14	-3712
Taxes: Total	-628	327	-301	204	151	356	-1228	807	-421
Net Change	-1162	-247	-1410	345	-254	91	-2498	-793	-3291
Rel. Change	-9.9	-2.1	-12.0	2.9	-2.2	0.8	-21.4	-6.8	-28.1
Peak Value: S2									
Benefits	-1944	5	-1939	320	-40	280	-3997	29	-3968
Taxes: Total	-695	191	-504	115	140	255	-1334	455	-878
Net Change	-1249	-186	-1435	206	-180	25	-2664	-426	-3090
Rel. Change	-10.4	-1.5	-12.0	1.7	-1.5	0.2	-22.2	-3.5	-25.7
Peak Value: S3									
Benefits	-1944	-325	-2270	320	-40	280	-3997	29	-3968
Taxes: Total	-695	943	248	115	140	255	-1334	455	-878
Net Change	-1249	-1268	-2518	206	-180	25	-2664	-426	-3090
Rel. Change	-10.4	-10.6	-21.0	1.7	-1.5	0.2	-22.2	-3.5	-25.7
Option Value: S1									
Benefits	-1627	115	-1512	499	426	925	-3535	51	-3484
Taxes: Total	-572	193	-378	185	-192	-6	-1165	371	-794
Net Change	-1055	-79	-1134	314	618	931	-2370	-320	-2690
Rel. Change	-9.2	-0.7	-9.9	2.7	5.4	8.1	-20.6	-2.8	-23.4
Option Value: S2									
Benefits	-1814	103	-1711	280	462	742	-3829	8	-3821
Taxes: Total	-649	39	-610	100	-224	-124	-1276	-173	-1448
Net Change	-1165	64	-1100	181	686	867	-2553	181	-2372
Rel. Change	-9.8	0.5	-9.3	1.5	5.8	7.3	-21.6	1.5	-20.1
Option Value: S3									
Benefits	-1814	-339	-2153	280	462	742	-3829	8	-3821
Taxes: Total	-649	834	185	100	-224	-124	-1276	-173	-1448
Net Change	-1165	-1173	-2338	181	686	867	-2553	181	-2372
Rel. Change	-9.8	-9.9	-19.8	1.5	5.8	7.3	-21.6	1.5	-20.1
SPANISH SPECIFIC REFORMS									
	R97			A02					
Peak Value									
Benefits	-56	-22	-78	430	-37	393			
Taxes: Total	-31	-62	-92	163	34	197			
Net Change	-25	40	14	267	-71	196			
Rel. Change	-0.2	0.3	0.1	2.2	-0.6	1.6			
Option Value									
Benefits	-37	37	0	454	143	597			
Taxes: Total	-24	-18	-42	173	-27	146			
Net Change	-13	54	42	282	170	452			
Rel. Change	-0.1	0.5	0.4	2.4	1.4	3.8			

Table 7: Fiscal impact of reforms by regime: Males in RETA. In 10^6 2001 Euros.

	PDV				Change rel. to base		
	Base	+3-year S3	Act.Adj.	Common			
	(A)	(B)	(C)	(D)	B/A	C/A	D/A
COMPARATIVE REFORMS							
		Peak Value: S1					
Benefits	2191	1786	2311	985	-18.5	5.5	-55.1
Taxes: Payroll	773	865	775	852	11.9	0.3	10.3
Taxes: Income	411	353	433	244	-14.0	5.6	-40.5
Taxes: VAT	309	253	324	145	-17.9	4.9	-53.1
Taxes: Total	1492	1471	1532	1241	-1.4	2.7	-16.8
		Peak Value: S2					
Benefits	2340	1868	2403	987	-20.2	2.7	-57.8
Taxes: Payroll	591	629	603	687	6.3	1.9	16.2
Taxes: Income	423	361	434	249	-14.5	2.8	-41.0
Taxes: VAT	332	267	340	146	-19.5	2.4	-56.0
Taxes: Total	1346	1257	1377	1082	-6.6	2.3	-19.6
		Peak Value: S3					
Benefits	2237	1808	2350	987	-19.2	5.1	-55.9
Taxes: Payroll	719	812	717	789	12.9	-0.3	9.7
Taxes: Income	413	354	433	246	-14.4	4.9	-40.5
Taxes: VAT	316	257	331	146	-18.6	4.6	-53.9
Taxes: Total	1448	1423	1481	1180	-1.7	2.2	-18.5
		Option Value: S1					
Benefits	2318	1805	2342	984	-22.1	1.0	-57.5
Taxes: Payroll	660	875	684	856	32.5	3.5	29.5
Taxes: Income	425	364	431	250	-14.5	1.4	-41.2
Taxes: VAT	327	254	330	144	-22.3	0.8	-56.1
Taxes: Total	1413	1493	1445	1250	5.7	2.2	-11.6
		Option Value: S2					
Benefits	2318	1849	2342	984	-20.2	1.0	-57.5
Taxes: Payroll	660	766	684	856	16.0	3.5	29.5
Taxes: Income	425	363	431	250	-14.8	1.4	-41.2
Taxes: VAT	327	263	330	144	-19.8	0.8	-56.1
Taxes: Total	1413	1391	1445	1250	-1.6	2.2	-11.6
		Option Value: S3					
Benefits	2318	1805	2342	984	-22.1	1.0	-57.5
Taxes: Payroll	660	875	684	856	32.5	3.5	29.5
Taxes: Income	425	364	431	250	-14.5	1.4	-41.2
Taxes: VAT	327	254	330	144	-22.3	0.8	-56.1
Taxes: Total	1413	1493	1445	1250	5.7	2.2	-11.6
SPANISH SPECIFIC REFORMS							
	Base	R97	A02				
		Peak Value					
Benefits	2340	2272	2243		-2.9	-4.1	
Taxes: Payroll	591	594	632		0.4	6.8	
Taxes: Income	423	411	414		-2.8	-2.0	
Taxes: VAT	332	323	318		-2.7	-4.3	
Taxes: Total	1346	1328	1364		-1.3	1.3	
		Option Value					
Benefits	2318	2245	2205		-3.1	-4.9	
Taxes: Payroll	660	672	699		1.8	5.8	
Taxes: Income	425	413	413		-2.9	-3.0	
Taxes: VAT	327	318	311		-2.9	-4.9	
Taxes: Total	1413	1403	1423		-0.7	0.7	

