LIFE-TIME REDISTRIBUTION EFFECTS OF THE SPANISH PUBLIC PENSION SYSTEM

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ABSTRACT

The paper analyses the inter and intragenerational redistribution effects of the public pensions system in Spain. This is achieved by first comparing the expected present value of life-time income transfers (PVT) and internal rates of return (IRR) of different population cohorts. Secondly, we study the intragenerational aspects of the Spanish public pensions by calculating PVTs the IRRs for workers of different categories, grouped by earnings, gender and marital status.

The results obtained show the nature of the important intergenerational effects of the Social Security System in Spain. The oldest 1935 cohort clearly benefits in relation to the youngest 1965 cohort. This is basically due to the gap between current wages and the contribution bases established in the 60s and 70s in Spain during the early stages of the Social Security System, and to the worsening shortfall in Social Security funding, combined with the longer of life expectancy.

In addition, intragenerational effects exist by income levels. For contributors who pay between the minimum and the maximum allowable contribution bases, net transfers and rates of return are higher in actuarial terms for high income contributors. The social security 'deal' is again more profitable for high income individuals since they contribute at the maximum basis, with respect to low income contributors at the minimum basis. This is due to the late entry and a higher survival rate for high income contributors.

The system tends to favour women, given that they generally live longer than men and this factor is only partially offset by their lower wages. Married males, given the fact that they have longer life expectancy and leave a pension to their spouse, obtain higher present net transfers too than do single contributors.

We close the paper with some comments on the slight impact and moderate effects of proposals for Social Security reform and on how these may change the previously observed redistribution effects.

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1.-INTRODUCTION

The life-time income redistribution effects of the Social Security public pensions programs have been approached in the literature from two directions. On the one hand, the studies of Pellechio and Goodfellow [1983], Hurd and Shoven [1985], Ferrara and Lott [1985], Boskin [1986], Boskin et al. [1987], Myers and Schobel [1993] and Steuerle and Bakija [1994] have focused on the impact of the programs on a hypothetical individual or family. On the other hand, some studies have been based on population surveys and actual social security records for different population cohorts of retirees, in the case of Hurd and Shoven [1985], Meyer and Wolff [1987a, 1987b] and Nelissen [1987], and of workers still in the labour market, in the case of Creedy et al. [1993].

Ours is a middle-of-the-road approach, since we have resorted to simulating data in some cases and taken actual figures in others. Simulation is used for calculating contributions (increase in earnings and changes in the pay-roll tax) and the benefits for hypothetical workers and pensioners. However, whenever possible, we have taken the available information based on the Social Security Law, life expectancy of pensioners and, where applicable, of his beneficiary, so as not to stray from the real world.

The way the literature evaluates how Social Security redistributes income across and within generations is to compute the present values of life-time benefits and contributions. Other views refer the expected rates of return and the relative values of both receipts and payment flows.

For the analysis of the redistribution effects of the Spanish Social Security system, we take the case of the 'General Regime' (the so-called *Régimen General de la Seguridad Social*), which covers a 70% of the

contributors and a 53% of the pensioners. By doping this we do not consider the intragenerational impact due to the existence of other Social security regimes (civil servants, self-employees, and for agricultural workers, among others) regarding their different, and generally more 'profitables regimes'[1]. We follow a life-time approach for workers who differ according to age, their earnings level, gender and marital status.

The application of this type of analysis to the Spanish case differs from previous studies (see, Monasterio y Suárez [1992] y Monasterio et al. [1996], Durán [1995] and Jimeno y Licandro [1996]) in the following respects: we assume several types of individuals born in four generations (1935, 1945, 1955 y 1965), but who have contributed to the Spanish Social Security system from 1960 up to the present. Different earning profiles, gender and marital status are considered in each case.

Earlier studies (Hurd and Shoven, 1985, Boskin 1986, Boskin et al. 1987, Meyer and Wolff, 1987a, 1987b and Steuerle and Bakija, 1994) found out that U.S. Social Security net transfers create important intergenerational redistributive effects. In general, older cohorts of retirees achieved up to three times their contribution, with high rates of return (greater than 10% in real terms in the case of retirees during the fifties and sixties). By contrast, future pensioners will get much lower rates, say in 2025, estimated at a mere 2%. In addition, intragenerational redistribution effects seem to be due to the fact that the PAYG system shows different net transfers and rates of return for individuals in the same cohort but with different income, gender and marital status.

In particular, Steuerle and Bakija (op. cit.) find that the system has been regressive within generations during most of the US Social Security's

[1] As shown by Monasterio and Suárez [1992] and Monasterio et al. [1996], IRRs are higher for the Special rather than for the General Regime due, in general, to the shorter contribution periods required for reaching the full pension.

history. That is, given a cohort of retirees, net transfers have been inversely related to need: people with the highest life time incomes have tended to receive the largest absolute transfers above and beyond what they contributed. For the first century of retirees in the system, the largest amount of net transfers went to high income individuals who turned 65 around the year 1980. Boskin et al. (op. cit) also show very significant differences in the treatment of households with regard to their circumstances, particularly in relation to income differences and marital status.

The paper is organized as follows. In the second section we detail method, data and assumptions. We then proceed to calculate the effects and present the results according to the strategy adopted. In the fourth section we calibrate the results by comparing the redistributive consequences of alternative reform proposals which try to redress existing Social Security pension deficits. We end by discussing the main results and some suggestions for future research in the field when data becomes available[2].

2.-METHODOLOGY AND DATA

In order to understand how Social Security redistributes income across and within generations it is required to adopt a life-time approach. We need to compare how retirement benefits and tax contributions evolve over life for people of different cohorts, earnings, gender and marital status.

[2] A more complete analysis of the Spanish Social Security can be found in "La Seguridad Social en España: aspectos redistributivos inter e intrageneracinales, y consideraciones para su reforma", Gil [1997].

A computer simulation was used to convert assumptions about households' wages, expected mortality and economic growth in real wages into expected present values of Social Security contributions, pension benefits, net transfers and internal rates of return.

In doing so, we take four cohorts of hypothetical workers, born in 1935, 1945, 1955 and 1965. We assume that individuals contribute to the Social Security system up to retirement at age 65[3]. Without unemployment this garantees full pension. This is actually the case of 75% of the General Regime insurees[4].

We have assumed 25 years for the entrance age when we study both intergenerational and intragenerational redistribution effects by gender and marital status. Only in the case of the analysis of the intragenerational effects by income levels we have considered different affiliation ages, since they are likely to be positively correlated to the worker's training, as shown in Table 1[5].

[3] In practice, 63 is the average age for retirement once we account for some factors in existing regulations that induce early retirement (see Gómez-Sala, 1993).
[4] In the case of self employed workers and agricultural labourers, on average 56% of pensions are obtained after contributing for 15 years or less.
[5] We have not considered the 1935 cohort in this case due to the fact that at so early age, we would have had to consider contributions of up to 50 years for low income workers. Data for the whole period are not available.

Table 1: 'Entrance' ages into the labour market according to education levels and some assumptions on the increase of real wages of intermediate income workers.

Cohorts: Year of birth	High Income Earners	Intermediate Income Earners		Low Income Earners
		Real Wage Increase (2,5%;2%) and (2%; 1,5%)	Real Wage Increase (1,5%;1%) and (1%; 0,5%)	
1945	23 years	20 years	18 years	15 years
1955	25 years	22 years	20 years	16 years
1965	28 years	26 years	24 years	22 years

Note: High Income Earners are here identified with Graduate Educated people (the so calledprofessional category 1 or *Titulados Superiores*); Low Income Earners, or unskilled workers, with professional category 10 or *Peones*). In brackets we include the percentual increase in real wages until the individual is 55 years old and since then up to retirement we assume different rates.
Source: Own elaboration from M.T.S.S data [1995a].

We considere that the age of entry to the labour market is higher for the 1965 cohort, independently of the education level achieved, due to the larger incidence of youth unemployment in the 80s and 90s[6].

2.1-Life time contributions

We have assumed three type of workers with different income levels for each of the four cohorts. High income earners are identified with professionals with a higher degree (professional category 1), according to the Earnings Survey (E.S.). With the sole exception of the 1935 cohort

[6] In 1995, the average affiliation age was 23 years. For workers with high education (*Titulados Superiores*) it was 28, and 22 for the lower categories (unskilled workers or *Peones*). For the middle income earners the figure was 24/25 years old.

(and just for the 1960-1963 period for which this identification does not apply), we assume that they contribute at the maximum contribution permitted[7].

Low income earners are identified with unskilled workers (professional category 10). They contribute at the minimum contribution basis permitted[8]. Since 1996 the contributions of all of them are assumed to be linked to price increases; this is estimated at 2.5% per annum (see Table 2).

Table 2: Average monthly contribution basis at 64 and initial monthly pension, for each type of contributor (in constant 1996 pesetas).

	High Income Earners	**Low Income Earners**
Contribution Basis	374.880	75.687
Initial Retirement Pensions	274.508	61.749

Finally, there exist several intermediate income earners who contribute according to different wage profiles, ranged between the minimum and the maximum allowable contribution basis. The starting point is the average wage of professional category 10. However, we have had to estimate the average income earnings for these workers, since there was no single homogeneous Earnings Survey by the National Spanish Statistic Institute (I.N.E.) between 1960 and 1996[9].

[7] It includes the basic and the so called *complementary* basis for the 1972-1978 period.

[8] Again, for the years 1960-1963, we assume average earnings, and that no complementary basis was applicable for the period 1972-1978.

[9] Despite the INE earnings Survey suffers an upward bias although basically corrected in the 1989 E.S. -see Malo de Molina [1983] for discussion- we have opted for employing these data, because they will allow us to construct wage series by contributors´groups.

For this purpose we have utilized the 1977 E.S. and the 1981 E.S. Both cover the period from 1977 to 1988 and employ similar methodology. From 1960 to 1976, and due to the changes introduced in 1977 on previous 1963 Survey methodology[10], we have backwards estimated the 1977 earnings up to 1960. We have done this by taking into account the annual rates of growth of average earnings per hour of the professional category 10[11]. Finally for the 1989-1996 period, and again because of the methodological changes introduced in 1989 E.S.[12] -having omitted earnings by type of workers-, we have had to estimate wages by forecasting the average earning rate of increase for 1987 and 1988[13]. From 1996, onwards, we assume that wages increase at the forecast inflation rate of 2.5%. We have taken gross total earnings in all the cases commented on above. Time series and cross sectional data were then used in the calculation of the final results.

For each of the four cohorts we looked at several wage-contribution series for the intermediate income earner, from his entrance into the labour market until retirement. For this purpose we have assumed different hypotheses on wage growth in order to construct the longitudinal series. This is due to the fact of existence of overlapping different cohorts of individuals at any given point in time.

We do this by taking the cross section annual earnings growth rates for the professional category 10. Once in the labour market, these rates are additionally increased by different percentage increases in real wages. They are assumed to be inversely correlated to age as reflection of lower

[10] See Malo de Molina [op. cit.] for an explanation of theses changes.
[11] In addition, information on earnings by types of Professional Categories of workers was suppressed.
[12] See *Metodología de la encuesta de salarios en la industria y los servicios*, The National Statistical Institute (INE), 1989.
[13] We have applied an average rate of growth in gross salaries of 4.67% for the '10th category' or "*Peones*".

productivity, throughout individuals' working life (before and after the cut-off point of 55). This is shown in Table 3.

Table 3: Rate of growth of increases in real wages, according to the age, for intermediate income earners (alternative values in columns).

≤ 55 years	2.5%	2%	1.5%	1%
> 55 years	2%	1.5%	1%	0.5%

We show in Table 4 the resulting monthly contribution basis for hypothetical intermediate income earners, who enter the labour market at 25 and leave it at 64. Notice that the final wage level ends with the same values for each of the four cohorts, since we have assumed identical wage increases and the same age (25) on entry to the labour market.

Table 4: Monthly contribution basis at age 64 and initial retirement pension (in constant 1996 pesetas) for intermediate income earners under different assumptions of real wage increases (all entering the labour market at age 25).

	Real Wage Inc. (≤ 55: 2.5% > 55: 2%)	**Real Wage Inc. (≤ 55:2% > 55: 1.5%)**	**Real Wage Inc. (≤ 55:1.5% > 55: 1%)**	**Real Wag. Inc. (≤ 55:1% > 55: 0.5%)**
Contribution Basis (CB)	308,024	253,247	208,010	170,687
Initial Retir. Pension (IRP)	234,713	196,232	163,937	136,853

Finally, in Table 5 we change the basic assumptions by allowing for different ages on entry to the labour market. As it can be seen, real wage increases favour the 1945 cohort in all the cases.

Table 5: Monthly contribution basis at age 64 and initial retirement pension (in constant 1996 pesetas) for intermediate income earners of different cohorts under different assumptions of real wage increases.

Cohorts: Year of birth	**Real Wage Inc. (≤ 55: 2.5% > 55: 2%)**	**Real Wage Inc. (≤ 55: 2% >55: 1.5%)**	**Real Wage Inc. (≤ 55: 1.5% > 55: 1%)**	**Real Wage Inc. (≤ 55:1% >55: 0.5%)**
1945	CB= 348,491 IRP=265,548	CB= 279,596 IRP=216,650	CB= 230,959 IRP=182,024	CB= 183,080 IRP=146,789
1955	CB= 331,769 IRP=252,806	CB= 268,796 IRP=208,281	CB= 224,117 IRP=176,631	CB= 179,419 IRP=143,854
1965	CB= 300,511 IRP=228,987	CB= 248,280 IRP=192,384	CB= 211,129 IRP=166,396	CB= 172,394 IRP=138,221

Note: CB: Monthly Contribution Basis; IRP.: Initial Retirement Pension. We have assumed here the same ages on entry to the labour market as in Table 1.

We have calculated the Social Security contributions to the General Regime for each hypothetical worker between 1960 and 1996 in accordance with the regulations then in force. We assumed that 1996 legislation will remain in force and that payroll tax will continue to be levied at 28.3% rates (the 1996 rate). The contribution rate has been reduced however by the ratio of total contributions to pensions, due to the

fact that the General Social Security Regime finances some other Social security benefits. This ratio grew from an initial 19.3% in 1960 up to 70.5% in 1996.

From 1996 to 2029 (last year of contributions for the 1965 cohort), we have calculated the pension burden (average pension and number of pensioners) and the increase in the amount of contributions (monthly contribution basis, rates and number of contributors) following the estimations of M.T.S.S [1995b], Barea et al. [1995], Herce and Pérez-Díaz [1995] and Carpio y Domingo [1996]. In particular:

a) for Herce and Pérez-Díaz [1995], the average rate of growth of pensions is put at 3.5% for 1995-2000, 1.82% for 2000-2020 and 1.5% for 2020-2030[14]. These are higher rates than those actually recorded, since the authors assume that no other Special Regimes will plausibly benefit (cross-subsidise) from the finance of the General Regime, and the relative aging of the Spanish baby-boom generation will disappear in 2045.

b) for the trend in contributions to the Social Security System -which will depend on real GDP and productivity growth-, we have assumed a 1% annual cumulative increase between 1995-2000 and 0.5% between 2000-2030[15].

[14] The actual annual increase in the number of pensions has been: 6.3% between 1980-1985, 4.7% between 1985-1990 and 4.5% between 1990-1995 (see, the *Informe económico-financiero de los presupuestos de la Seguridad Social*, 1996).

[15] This is a less optimistic assumption that the rates considered by Herce and Pérez-Díaz [1995] -a 1% increase in average terms between the years 2000-2025-, or by M.T.S.S [1995b] -a 0.87% for the period 1998-2010. But this hypothesis is more consistent with the reduction in the unemployment rate experienced by the European countries in the last decade.

c) finally we have assumed that pensions increase in real terms a 1,5% per year, in similar terms that the increase in real wages (this is slightly less than the average increase in productivity).

Overall, the assumptions above imply a difference between the growth rate of pensioners, weighted by the average real pension, and the growth rate of contributors, weighted by the average real contribution wages, producing a gap averaging 2.5% between 1995-2000, 1.32% for 2000-2020 and a 1% for 2020 to 2030.

Lastly, we consider a backwards incidence of payroll taxes in terms of lower wages[16]. Thus they are considered as 'differed wages'.

2.2.-Life time retirement benefits

We compute the initial retirement pension P_0 in accordance with the Social Security Law, given the maximum and the minimum pensions legislation (at any given moment in the past, and under the constant regulation hypothesis in the future). Thereafter, the initial pension, expressed in 1996 constant pesetas, is indexed to price increases up to the moment the pensioner dies.

The old-age pension is calculated on the last 8 years of contributions before retirement. These are adjusted by the price index, except for the two final years. The fact that workers retire at 65, after having contributed at least 35 years (this is the case of three quarters of the contributors under the General Regime), which garantees the payment of the full pension (i.e. 100% of the permitted maximum).

[16] Argimón and González-Páramo [1987] and Escobedo [1991] find empirical evidence for this hypothesis.

The estimated retirement pension for a high income worker is bounded by the maximum allowable pension (see Table 3: in 1996, 274,508 pesetas per month). For a low income worker the pension is 61,749 pesetas per month, slightly above the minimum pension[17].

As commented, Tables 4 and 5 show initial retirement pensions for intermediate income earners under different assumptions. Their replacement rate is, on average, around 90%.

2.3 Survival and life expectancy

In general, there exist two approaches for adjusting life-time contributions and retirement pensions of our hypothetical workers: survival and the life expectancy tables. The first one takes the survival probability at each age, according to Mortality Tables, once we assume a given age on the worker's entry to the labour market. The second one takes observed life expectancy from worker's affiliation to the Social security scheme.

Both approaches give similar results, since both take the same basis: mortality rates. However, we adopt the 'survival method' for estimating inter and intragenerational redistribution effects for income levels and gender. We have made these adjustments whenever possible since they allow for a more accurate adjustment of survival rates at each worker's age. In adjusting for the marital status of the workers, we have had to use the life expectancy approach due to data availability.

[17] In fact, under the General Regime, only a 25% of the low income earners get a financial complement for a minimal pension.

In short, for the intergenerational redistribution exercise we use the survival table on a longitudinal or *generational* basis[18], in order to reflect the dynamic survival rate at each age. In the intragenerational case, for gender and income levels, we use the ordinary or 'static' survival tables under different assumptions of entry to the labour market. This is because we wish to obtain the redistribution sign for a given cohort, leaving aside the impact of time. Finally, for the study of the redistribution effects among workers according to their marital status, we take the average life expectancy at age 25, as mentioned above.

In particular, we have constructed four different longitudinal survival tables for gender, according to the year workers enter the labour market. This was done in two stages. First, we covered the years when the cohorts joined the labour market (1960, 1970, 1980 and 1990): here the survival rates take the number of surviving individuals by gender at each age point in the general population. Second, the previous tables as a result of the estimates of the mortality functions (see González-Calvet [1994, 1996]). This allows the death probabilities at each age and year per gender to be obtained up to the middle of the next century. (In the Appendix 1 we show a comparison between the longitudinal survival and the static INE tables).

In accounting for the survival tables by gender, we take the ordinary static survival tables, as used by life insurance companies -Lecina [1990]- for estimating survival rates in private pension plans. We adopt the 1970 survival table for the 1935 and 1945 cohorts and the 1980 table for the 1955 and 1965 cohorts. