EVALUATING SPANISH PENSION EXPENDITURE UNDER ALTERNATIVE REFORM SCENARIOS.*

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Abstract

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

KEYWORDS: SOCIAL SECURITY, REFORM, SPAIN, OPTION VALUE.
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Contents

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 sets of reform measures that the Spanish government has adopted, respectively, in 1997 and 2002.

Each reform scenario consists in 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 very 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 the 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 will be completely implemented by 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 essentially 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 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

[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.

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 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. Summary information about its structure and rules are reported later in this Section.

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, each one with its own ceiling and floor for covered earnings.

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

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

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

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

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

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

and eliminates social security contributions for workers meeting the eligibility criteria for full normal retirement ($a \geq 65$ and $n \geq 35$) and 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 bull-fighters. Beside differences in the SS tax rate and the definition of covered earnings, an important difference is the fact that the affiliated to the special schemes have no early retirement option (exception made for miners and sailors).

The rest of this section focuses on the special schemes for self-employed workers (RETA) and farmers (REA), which together represent 93 percent of the affiliated 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 about age 50 to 55. 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 unrelated to actual 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.

2.5 Government employees

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

Public servants are divided into 5 categories, labelled from A to E, corresponding loosely to decreasing school levels: A for college graduates (*doctor, licenciado, arquitecto o equivalente*), B for people holding certain kinds of college diplomas (*ingeniero técnico, diplomado, etc.*), C for high school graduates (*bachiller o equivalente*), D for junior high school diplomas (*graduado escolar o equivalente*), and E for individuals with lower education levels (*certificado de escolaridad*). For each of these categories, the budget law defines every year a theoretical SS wage (*haber regulador*) which is used to compute SS contributions and pensions. The implied wage scale has remained relatively constant since 1985. The top to bottom ratio never exceeded 2.5.

SS contributions are the sum of three parts, each proportional to the legislated covered wage, according to proportionality factors legislated annually: a) *derechos pasivos* (3.86 percent in 1995), b) *cuota mensual de Mutualidades* (1.89 percent), and c) *aportación del Estado* (paid by the government, it varies between 6 and 10 percent depending on the sector of the administration). To parallel this three-part contribution structure, actual pensions are computed by adding up three sources of benefits: a) the basic pension (*derechos pasivos*), b) a portion directed to the pensioner's family (*ayuda familiar*), and c) a complementary portion coming from the various *Mutualidades* (ISFAS, MUFACE, MUGEJU).

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

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

The differences with respect to the general scheme are various. First, while the entitlement to a pension still requires at least 15 years of contributions, the replacement rate (the ratio of the pension to the benefit base) increases somewhat irregularly with seniority, up to 100 percent after 35 years. So, for example, 15 years of service give right to a pension equal to only 26.92 percent of the benefit base, against 60 percent of the general scheme. After 30 years the same ratio has increased to 81.73 percent, against 90 percent for the general scheme.

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

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

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

Third, unlike the general scheme, the RCP imposes mandatory retirement at age 65. Exception are made for a few special categories, such as university professors and judges. On the other hand, the RCP allows for early retirement at the age of 60, without any penalty for public servants with at least 30 years of service (20 for military personnel).

A fourth important difference with respect to the general scheme is compatibility between RCP pensions recipiency and income from continuing to work. In a number of special cases, RCP pensioners are allowed to keep a public sector occupation, as long as this does not provide them with a "regular flow of income" (for example, this is the case of members of legislative bodies). More

importantly, the legislation allows RCP pensions to be cumulated with earnings from employment in the private sector.

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

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 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

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		
–maximum pension exempted	$\propto$ Minimum wages	id.
–maximum 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		
–Minimum pension	$\propto$ Minimum wages and family specific	id.
–Maximum 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	$b_t = max\{min\{\tilde{b}_t[n,e,BR(BC,I)]\,,\,\overline{b}_t\}\,,\,\underline{b}_t\}$ where $\tilde{b}_t$ is the pension in A+B and $\overline{b}_t$ 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	$\alpha_n = 1 + 0.02$ (a-65)iff $n\ge 30$
-Social Security contributions:	No contributions for workers 65+, provided $n\ge 35$
-Survivor benefits	0.46 × (benefit base)

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 RESS 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.

RESS

As already pointed out, for individuals enrolled in the RESS, 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, as confirmed by Table **??** which displays the fraction of self-employed contributing the minimum (censored from below) or the maximum (censored from above) for the years 1986 and 1995 respectively. This implies that there is no way in which true earnings for the self-employed can be recovered from the HLSS data set.

We 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 $\tau_a = -\text{SSA}_a / W_{a+1}$, 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* $\text{PV}_a = \max_h\{\text{SSW}_h - \text{SSW}_a\}$, $h = a+1, \ldots, R$, 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* $\text{OV}_a = \max_h\{V_h - V_a\}$, $h = a+1, \ldots, R$, 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, $V_a = 1.25\ \text{SSW}_a$ and

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

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

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

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

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

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).

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.

- 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 any age penalty, and the existence of mandatory retirement at age 65; to measure seniority on the job and in the labor market we have used the length of the current employment spell and its square, the number of years of contribution and its square, the number of years of potential experience; dummies for schooling level and the contributive group (only for people in the RGSS); dummies for part-time work and the 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. The model has 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.

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, implying 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.

R97 + 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 simulation:

S2: Starting from the basic reduced form model for retirement, 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.

Setting to zero the probability of using the DI benefits after age 60 has a very negligible impact, as these are already extremely small to begin with.

For the policy reform denoted R1 we also carry out a second simulation, which aims at quantifying the impact that a change in the legislated ERA and NRA would have on total expenditure.

S3: 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.

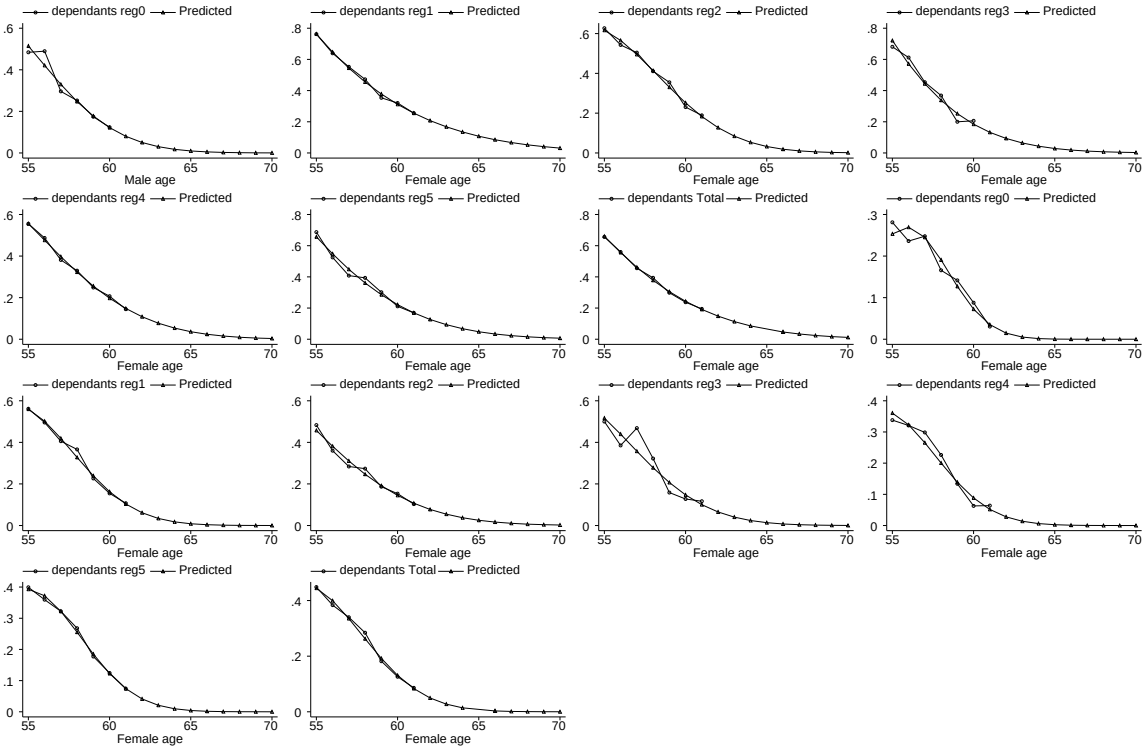


Figure 1: Average number of dependants by region and sex of affiliated individual

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. Figure 1 reports the results of the analysis by region and sex.

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 and extracting the SSW (in 1995) of all those in the 1940 cohort who had already retired at the time, we need a couple of 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 13 and 14.

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:

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

where $p_{hi}(R;X)$ and $p_{hi}(d;X)$ 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:

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

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

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

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 twenty four 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 clearly 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:

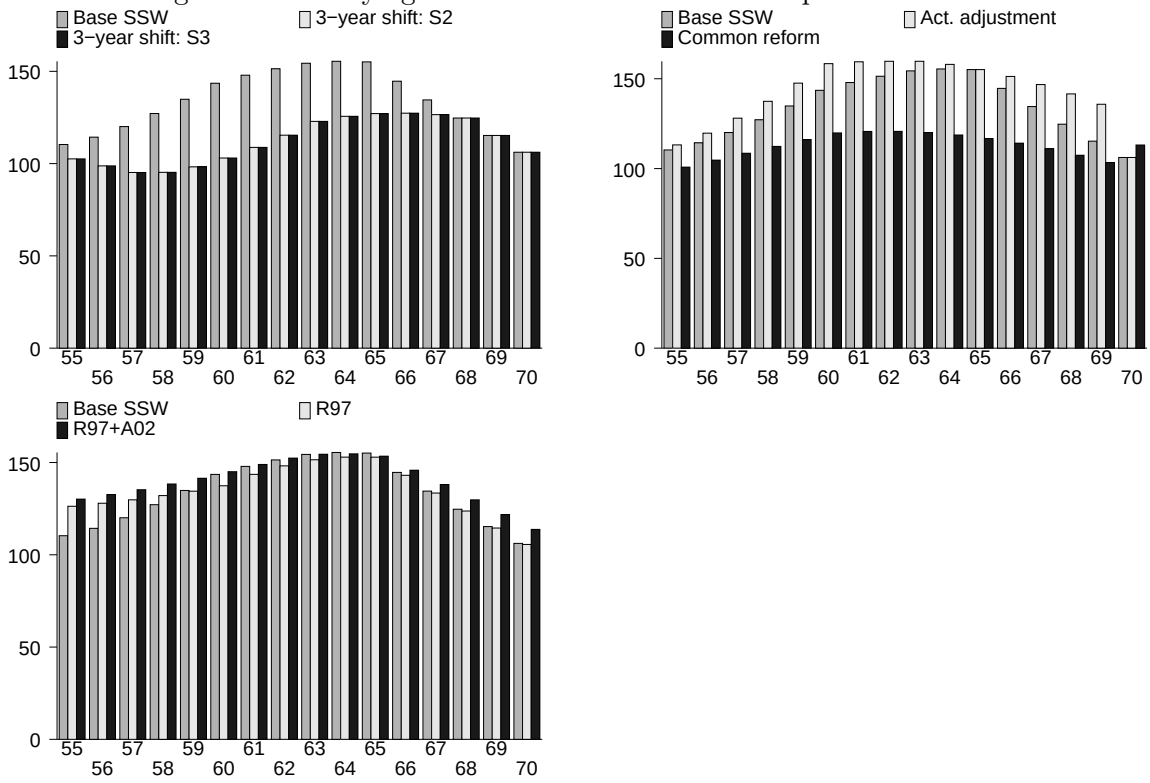
Total Taxes = SS contribution + (1+ VAT) Income Taxes

The difference between the above quantity under the base case pension system and any pension reform gives 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.

Figure 2: SSW by age of labor force exit. RGSS. Option Value



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 their 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

Notice first that the results are pretty homogeneous across sexes. So, while we present the details of the simulation separately for males and females, 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.

Figure 3: SSW by age of labor force exit. RESS. Option Value.

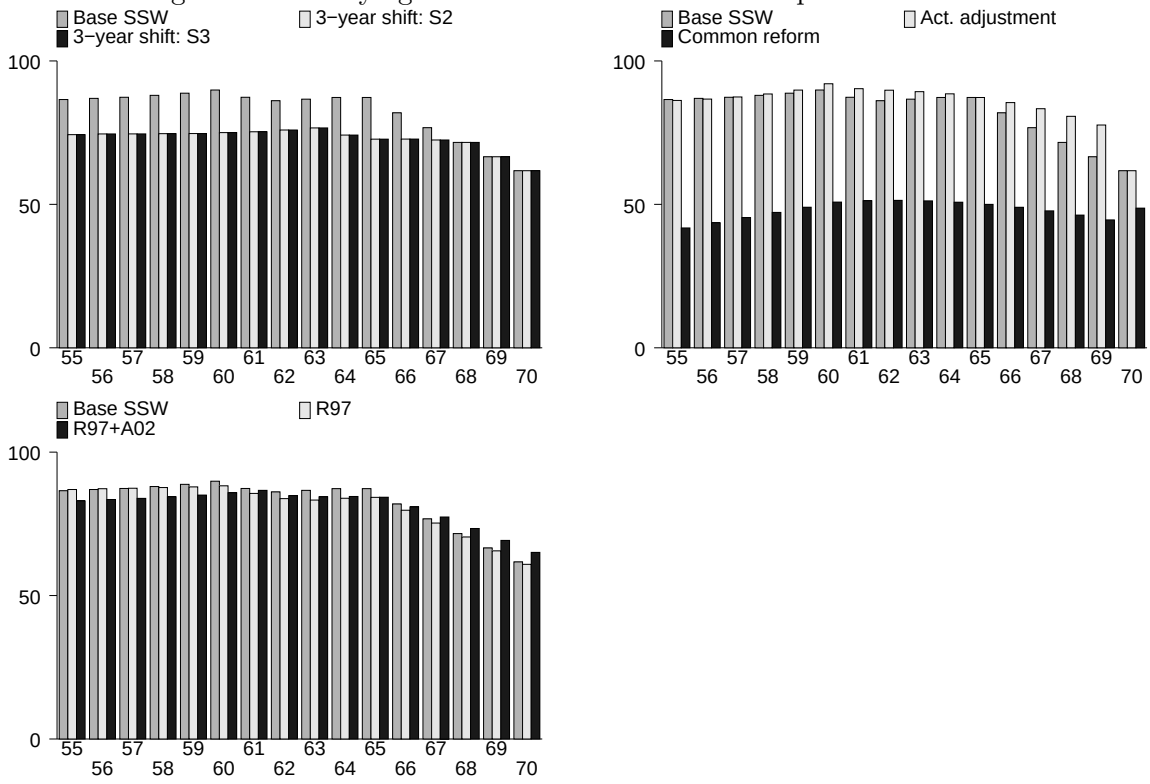
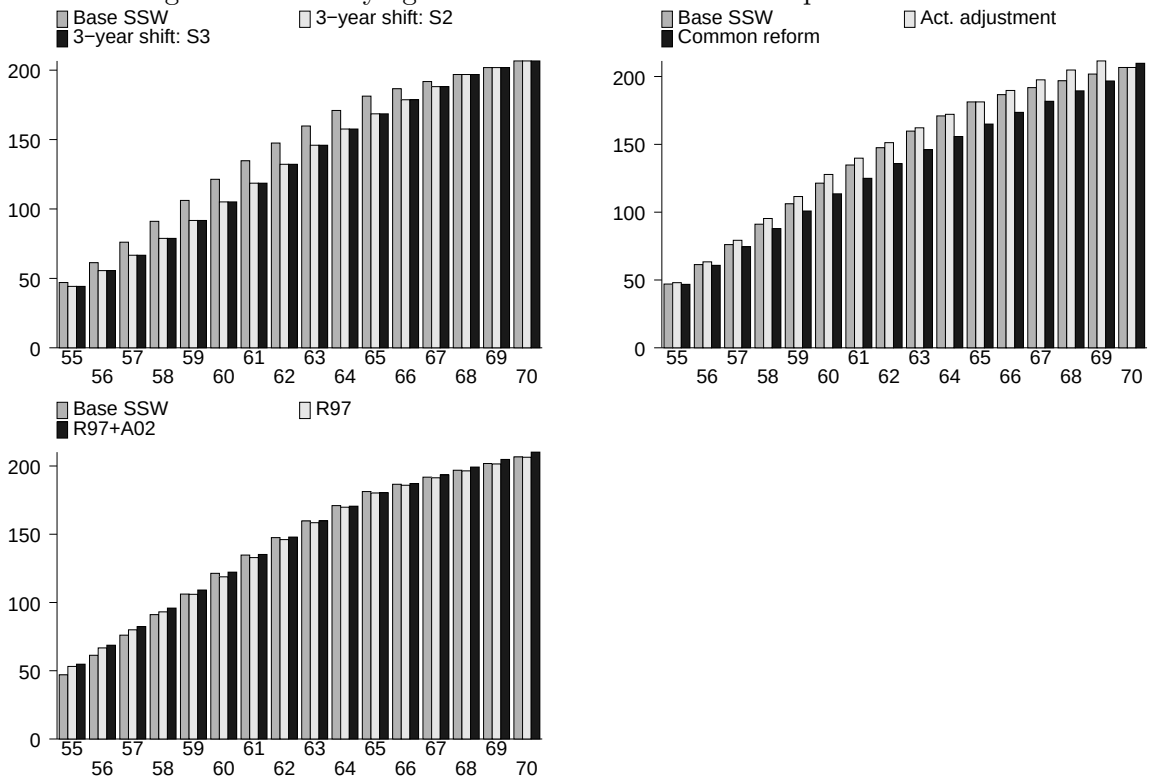


Figure 4: Taxes by age of labor force exit. RGSS. Option Value.



5.1.1 RGSS

We begin our analysis of results from the RGSS. Figure 2 reports SSW by age. 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 55 to 65. The reduction is substantial and, in particular, this reform also 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 R97&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 4. 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 8, 9, and 10 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 8 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. 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 9, top panels). Finally, top panels of Figure 10, 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 6, which is also structured in three panels to facilitate comparison. Results are straightforward: R97 and R97&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 5-8. A large amount of information is reported in this tables, hence we outline only the main features. In Tables 5 and 6 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 separately for male (5) and female (6) workers, and using two different financial measures of retirement incentives, the peak and option values. Tables 7 and 8 summarize, for males and females respectively, the decomposition of the fiscal effects into the behavioral and the mechanical components, which are discussed earlier in the chapter and in the introduction to this volume. 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

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

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 (Tables 7 and 8). 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 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.

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. Figure 3 reports SSW by age. In the first panel we compare the status quo with the R1 reform in its two versions, S2 and S3. They are both somewhat lower than in the base case, and keep the same flat age profile, dropping slightly after the age of 63. A remarkably strong reduction of SSW is obtained by the Common Reform R3 while, as in the RGSS case, the impact of R2 is small. Again, the two Spanish reforms, R97 and R97&A02, do not seem to be doing particularly well; nevertheless, for RESS affiliates, the two reforms decrease rather than increasing gross SSW. The profiles for total (cumulated) tax payments at different ages, reported in Figure 5, are essentially undistinguishable from the base case, exception made for R3, which generates a visible decrease in total tax payments. In the two lower panels of Figures 8, 9, and 10, the same kind of information is reported, only more detailed. In Figure 8 we see that, as for 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

Figure 5: Taxes by age of labor force exit. RESS. Option Value.

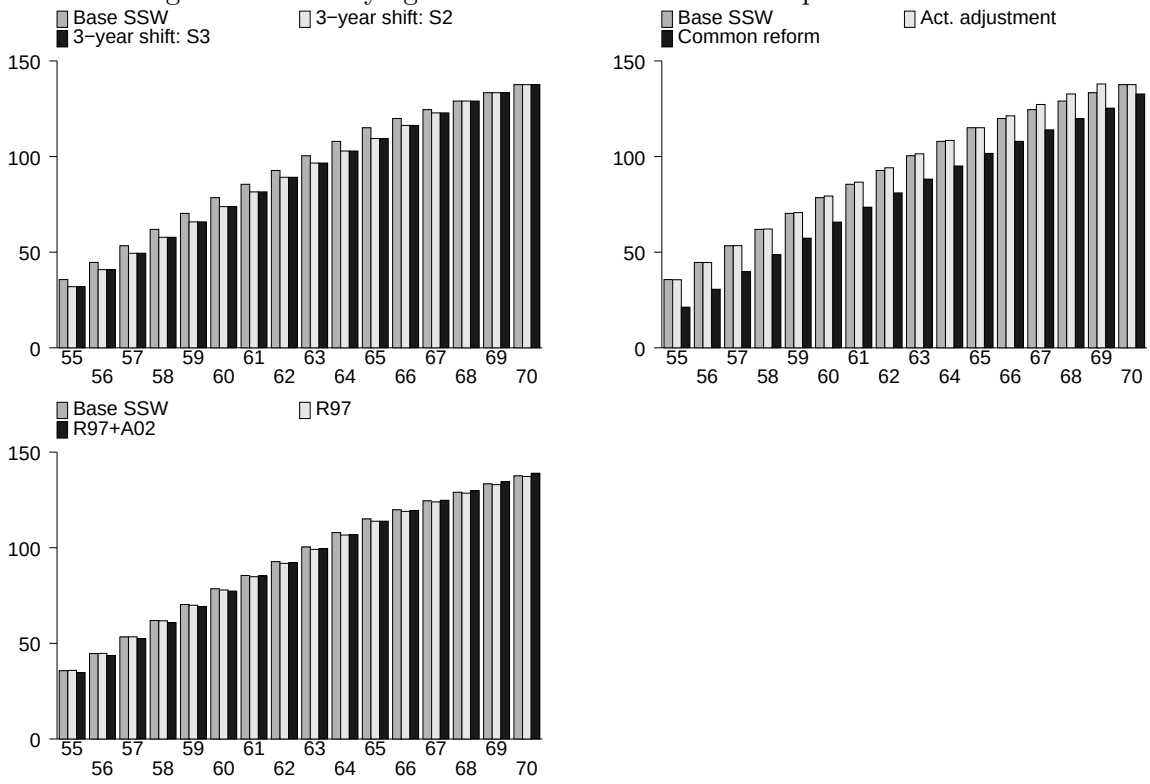


Figure 6: Distribution of age of labor force exit. RGSS. Option Value.

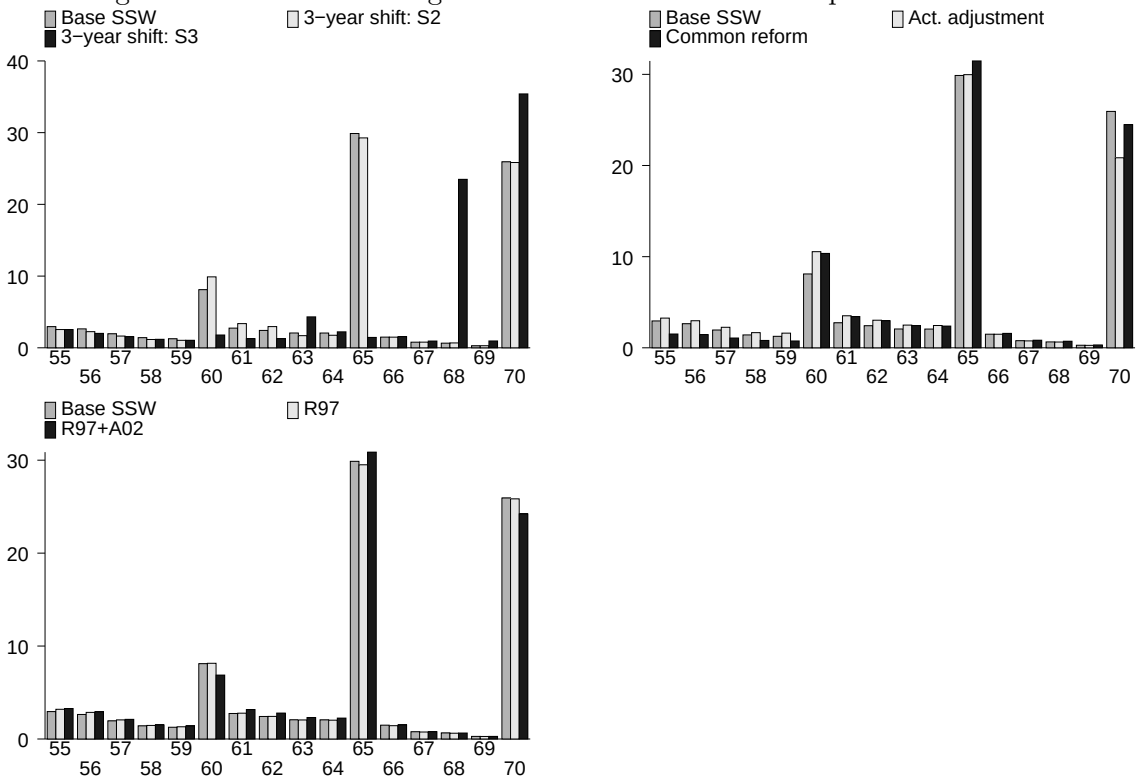


Figure 7: Distribution of age of labor force exit. RESS. Option Value.

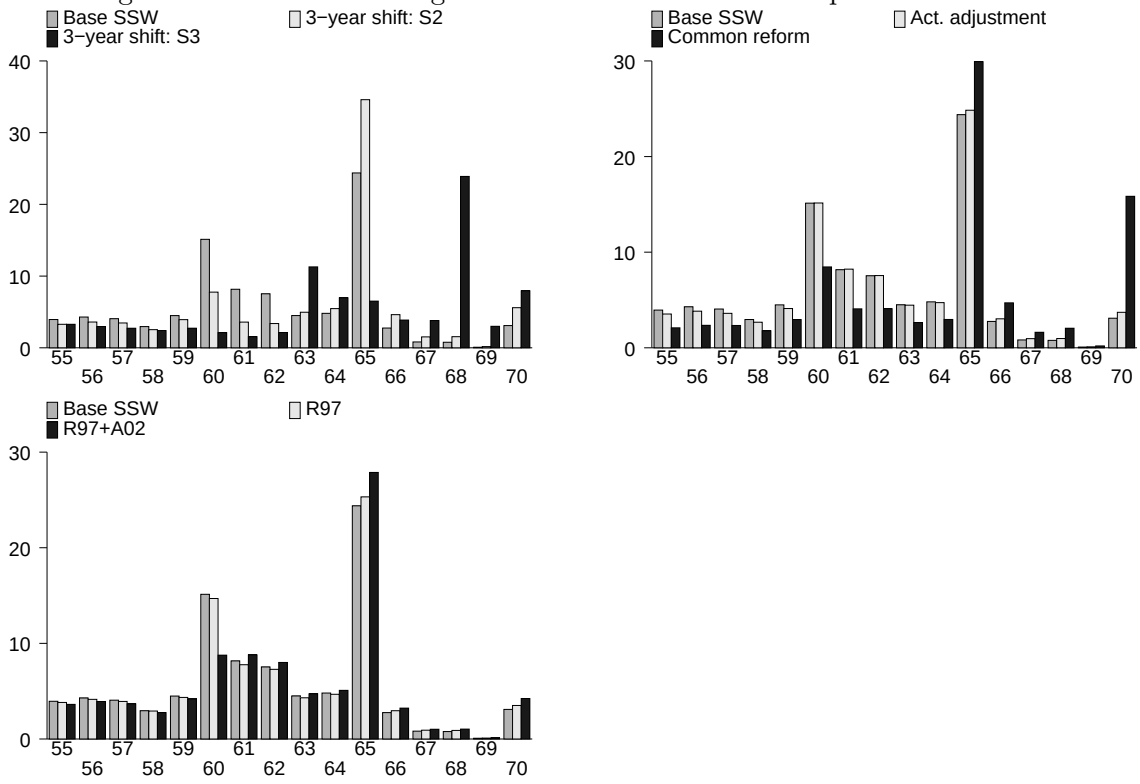
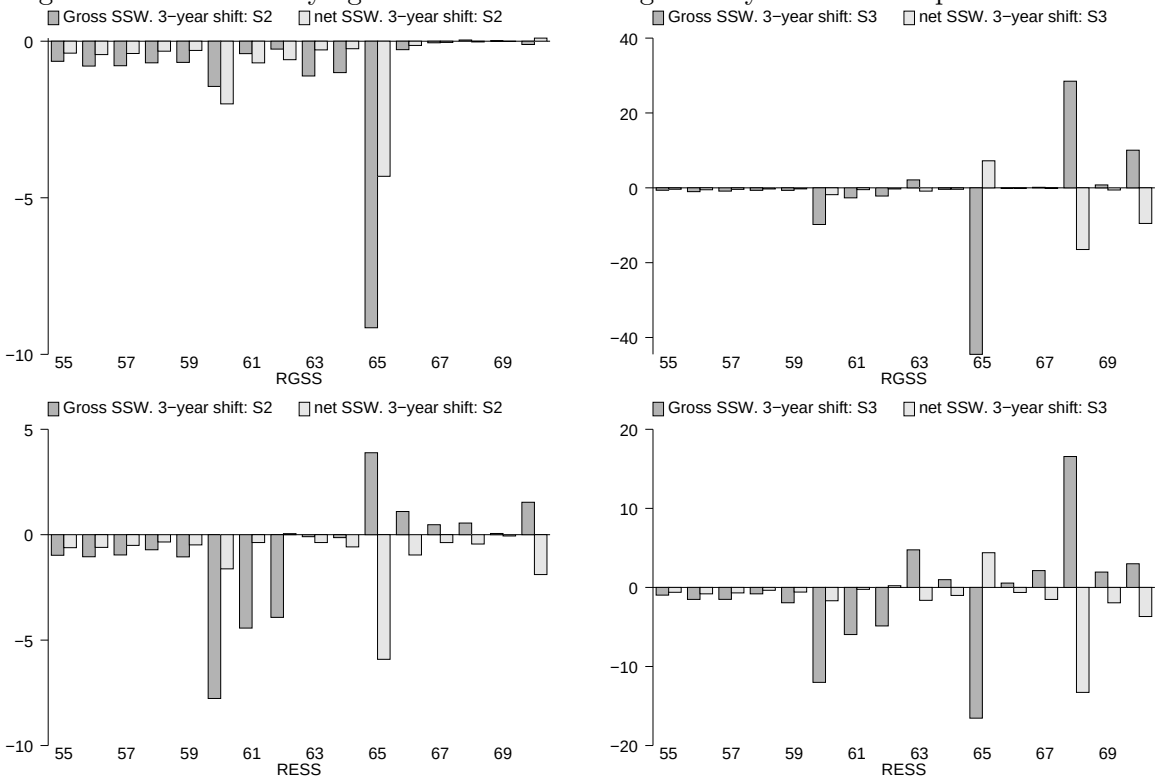


Figure 8: Total effect by age of retirement and regime. 3-year reform. Option Value.



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 9, bottom panels). Finally, bottom panels of Figure 10, 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 7. 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 R97&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 6, 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 9-12. As before for the RGSS, in Tables 9 and 10 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 separately for male (9) and female (10) workers, and using two different financial measures of retirement incentives, the peak and option values. Similarly, in Tables 11 and 12 we report, for males and females respectively, the decomposition between mechanical and behavioral components. There are quantitative, but not qualitative, differences with the RGSS case described earlier (Tables 5-8). The two Spanish reforms now have a somewhat more visible impact on the fiscal position, which (Tables 11 and 12) is now 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, (Tables 11 and 12) 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 on, 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 Figure 12, which reports the total (RGSS plus RESS) fiscal effect of each reform on the Spanish government's fiscal position. We distinguish, in each case, between mechanical and behavioral effect. The same information is reported, in numerical form, in Tables 13 and 14. 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 R97+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 plus 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, maybe a decade or slightly more, such adjustment is likely to eliminate or at least greatly reduce the savings that accrue via the mechanical channel. This would leave, in the long run, only with 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 and re-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, summarizes 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 Table 15 for the comparative reforms and Table 16 for the Spanish specific reforms.

Consider first the three comparative reforms. The impression is striking. For all measures of financial incentives the burden of the reform 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" (do the opposite). The following is a summary of the distributional impact, 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 sizable 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 partially, 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 wealth 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 tiny and practically insignificant aggregate impact. 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.

R97&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 RESS, for which none of the financial measures of retirement incentive seems to play a major role in affecting decisions.

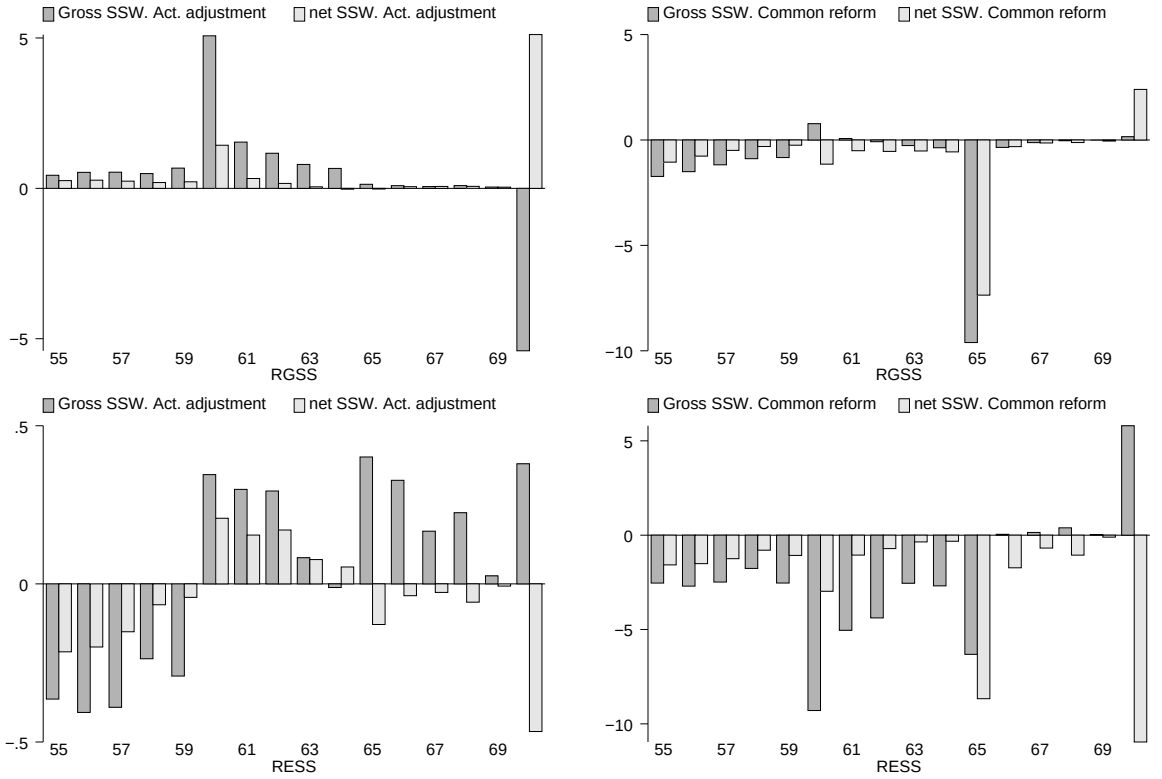
Once this is understood, our findings can be summarized, reform by reform, as follows.

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 that common retirement age is 68 and no longer 65 as it is now, also leads most of the people that now use 65 as a focus point to adopt 68 as a new focus age for retirement, 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 actual outstanding implicit social security debt of Spain, the actual reduction would be likely to be around 15 percentage points at most. Further, some re-distributional 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 careful 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

Figure 9: Total effect by age of retirement and regime. Act. adjustment and Common reforms. Option Value.



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 wealth and in the yearly pension payments of workers belonging to the lower 60 percent of the wage distribution.

The two Spanish reforms, both being currently implemented in Spain, are the least effective of the group. In both cases, the 1997 Reform and the latter plus the 2002 Amendment, the total SSW varies very little, retirement patterns remain almost identical (a very mild shift to the right is predicted for the RESS affiliates) and the net fiscal effect is tiny. Also these reforms, though, 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 R97&A02 engenders will be sufficient to contain the forthcoming Spanish pension deficit.

Figure 10: Total effect by age of retirement by regime. Spanish reforms. Option Value.

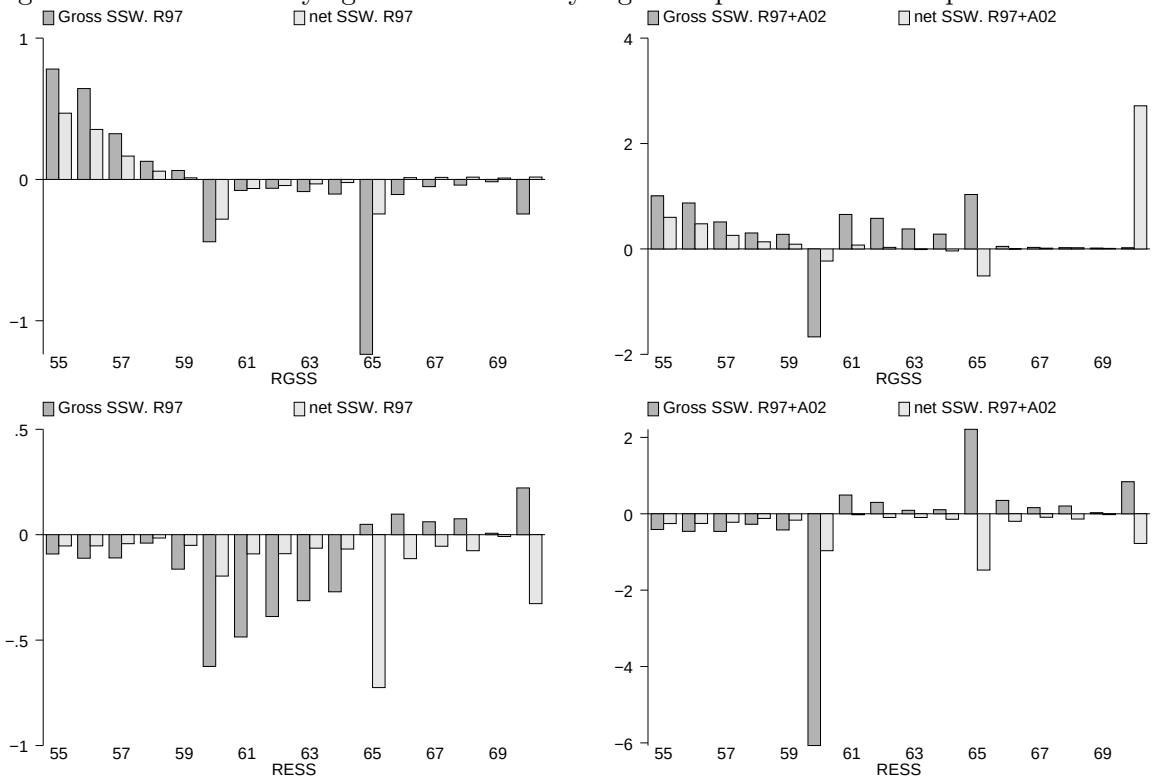


Figure 11: Fiscal implications of reforms as a percentage of the GDP by gender and regime. RETA.

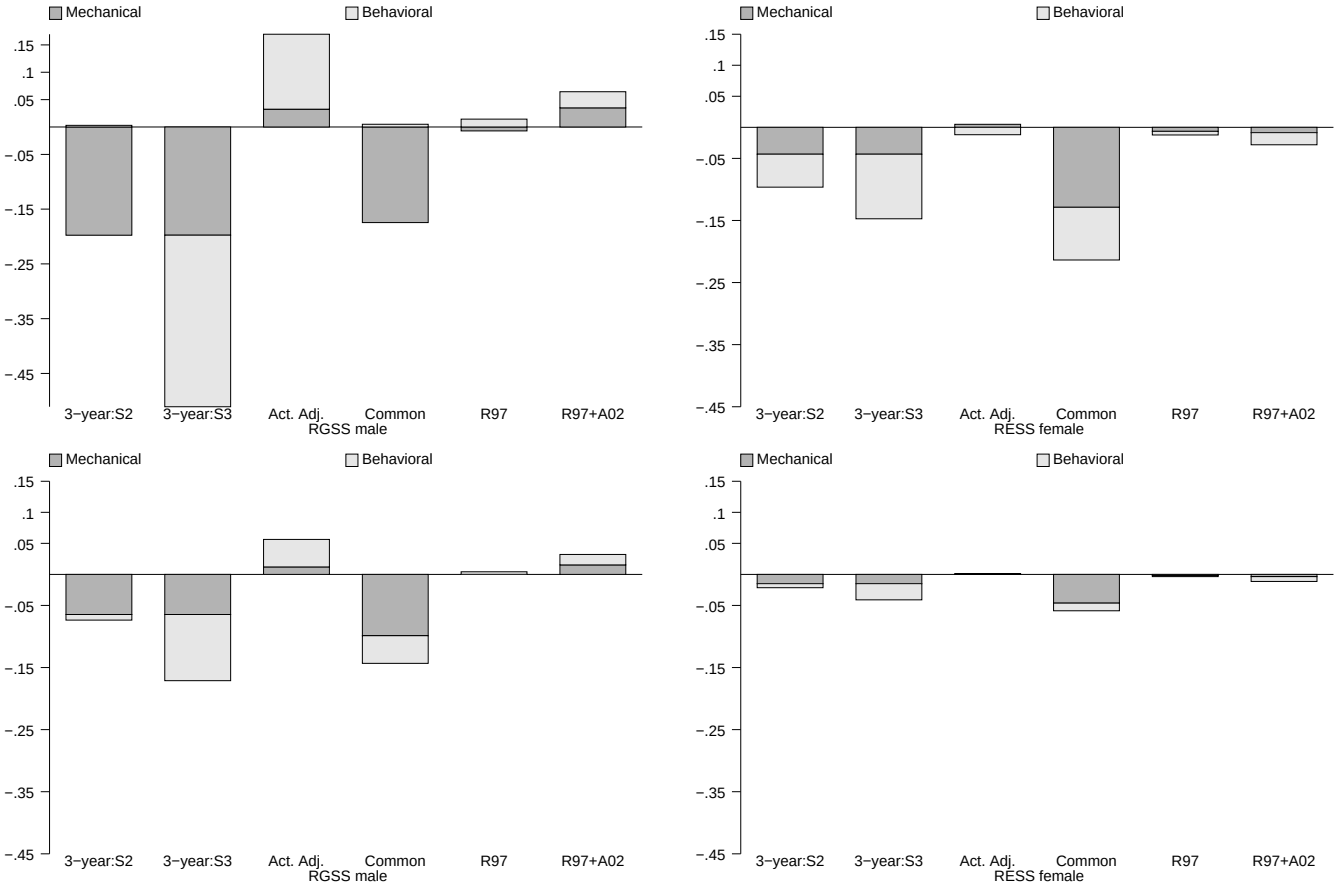
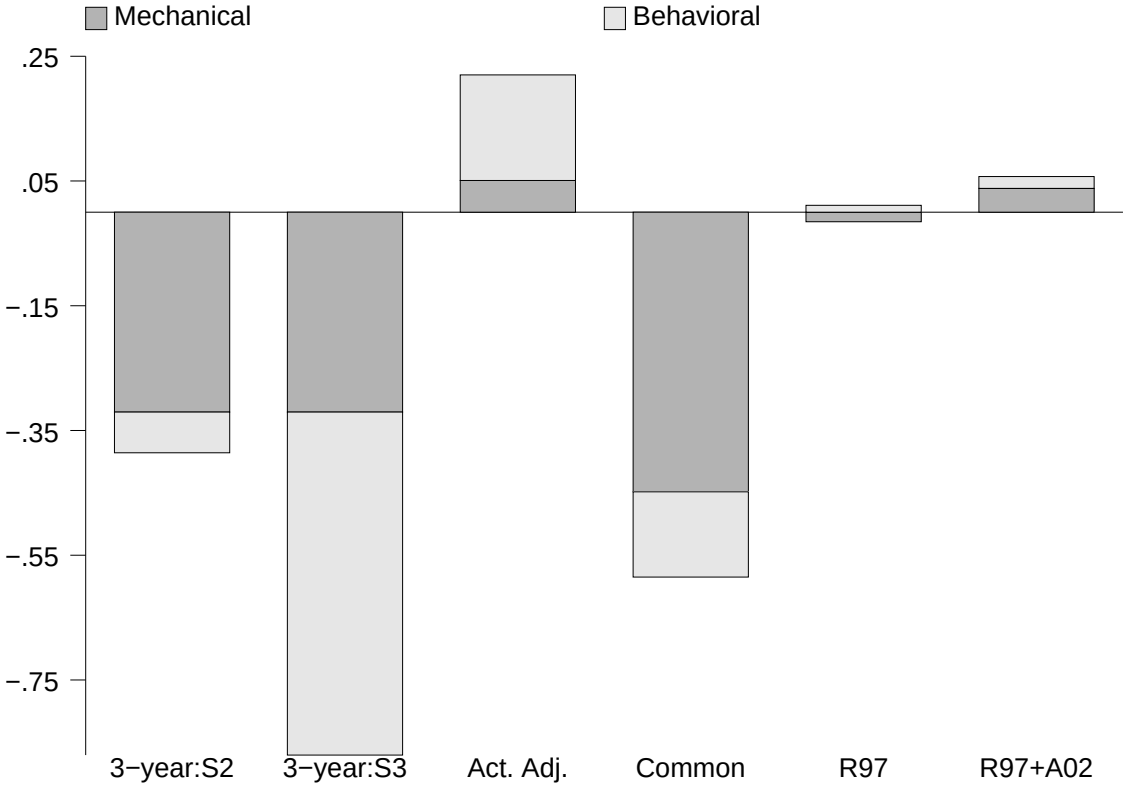


Figure 12: Fiscal implications of reforms as a percentage of the GDP.



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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.

Table 3: Probit models of the 1995 retirement rates.

	ACCRUAL		PEAK		OV	
	coef.	s.e.	coef.	s.e.	coef.	s.e.
	Male RGSS: 16191 obs.					
SSW	.00749	.00152	.01387	.00170	.01627	.00186
(m.e.)	.00071	.00014	.00136	.00017	.00161	.00018
Incent.	-.00130	.00489	.00448	.00254	.01032	.00115
(m.e.)	-.00012	.00046	.00044	.00025	.00102	.00011
Cons.	-1.197	.53053	-1.273	.52863	-1.262	.53657
	R^2	log-l	R^2	log-l	R^2	log-l
	.373	-3579.	.380	-3544.	.381	-3534.
	Female RGSS: 3852 obs.					
SSW	.01812	.00419	.02022	.00438	.02175	.00477
(m.e.)	.00162	.00038	.00185	.00040	.00199	.00044
Incent.	-.00580	.00755	.00393	.00527	.00361	.00210
(m.e.)	-.00053	.00068	.00036	.00048	.00033	.00019
Cons.	-.2204	.74217	-.2072	.74880	-.3375	.75922
	R^2	log-l	R^2	log-l	R^2	log-l
	.355	-860.1	.356	-858.5	.356	-858.5
	Male RETA 4355 obs.					
SSW	.00726	.01174	.00992	.01238	.00501	.01451
(m.e.)	.00096	.00155	.00131	.00163	.00066	.00191
Incent.	.01050	.01440	.01432	.01056	.00187	.00758
(m.e.)	.00138	.00190	.00188	.00139	.00025	.00100
Cons.	-1.542	1.2772	-1.6444	1.2819	-1.324	1.283
	R^2	log-l	R^2	log-l	R^2	log-l
	.252	-1079.	.253	-1078.	.253	-1079.
	Female RETA 2051 obs.					
SSW	-.00176	.01113	-.00248	.01119	-.01475	.01781
(m.e.)	-.00025	.00156	-.00035	.00157	-.00207	.00250
Incent.	.02538	.01207	.01824	.01039	.00739	.01736
(m.e.)	.00355	.00169	.00256	.00146	.00104	.00244
Cons.	-3.678	3.7786	-2.4574	3.8070	-1.876	3.9571
	R^2	log-l	R^2	log-l	R^2	log-l
	.197	-597.9	.196	-598.5	.195	-598.9

note: m.e. stands for marginal effect

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

	Work Force	Fraction
RGSS: Male		
Catalonia	24272.78	.1920417
South	26559.76	.2101359
Castilla	8885.63	.0703015
Madrid	24419.18	.1932
East	20636.98	.163276
North	21618.93	.171045
RGSS: Female		
Catalonia	8622.97	.1806272
South	12999.16	.2722962
Castilla	4767.17	.0998589
Madrid	7142.7	.1496197
East	8133.33	.1703706
North	6073.72	.1272275
RETA: Male		
Catalonia	6239.86	.1615313
South	9896.71	.2561962
Castilla	3084.44	.0798469
Madrid	4973.41	.1287467
East	7679.09	.1987886
North	6755.91	.1748903
RETA: Female		
Catalonia	858.14	.0700625
South	3123.26	.2549975
Castilla	1489.02	.1215705
Madrid	2421.92	.1977368
East	2496.8	.2038504
North	1859.06	.1517823
Total	225010	—

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

			PDV			Change rel. to base			
	Base	+3-year S2	+3-year S3	Act.Adj.	Common				
	(A)	(B)	(C)	(D)	(E)	B/A	C/A	D/A	E/A
			Peak Value						
Benefits	12000	10061	9730	12280	8032	-16.2	-18.9	2.3	-33.1
Taxes: Payroll	5558	5730	6491	5698	5989	3.1	16.8	2.5	7.8
Taxes: Income	2341	1902	1968	2426	1529	-18.8	-15.9	3.7	-34.7
Taxes: VAT	1791	1553	1478	1820	1293	-13.3	-17.4	1.6	-27.8
Taxes: Total	9689	9185	9937	9944	8811	-5.2	2.6	2.6	-9.1
			Option Value						
Benefits	11829	10119	9676	12572	8009	-14.5	-18.2	6.3	-32.3
Taxes: Payroll	5654	5658	6494	5303	5516	0.1	14.9	-6.2	-2.4
Taxes: Income	2316	1904	1955	2441	1466	-17.8	-15.6	5.4	-36.7
Taxes: VAT	1766	1563	1472	1867	1305	-11.5	-16.6	5.8	-26.1
Taxes: Total	9735	9125	9920	9611	8287	-6.3	1.9	-1.3	-14.9
	Base	R-97	R-97 + A02						
			Peak Value						
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						
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: Fiscal impact of reforms: Females in RGSS. In 10^6 2001 Euros.

			PDV			Change rel. to base			
	Base (A)	+3-year S2 (B)	+3-year S3 (C)	Act.Adj. (D)	Common (E)	B/A	C/A	D/A	E/A
			Peak Value						
Benefits	4360	3673	3557	4457	2709	-15.8	-18.4	2.2	-37.9
Taxes: Payroll	2074	2139	2424	2126	2243	3.1	16.9	2.5	8.1
Taxes: Income	819	666	693	848	508	-18.6	-15.4	3.6	-38.0
Taxes: VAT	658	573	546	668	446	-12.9	-17.0	1.5	-32.1
Taxes: Total	3551	3379	3663	3642	3197	-4.8	3.2	2.6	-10.0
			Option Value						
Benefits	4329	3736	3587	4570	2705	-13.7	-17.1	5.6	-37.5
Taxes: Payroll	2001	2027	2298	1883	2084	1.3	14.8	-5.9	4.1
Taxes: Income	813	680	694	852	497	-16.4	-14.6	4.8	-38.8
Taxes: VAT	652	580	550	685	448	-11.0	-15.6	5.1	-31.2
Taxes: Total	3466	3287	3542	3420	3030	-5.2	2.2	-1.3	-12.6
	Base	R-97	R-97 + A02						
			Peak Value						
Benefits	4360	4319	4477			-0.9	2.7		
Taxes: Payroll	2074	2058	2093			-0.8	0.9		
Taxes: Income	819	803	854			-1.9	4.3		
Taxes: VAT	658	653	669			-0.7	1.8		
Taxes: Total	3551	3514	3616			-1.0	1.9		
			Option Value						
Benefits	4329	4316	4524			-0.3	4.5		
Taxes: Payroll	2001	1993	1959			-0.4	-2.1		
Taxes: Income	813	804	857			-1.1	5.5		
Taxes: VAT	652	651	676			-0.1	3.7		
Taxes: Total	3466	3448	3492			-0.5	0.8		

Table 7: Decomposition of the total effect: Males in RGSS. In 10^6 2001 Euros.

	Change in PDV											
	+3-year S2			+3-year S3			Act. Adj.			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
						Peak Value						
Benefits	-1944	5	-1939	-1944	-325	-2270	320	-40	280	-3997	29	-3968
Taxes: Total	-695	191	-504	-695	943	248	115	140	255	-1334	455	-878
Net Change	-1249	-186	-1435	-1249	-1268	-2518	206	-180	25	-2664	-426	-3090
Rel. Change	-10.4	-1.5	-12.0	-10.4	-10.6	-21.0	1.7	-1.5	0.2	-22.2	-3.5	-25.7
						Option Value						
Benefits	-1814	103	-1711	-1814	-339	-2153	280	462	742	-3829	8	-3821
Taxes: Total	-649	39	-610	-649	834	185	100	-224	-124	-1276	-173	-1448
Net Change	-1165	64	-1100	-1165	-1173	-2338	181	686	867	-2553	181	-2372
Rel. Change	-9.8	0.5	-9.3	-9.8	-9.9	-19.8	1.5	5.8	7.3	-21.6	1.5	-20.1
	R97			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 8: Decomposition of the total effect: Females in RGSS. In 10^6 2001 Euros.

	Change in PDV											
	+3-year S2			+3-year S3			Act. Adj.			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
						Peak Value						
Benefits	-680	-7	-687	-680	-123	-803	112	-15	97	-1663	11	-1651
Taxes: Total	-241	69	-172	-241	353	113	40	52	91	-531	177	-354
Net Change	-439	-76	-515	-439	-476	-916	72	-67	5	-1132	-166	-1297
Rel. Change	-10.1	-1.7	-11.8	-10.1	-10.9	-21.0	1.7	-1.5	0.1	-26.0	-3.8	-29.8
						Option Value						
Benefits	-610	16	-593	-610	-132	-742	93	148	241	-1640	16	-1624
Taxes: Total	-214	35	-179	-214	290	76	33	-79	-46	-515	79	-436
Net Change	-396	-18	-414	-396	-422	-818	60	227	287	-1126	-63	-1188
Rel. Change	-9.1	-0.4	-9.6	-9.1	-9.8	-18.9	1.4	5.2	6.6	-26.0	-1.4	-27.4
	R97			R97+A02								
						Peak Value						
Benefits	-33	-7	-41	131	-14	117						
Taxes: Total	-15	-22	-36	51	15	66						
Net Change	-19	15	-4	81	-29	51						
Rel. Change	-0.4	0.3	-0.1	1.9	-0.7	1.2						
						Option Value						
Benefits	-20	7	-13	146	49	196						
Taxes: Total	-10	-8	-18	57	-31	26						
Net Change	-10	15	6	89	81	170						
Rel. Change	-0.2	0.3	0.1	2.1	1.9	3.9						

Table 9: Fiscal impact of reforms: Males in RESS. In 10^6 2001 Euros.

			PDV			Change rel. to base			
	Base (A)	+3-year S2 (B)	+3-year S3 (C)	Act.Adj. (D)	Common (E)	B/A	C/A	D/A	E/A
			Peak Value						
Benefits	2340	1868	1835	2403	987	-20.2	-21.6	2.7	-57.8
Taxes: Payroll	591	629	761	603	687	6.3	28.7	1.9	16.2
Taxes: Income	423	361	363	434	249	-14.5	-14.1	2.8	-41.0
Taxes: VAT	332	267	261	340	146	-19.5	-21.5	2.4	-56.0
Taxes: Total	1346	1257	1385	1377	1082	-6.6	2.9	2.3	-19.6
			Option Value						
Benefits	2318	1849	1805	2342	984	-20.2	-22.1	1.0	-57.5
Taxes: Payroll	660	766	875	684	856	16.0	32.5	3.5	29.5
Taxes: Income	425	363	364	431	250	-14.8	-14.5	1.4	-41.2
Taxes: VAT	327	263	254	330	144	-19.8	-22.3	0.8	-56.1
Taxes: Total	1413	1391	1493	1445	1250	-1.6	5.7	2.2	-11.6
	Base	R-97	R-97 + 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 10: Fiscal impact of reforms: Females in RESS. In 10^6 2001 Euros.

			PDV			Change rel. to base			
	(A)	(B)	(C)	(D)	(E)	B/A	C/A	D/A	E/A
	Base	+3-year S2	+3-year S3	Act-Adj	Common				
			Peak Value						
Benefits	742	594	582	760	300	-19.9	-21.5	2.4	-59.5
Taxes: Payroll	186	197	239	189	216	5.7	28.1	1.4	15.9
Taxes: Income	134	114	115	137	78	-14.3	-14.1	2.4	-42.0
Taxes: VAT	105	85	83	108	45	-19.2	-21.5	2.2	-57.7
Taxes: Total	425	396	436	433	338	-6.8	2.6	1.9	-20.5
			Option Value						
Benefits	745	598	586	763	299	-19.7	-21.3	2.4	-59.8
Taxes: Payroll	170	183	222	170	198	7.6	31.2	0.1	16.5
Taxes: Income	133	115	115	136	78	-13.5	-13.7	2.3	-41.3
Taxes: VAT	106	86	83	108	45	-19.1	-21.3	2.2	-58.0
Taxes: Total	409	383	421	414	320	-6.2	3.0	1.3	-21.6
	Base	R-97	R-97 + A02						
			Peak Value						
Benefits	742	721	710			-2.8	-4.3		
Taxes: Payroll	186	187	198			0.4	6.4		
Taxes: Income	134	130	131			-2.7	-2.2		
Taxes: VAT	105	103	101			-2.5	-4.5		
Taxes: Total	425	419	429			-1.3	1.0		
			Option Value						
Benefits	745	727	712			-2.4	-4.4		
Taxes: Payroll	170	173	184			2.0	8.7		
Taxes: Income	133	130	130			-2.2	-2.0		
Taxes: VAT	106	104	101			-2.2	-4.6		
Taxes: Total	409	407	416			-0.5	1.8		

Table 11: Decomposition of the total effect of Reforms by regime: Male in RESS. In 10^6 2001 Euros.

	change in PDV											
	+3-year S2			+3-year S3			Act-Adj			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
					Peak Value							
Benefits	-467	-5	-472	-467	-38	-504	58	6	64	-1366	13	-1353
Taxes: Total	-124	36	-89	-124	163	39	17	14	31	-357	93	-264
Net Change	-342	-40	-383	-342	-200	-543	40	-8	33	-1009	-80	-1089
Rel. Change	-14.6	-1.7	-16.4	-14.6	-8.6	-23.2	1.7	-0.3	1.4	-43.1	-3.4	-46.6
					Option Value							
Benefits	-420	-49	-469	-420	-93	-513	44	-20	24	-1346	12	-1334
Taxes: Total	-114	92	-22	-114	194	80	14	18	32	-355	192	-164
Net Change	-306	-141	-447	-306	-287	-593	31	-38	-8	-991	-180	-1170
Rel. Change	-13.2	-6.1	-19.3	-13.2	-12.4	-25.6	1.3	-1.6	-0.3	-42.7	-7.7	-50.5
	R97			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 12: Decomposition of the total effect of Reforms: males in RESS. In 10^6 2001 Euros.

	change in PDV											
	+3-year S2			+3-year S3			Act. Adj.			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
						Peak Value						
Benefits	-145	-2	-148	-145	-14	-160	16	2	18	-446	4	-442
Taxes: Total	-39	10	-29	-39	50	11	5	3	8	-116	29	-87
Net Change	-107	-12	-119	-107	-64	-171	11	-2	10	-330	-25	-354
Rel. Change	-14.4	-1.6	-16.0	-14.4	-8.6	-23.0	1.5	-0.2	1.3	-44.5	-3.3	-47.8
						Option Value						
Benefits	-143	-3	-147	-143	-15	-158	17	1	18	-451	5	-446
Taxes: Total	-37	12	-25	-37	49	12	5	1	6	-116	27	-88
Net Change	-106	-15	-121	-106	-64	-171	12	1	12	-335	-22	-357
Rel. Change	-14.3	-2.0	-16.3	-14.3	-8.6	-22.9	1.6	0.1	1.7	-45.0	-3.0	-47.9
	R97			R97+A02								
						Peak Value						
Benefits	-20	-0	-21	-29	-3	-32						
Taxes: Total	-6	1	-6	-7	11	4						
Net Change	-14	-1	-15	-22	-15	-36						
Rel. Change	-1.9	-0.2	-2.0	-2.9	-2.0	-4.9						
						Option Value						
Benefits	-17	-1	-18	-29	-3	-32						
Taxes: Total	-5	3	-2	-7	14	7						
Net Change	-12	-4	-16	-22	-18	-40						
Rel. Change	-1.6	-0.6	-2.1	-3.0	-2.4	-5.3						

Table 13: Total fiscal impact of Reforms. In 10^6 2001 Euros.

			PDV			Change rel. to base			
	Base	+3-year S2	+3-year S3	Act.Adj.	Common				
	(A)	(B)	(C)	(D)	(E)	B/A	C/A	D/A	E/A
			Peak Value						
Benefits	19441	16195	15704	19900	12027	-16.7	-19.2	2.4	-38.1
Taxes: Payroll	8410	8695	9915	8616	9135	3.4	17.9	2.5	8.6
Taxes: Income	3716	3044	3138	3846	2363	-18.1	-15.5	3.5	-36.4
Taxes: VAT	2885	2478	2368	2935	1929	-14.1	-17.9	1.7	-33.1
Taxes: Total	15011	14217	15421	15397	13428	-5.3	2.7	2.6	-10.5
			Option Value						
Benefits	19221	16301	15655	20247	11997	-15.2	-18.6	5.3	-37.6
Taxes: Payroll	8485	8633	9889	8040	8653	1.7	16.5	-5.3	2.0
Taxes: Income	3687	3062	3128	3860	2292	-17.0	-15.2	4.7	-37.8
Taxes: VAT	2851	2491	2360	2991	1942	-12.6	-17.2	4.9	-31.9
Taxes: Total	15023	14186	15376	14891	12887	-5.6	2.3	-0.9	-14.2
	Base	R-97	R-97 + A02						
			Peak Value						
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						
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 14: Decomposition of the total effect of Reforms. In 10^6 2001 Euros.

	change in PDV											
	+3-year S2			+3-year S3			Act. Adj.			Common		
	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total	Mech.	Beh.	Total
	Peak Value											
Benefits	-3236	-9	-3246	-3236	-500	-3737	506	-47	459	-7472	58	-7414
Taxes: Total	-1099	305	-794	-1099	1509	410	177	209	386	-2337	754	-1583
Net Change	-2138	-314	-2452	-2138	-2009	-4147	329	-256	73	-5135	-696	-5831
Rel. Change	-11.0	-1.6	-12.6	-11.0	-10.3	-21.3	1.7	-1.3	0.4	-26.4	-3.6	-30.0
	Option Value											
Benefits	-2987	67	-2920	-2987	-579	-3567	434	591	1025	-7265	41	-7224
Taxes: Total	-1014	177	-837	-1014	1367	353	152	-285	-133	-2261	125	-2136
Net Change	-1973	-110	-2083	-1973	-1946	-3920	283	876	1158	-5004	-84	-5088
Rel. Change	-10.3	-0.6	-10.8	-10.3	-10.1	-20.4	1.5	4.6	6.0	-26.0	-0.4	-26.5
	R97			R97+A02								
	Peak Value											
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											
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 15: Distributional Analysis. Comparative reforms. Option Value. In 10^6 2001 Euros.

	PDV					Change rel. to base			
	Base (A)	+3-year S2 (B)	+3-year S3 (C)	Act.Adj. (D)	Common (E)	B-A	C-A	D-A	E-A
1st quintile (highest)									
Benefits	5510	4723	4554	5888	4599	-787	-955	378	-911
Taxes: Payroll	2906	2946	3310	2716	2591	40	404	-190	-315
Taxes: Income	1320	1134	1146	1390	1063	-185	-174	70	-257
Taxes: VAT	810	716	681	861	713	-94	-129	6.3	-97
Taxes: Total	5035	4796	5136	4966	4367	-239	101	-69	-669
Net Change						-548	-1056	447	-242
change as a % of Base ben.						-9.9	-19.2	8.1	-4.4
2nd quintile									
Benefits	4438	3689	3551	4731	2816	-749	-887	293	-1622
Taxes: Payroll	1995	2039	2346	1873	2115	44	351	-122	120
Taxes: Income	899	728	748	950	535	-171	-151	51	-364
Taxes: VAT	649	559	529	689	452	-91	-120	6.1	-197
Taxes: Total	3544	3326	3623	3513	3102	-218	79	-31	-441
Net Change						-531	-966	324	-1180
change as a % of Base ben.						-12.0	-21.8	7.3	-26.6
3rd quintile									
Benefits	3501	2924	2813	3688	1990	-577	-689	187	-1512
Taxes: Payroll	1504	1531	1758	1436	1622	28	254	-68	118
Taxes: Income	619	497	514	649	320	-122	-106	30	-299
Taxes: VAT	519	448	424	545	328	-71	-95	4.9	-191
Taxes: Total	2642	2476	2696	2629	2271	-166	54	-13	-371
Net Change						-411	-742	200	-1141
change as a % of Base ben.						-11.7	-21.2	5.7	-32.6
4th quintile									
Benefits	3151	2656	2543	3272	1597	-495	-608	121	-1554
Taxes: Payroll	1216	1238	1436	1175	1310	22	220	-41	94
Taxes: Income	490	395	408	507	226	-95	-82	17	-264
Taxes: VAT	473	411	388	490	271	-63	-85	3.6	-203
Taxes: Total	2179	2043	2231	2172	1807	-137	52	-7	-372
Net Change						-358	-661	128	-1182
change as a % of Base ben.						-11.4	-21.0	4.1	-37.5
5th quintile (lowest)									
Benefits	2602	2291	2167	2647	984	-311	-435	46	-1618
Taxes: Payroll	862	876	1034	838	1011	14	172	-24	148
Taxes: Income	356	305	309	361	145	-51	-47	5	-211
Taxes: VAT	397	356	333	403	175	-41	-63	1.7	-221
Taxes: Total	1615	1537	1676	1602	1331	-78	62	-13	-283
Net Change						-233	-497	58	-1334
change as a % of Base ben.						-9.0	-19.1	2.2	-51.3

Table 16: Distributional Analysis. Spanish reforms. In 10^6 2001 Euros.

	PDV			Change rel. to base	
	Base	R97	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