Table 8: Decomposition of the total effect by regime: Male in RETA. In 10^6 2001 Euros.

	Change in PDV								
	+3-year			Act			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
COMPARATIVE REFORMS									
Peak Value: S1									
Benefits	-377	-28	-405	100	20	120	-1209	2	-1206
Taxes: Total	-107	86	-21	32	8	40	-327	77	-250
Net Change	-270	-114	-384	68	12	80	-881	-74	-956
Rel. Change	-12.3	-5.2	-17.5	3.1	0.5	3.6	-40.2	-3.4	-43.6
Peak Value: S2									
Benefits	-467	-5	-472	58	6	64	-1366	13	-1353
Taxes: Total	-124	36	-89	17	14	31	-357	93	-264
Net Change	-342	-40	-383	40	-8	33	-1009	-80	-1089
Rel. Change	-14.6	-1.7	-16.4	1.7	-0.3	1.4	-43.1	-3.4	-46.6
Peak Value: S3									
Benefits	-467	-38	-504	58	6	64	-1366	13	-1353
Taxes: Total	-124	163	39	17	14	31	-357	93	-264
Net Change	-342	-200	-543	40	-8	33	-1009	-80	-1089
Rel. Change	-14.6	-8.6	-23.2	1.7	-0.3	1.4	-43.1	-3.4	-46.6
Option Value: S1									
Benefits	-402	-27	-429	96	17	113	-1254	4	-1250
Taxes: Total	-112	87	-25	30	2	33	-335	67	-268
Net Change	-290	-113	-404	66	15	81	-919	-63	-982
Rel. Change	-13.0	-5.1	-18.1	3.0	0.7	3.6	-41.1	-2.8	-43.9
Option Value: S2									
Benefits	-420	-49	-469	44	-20	24	-1346	12	-1334
Taxes: Total	-114	92	-22	14	18	32	-355	192	-164
Net Change	-306	-141	-447	31	-38	-8	-991	-180	-1170
Rel. Change	-13.2	-6.1	-19.3	1.3	-1.6	-0.3	-42.7	-7.7	-50.5
Option Value: S3									
Benefits	-420	-93	-513	44	-20	24	-1346	12	-1334
Taxes: Total	-114	194	80	14	18	32	-355	192	-164
Net Change	-306	-287	-593	31	-38	-8	-991	-180	-1170
Rel. Change	-13.2	-12.4	-25.6	1.3	-1.6	-0.3	-42.7	-7.7	-50.5
SPANISH SPECIFIC REFORMS									
	R97			A02					
Peak Value									
Benefits	-67	-1	-68	-88	-8	-96			
Taxes: Total	-21	3	-18	-22	40	18			
Net Change	-46	-4	-50	-66	-48	-114			
Rel. Change	-2.0	-0.2	-2.1	-2.8	-2.1	-4.9			
Option Value									
Benefits	-69	-4	-73	-89	-25	-113			
Taxes: Total	-22	11	-10	-23	33	10			
Net Change	-47	-15	-62	-66	-57	-123			
Rel. Change	-2.0	-0.7	-2.7	-2.8	-2.5	-5.3			

Table 9: Total fiscal impact of Reforms. In 10^6 2001 Euros.

	PDV				Change rel. to base		
	Base (A)	+3-year S3 (B)	Act.Adj. (C)	Common (D)	B/A	C/A	D/A
COMPARATIVE REFORMS							
		Peak Value: S1					
Benefits	18842	15990	19606	11967	-15,1	4,1	-36,5
Taxes: Payroll	8602	9093	8845	9764	5.7	2.8	13.5
Taxes: Income	3588	3035	3797	2381	-15.4	5.8	-33.6
Taxes: VAT	2809	2441	2894	1910	-13.1	3.0	-32.0
Taxes: Total	15000	14570	15536	14055	-2.9	3.6	-6.3
		Peak Value: S2					
Benefits	19441	16195	19900	12027	-16.7	2.4	-38.1
Taxes: Payroll	8410	8695	8616	9135	3.4	2.5	8.6
Taxes: Income	3716	3044	3846	2363	-18.1	3.5	-36.4
Taxes: VAT	2885	2478	2935	1929	-14.1	1.7	-33.1
Taxes: Total	15011	14217	15397	13428	-5.3	2.6	-10.5
		Peak Value: S3					
Benefits	19441	15704	19900	12027	-19.2	2.4	-38.1
Taxes: Payroll	8410	9915	8616	9135	17.9	2.5	8.6
Taxes: Income	3716	3138	3846	2363	-15.5	3.5	-36.4
Taxes: VAT	2885	2368	2935	1929	-17.9	1.7	-33.1
Taxes: Total	15011	15421	15397	13428	2.7	2.6	-10.5
		Option Value: S1					
Benefits	18647	16026	20045	12016	-14.1	7.5	-35.6
Taxes: Payroll	8707	9018	8283	9292	3.6	-4.9	6.7
Taxes: Income	3560	3035	3825	2343	-14.8	7.4	-34.2
Taxes: VAT	2780	2448	2964	1932	-11.9	6.6	-30.5
Taxes: Total	15047	14501	15072	13566	-3.6	0.2	-9.8
		Option Value: S2					
Benefits	19221	16301	20247	11997	-15.2	5.3	-37.6
Taxes: Payroll	8485	8633	8040	8653	1.7	-5.3	2.0
Taxes: Income	3687	3062	3860	2292	-17.0	4.7	-37.8
Taxes: VAT	2851	2491	2991	1942	-12.6	4.9	-31.9
Taxes: Total	15023	14186	14891	12887	-5.6	-0.9	-14.2
		Option Value: S3					
Benefits	19221	15655	20247	11997	-18.6	5.3	-37.6
Taxes: Payroll	8485	9889	8040	8653	16.5	-5.3	2.0
Taxes: Income	3687	3128	3860	2292	-15.2	4.7	-37.8
Taxes: VAT	2851	2360	2991	1942	-17.2	4.9	-31.9
Taxes: Total	15023	15376	14891	12887	2.3	-0.9	-14.2
SPANISH SPECIFIC REFORMS							
	Base	R97	A02				
		Peak Value: S3					
Benefits	19441	19234	19822		-1.1	2.0	
Taxes: Payroll	8410	8351	8524		-0.7	1.4	
Taxes: Income	3716	3646	3853		-1.9	3.7	
Taxes: VAT	2885	2862	2920		-0.8	1.2	
Taxes: Total	15011	14859	15296		-1.0	1.9	
		Option Value: S3					
Benefits	19221	19118	19869		-0.5	3.4	
Taxes: Payroll	8485	8467	8426		-0.2	-0.7	
Taxes: Income	3687	3644	3861		-1.2	4.7	
Taxes: VAT	2851	2841	2925		-0.3	2.6	
Taxes: Total	15023	14951	15212		-0.5	1.3	

Table 10: Decomposition of the total effect of Reforms. In 10^6 2001 Euros.

	Change in PDV								
	+3-year			Act			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
COMPARATIVE REFORMS									
Peak Value: S1									
Benefits	-2907	56	-2852	872	-108	764	-6902	27	-6875
Taxes: Total	-985	555	-430	317	219	536	-2158	1214	-944
Net Change	-1922	-500	-2421	555	-327	228	-4744	-1187	-5931
Rel. Change	-10.2	-2.7	-12.9	2.9	-1.7	1.2	-25.2	-6.3	-31.5
Peak Value: S2									
Benefits	-3236	-9	-3246	506	-47	459	-7472	58	-7414
Taxes: Total	-1099	305	-794	177	209	386	-2337	754	-1583
Net Change	-2138	-314	-2452	329	-256	73	-5135	-696	-5831
Rel. Change	-11.0	-1.6	-12.6	1.7	-1.3	0.4	-26.4	-3.6	-30.0
Peak Value: S3									
Benefits	-3236	-500	-3737	506	-47	459	-7472	58	-7414
Taxes: Total	-1099	1509	410	177	209	386	-2337	754	-1583
Net Change	-2138	-2009	-4147	329	-256	73	-5135	-696	-5831
Rel. Change	-11.0	-10.3	-21.3	1.7	-1.3	0.4	-26.4	-3.6	-30.0
Option Value: S1									
Benefits	-2727	106	-2621	801	596	1398	-6708	77	-6632
Taxes: Total	-918	372	-546	290	-266	24	-2086	605	-1481
Net Change	-1809	-266	-2075	511	862	1373	-4622	-528	-5150
Rel. Change	-9.7	-1.4	-11.1	2.7	4.6	7.4	-24.8	-2.8	-27.6
Option Value: S2									
Benefits	-2987	67	-2920	434	591	1025	-7265	41	-7224
Taxes: Total	-1014	177	-837	152	-285	-133	-2261	125	-2136
Net Change	-1973	-110	-2083	283	876	1158	-5004	-84	-5088
Rel. Change	-10.3	-0.6	-10.8	1.5	4.6	6.0	-26.0	-0.4	-26.5
Option Value: S3									
Benefits	-2987	-579	-3567	434	591	1025	-7265	41	-7224
Taxes: Total	-1014	1367	353	152	-285	-133	-2261	125	-2136
Net Change	-1973	-1946	-3920	283	876	1158	-5004	-84	-5088
Rel. Change	-10.3	-10.1	-20.4	1.5	4.6	6.0	-26.0	-0.4	-26.5
SPANISH SPECIFIC REFORMS									
	R97			A02					
Peak Value:S3									
Benefits	-177	-31	-207	445	-63	382			
Taxes: Total	-72	-80	-152	185	100	285			
Net Change	-104	49	-55	260	-163	97			
Rel. Change	-0.5	0.3	-0.3	1.3	-0.8	0.5			
Option Value:S3									
Benefits	-142	39	-103	483	165	647			
Taxes: Total	-61	-11	-72	200	-11	189			
Net Change	-81	50	-31	283	176	459			
Rel. Change	-0.4	0.3	-0.2	1.5	0.9	2.4			

Table 11: Distributional Analysis. Comparative reforms. Option Value. S1. In 10^6 2001 Euros.

	PDV				Change rel. to base		
	Base (A)	+3-year (B)	Act.Adj. (C)	Common (D)	B-A	C-A	D-A
1st quintile (highest)							
Benefits	5439	4649	5868	4638	-790	429	-801
Taxes: Payroll	2866	2969	2713	2753	103	-153	-113
Taxes: Income	1287	1119	1374	1089	-168	87	-197
Taxes: VAT	805	706	861	716	-99	6.9	-89
Taxes: Total	4957	4794	4947	4558	-163	-10	-400
Net Change					627	439	-402
change as a % of Base ben.					-11,5	8,1	7,4
2nd quintile							
Benefits	4314	3623	4698	2799	-691	384	-1515
Taxes: Payroll	2025	2125	1908	2281	100	-117	256
Taxes: Income	864	721	939	548	-143	74	-316
Taxes: VAT	636	549	686	446	-87	7.9	-190
Taxes: Total	3525	3394	3533	3275	-131	8	-250
Net Change					-560	376	-1265
change as a % of Base ben.					-13	8,7	29,3
3rd quintile							
Benefits	3366	2867	3645	1984	-499	279	-1382
Taxes: Payroll	1567	1625	1491	1751	58	-77	184
Taxes: Income	594	495	645	329	-99	51	-264
Taxes: VAT	501	438	538	325	-63	7.4	-177
Taxes: Total	2663	2558	2674	2405	-104	11	-257
Net Change					-395	268	-1125
change as a % of Base ben.					-11,7	8	-33,4
4th quintile							
Benefits	2993	2594	3202	1591	-399	209	-1402
Taxes: Payroll	1303	1339	1256	1408	35	-48	104
Taxes: Income	467	393	504	228	-74	37	-239
Taxes: VAT	451	400	479	268	-51	6.2	-183
Taxes: Total	2222	2131	2238	1904	-90	16	-318
Net Change					-309	193	-1085
change as a % of Base ben.					-10,3	6,4	36,2
5th quintile (lowest)							
Benefits	2508	2266	2603	990	-242	95	-1518
Taxes: Payroll	940	955	911	1093	15	-29	152
Taxes: Income	344	303	359	145	-41	15	-199
Taxes: VAT	383	351	396	175	-32	3.4	-208
Taxes: Total	1667	1609	1666	1413	-58	-1	-254
Net Change					-184	96	-1263
change as a % of Base ben.					-7,3	3,8	-50,4

Table 12: Distributional Analysis. Comparative reforms. Option Value. S3. In 10^6 2001 Euros.

	PDV				Change rel. to base		
	Base (A)	+3-year (B)	Act.Adj. (C)	Common (D)	B-A	C-A	D-A
1st quintile (highest)							
Benefits	5510	4554	5888	4599	-955	378	-911
Taxes: Payroll	2906	3310	2716	2591	404	-190	-315
Taxes: Income	1320	1146	1390	1063	-174	70	-257
Taxes: VAT	810	681	861	713	-129	6.3	-97
Taxes: Total	5035	5136	4966	4367	101	-69	-669
Net Change					-1056	447	-242
change as a % of Base ben.					-19.2	8.1	-4.4
2nd quintile							
Benefits	4438	3551	4731	2816	-887	293	-1622
Taxes: Payroll	1995	2346	1873	2115	351	-122	120
Taxes: Income	899	748	950	535	-151	51	-364
Taxes: VAT	649	529	689	452	-120	6.1	-197
Taxes: Total	3544	3623	3513	3102	79	-31	-441
Net Change					-996	324	-1180
change as a % of Base ben.					-21.8	7.3	-26.6
3rd quintile							
Benefits	3501	2813	3688	1990	-689	187	-1512
Taxes: Payroll	1504	1758	1436	1622	254	-68	118
Taxes: Income	619	514	649	320	-106	30	-299
Taxes: VAT	519	424	545	328	-95	4.9	-191
Taxes: Total	2642	2696	2629	2271	54	-13	-371
Net Change					-742	200	-1141
change as a % of Base ben.					-21.2	5.7	-32.6
4th quintile							
Benefits	3151	2543	3272	1597	-608	121	-1554
Taxes: Payroll	1216	1436	1175	1310	220	-41	94
Taxes: Income	490	408	507	226	-82	17	-264
Taxes: VAT	473	388	490	271	-85	3.6	-203
Taxes: Total	2179	2231	2172	1807	52	-7	-372
Net Change					-667	128	-1182
change as a % of Base ben.					-21.0	4.1	-37.5
5th quintile (lowest)							
Benefits	2602	2167	2647	984	-435	46	-1618
Taxes: Payroll	862	1034	838	1011	172	-24	148
Taxes: Income	356	309	361	145	-47	5	-211
Taxes: VAT	397	333	403	175	-63	1.7	-221
Taxes: Total	1615	1676	1602	1331	62	-13	-283
Net Change					-497	58	-1334
change as a % of Base ben.					-19.1	2.2	-51.3

Table 13: Distributional Analysis. Spanish reforms. S3 age dummies model. In 10^6 2001 Euros.

		PDV		Change rel. to base	
	Base	R97	A02		
	(A)	(B)	(C)	B-A	C-A
1st quintile (highest)					
Benefits	5510	5526	5864	16	354
Taxes: Payroll	2906	2882	2854	-24	-51
Taxes: Income	1320	1313	1416	-6	96
Taxes: VAT	810	813	850	3	40
Taxes: Total	5035	5009	1.7	-27	85
Net Change				43	269
change as a % of Base ben.				0.8	4.9
2nd quintile					
Benefits	4438	4425	4637	-13	199
Taxes: Payroll	1995	1991	1977	-4	-18
Taxes: Income	899	888	947	-11	47
Taxes: VAT	649	649	673	-0	24
Taxes: Total	3544	3528	1.5	-15	53
Net Change				3	146
change as a % of Base ben.				0.1	3.3
3rd quintile					
Benefits	3501	3487	3618	-14	117
Taxes: Payroll	1504	1504	1498	-0	-5
Taxes: Income	619	613	647	-6	28
Taxes: VAT	519	518	533	-1	14
Taxes: Total	2642	2634	1.4	-8	36
Net Change				-7	81
change as a % of Base ben.				-0.2	2.3
4th quintile					
Benefits	3151	3111	3183	-40	32
Taxes: Payroll	1216	1220	1219	4	3
Taxes: Income	490	481	499	-9	9
Taxes: VAT	473	468	477	-5	4
Taxes: Total	2179	2169	0.7	-11	16
Net Change				-30	16
change as a % of Base ben.				-0.9	0.5
5th quintile					
Benefits	2602	2551	2546	-51	-56
Taxes: Payroll	862	867	874	5	12
Taxes: Income	356	345	349	-11	-7
Taxes: VAT	397	390	389	-6	-8
Taxes: Total	1615	1603	-0.2	-12	-3
Net Change				-39	-53
change as a % of Base ben.				-1.5	-2.0

Figure 6: Total effect by age of retirement and regime. Act. adjustment and Common reforms. Option Value. S3 model

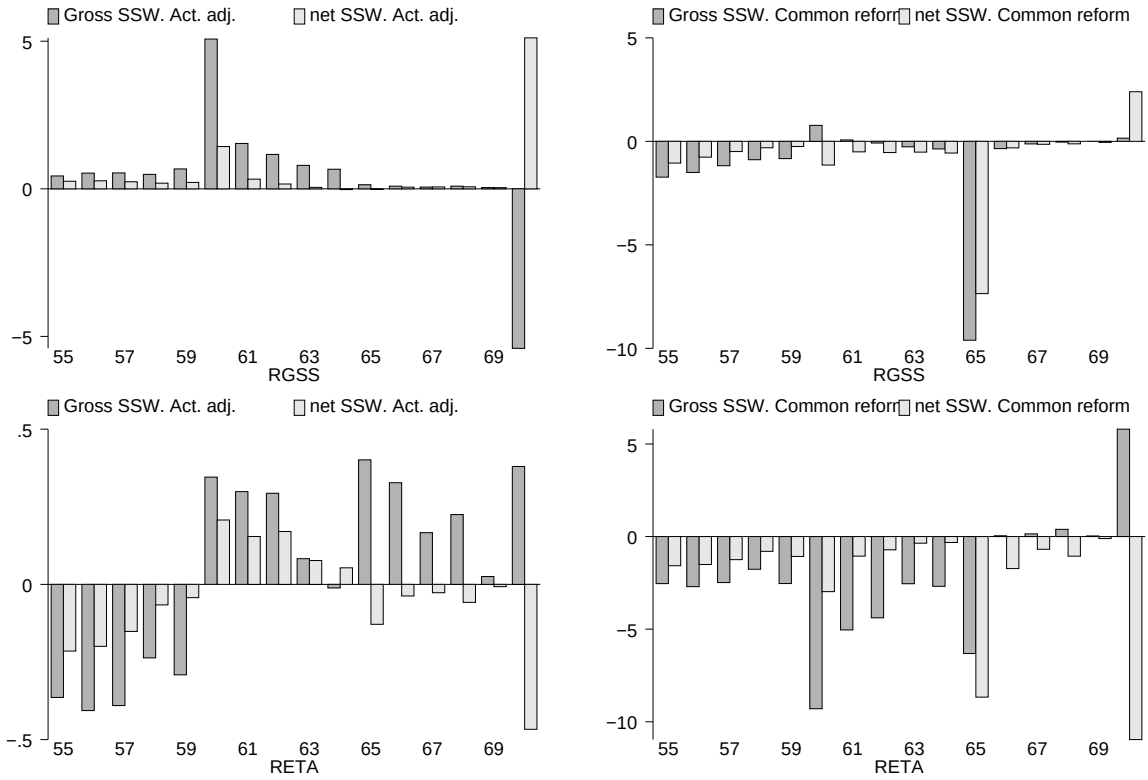


Figure 7: Total effect by age of retirement and regime. Spanish reforms. Option Value. S3 model

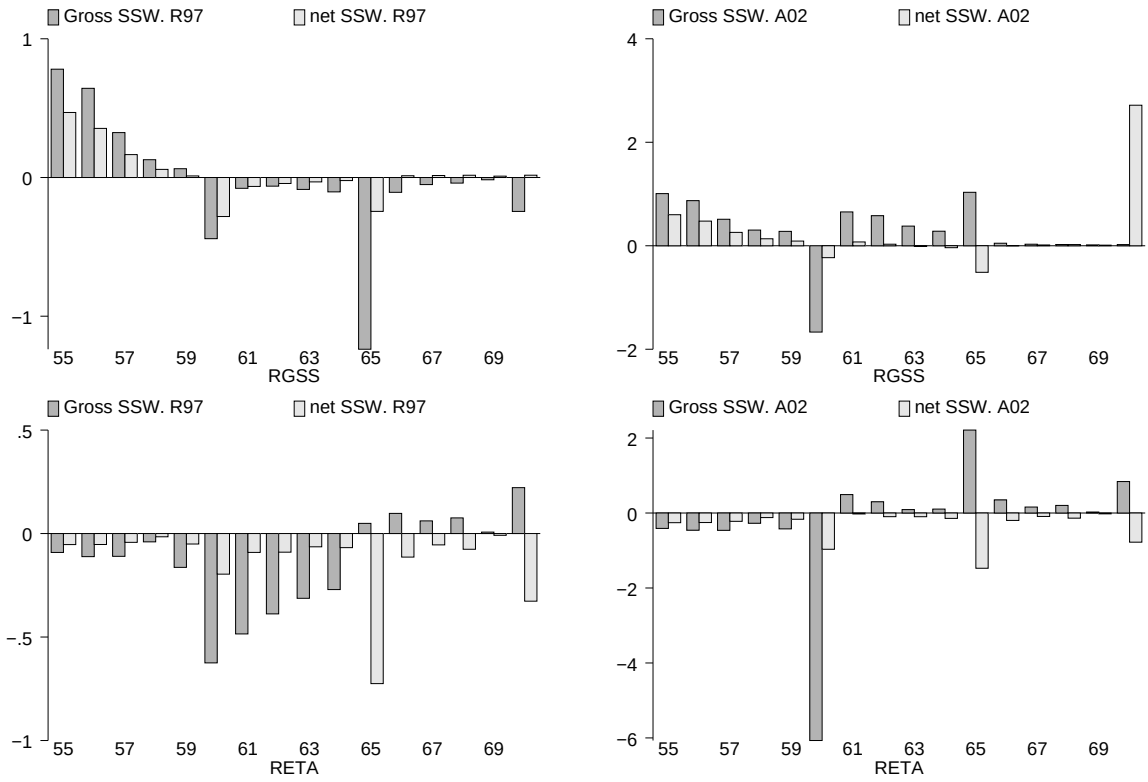


Figure 8: Fiscal implications of reforms as a percentage of the GDP by gender and regime. S3 model.

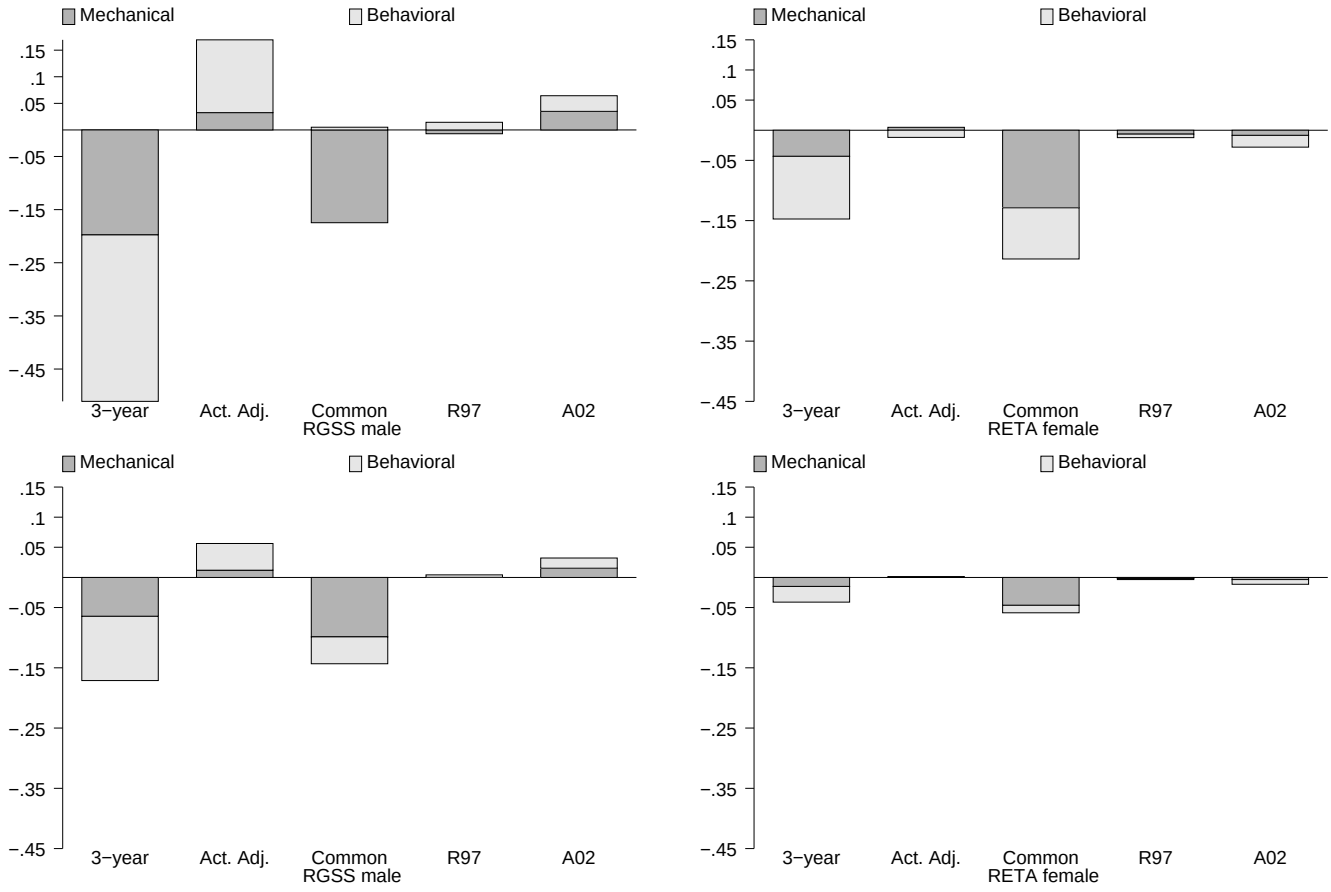


Figure 9: Fiscal implications of comparative reforms as a percentage of the GDP. RGSS and RETA.

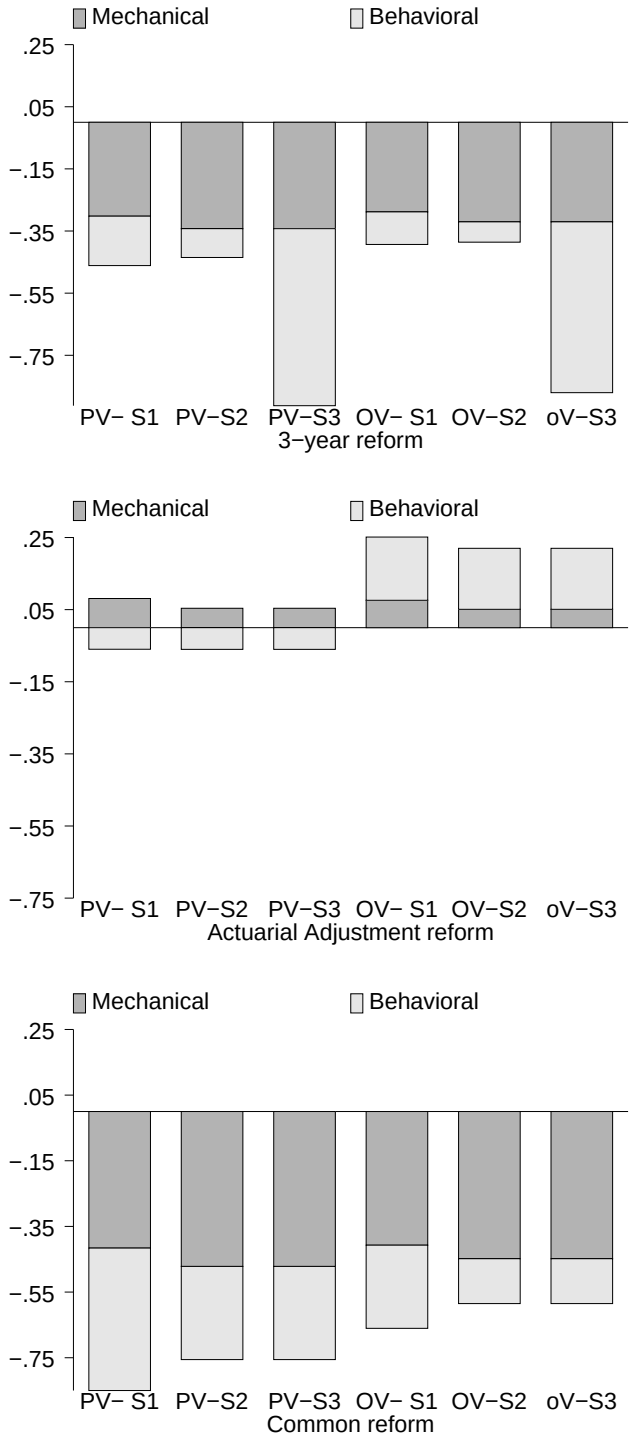
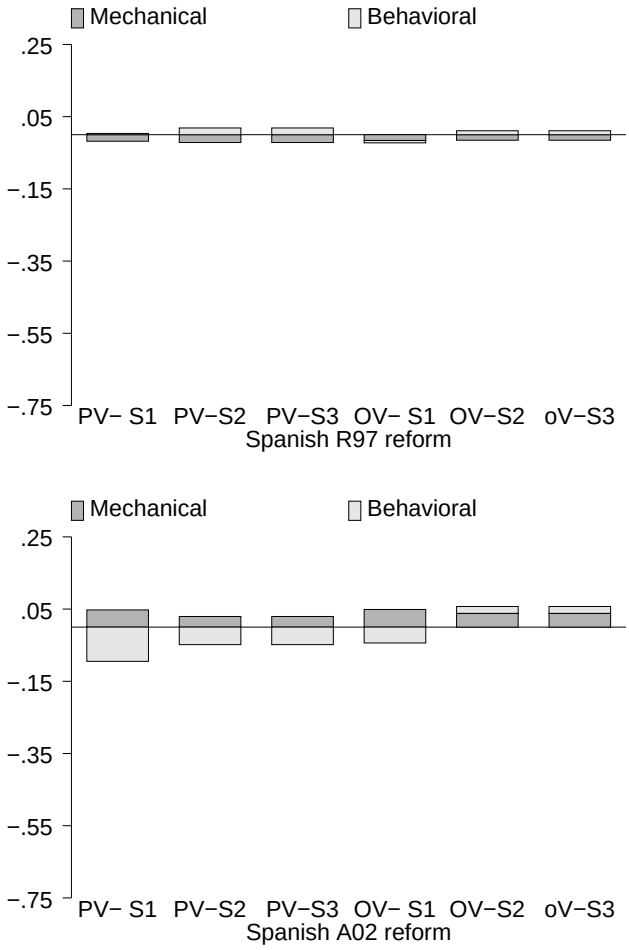


Figure 10: Fiscal implications of Spanish reforms as a percentage of the GDP. RGSS and RETA.



References

Abío, G., H. Bonin, J. Gil and C. Patxot, "El impacto intergeneracional de la reforma de las pensiones en España: un enfoque de contabilidad generacional", *Cuadernos Económicos de ICE*, 65: 101–116.

Boldrin, M., S. Jiménez-Martín and F. Peracchi (1999) "Social Security and Retirement in Spain", in J. Gruber and D. Wise (eds.), *Social Security Programs and Retirement around the World*, Chicago University Press for the NBER.

Boldrin, M., S. Jiménez-Martín and F. Peracchi (2001a) *Sistema de Pensiones y Mercado de Trabajo en España*, Fundación BBV, Madrid.

Boldrin, M., S. Jiménez-Martín and F. Peracchi (2001b) *Micro-modelling of retirement behavior in Spain*, forthcoming in Gruber, J. and D. Wise, eds. *Social Security and Retirement around the World: micro-estimation*, Chicago University Press.

Instituto Nacional de Estadística, INE (1995), *Proyecciones de la Población de España*, Madrid.

Instituto Nacional de Estadística, INE, *Encuesta de Población Activa. Microdata files from 1995-II to 2001-II*. Madrid. e

Jiménez-Martín S. (1998) "Indexation and wage change settlements: Evidence from Spanish manufacturing firms", *Oxford Bulletin of Economics and Statistics*, 60. 449–484.

Jiménez-Martín S. (1999) "El impacto de la reforma de 1997 en los incentivos y la deuda implícita de la Seguridad Social", *Economístas*, no 84.

Ministerio de Trabajo y Asuntos Sociales, *Boletin de Estadísticas Laborales*. Various issues.

A Data and Variables

In this section we define the variables that have been employed in the specification 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 data set, 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 first time observed in the data set).
- **Temporary illness:** Length of history spent in temporary illness.
- **Sector:** 1-digit SIC industry classification.
- **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.

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 3.2.
- **Pension amount:** See section 2 for a detailed description.
- **Average life cycle earnings:** Constructed on the basis of a fixed effect model, for each contributive group.
- **Expected earnings:** See section 3.2 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.

The Spanish Labor Force Survey or EPA

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 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 origin al survey. It contains fewer variables than EPA, but it permits to follow individuals for up to 6 consecutive quarters.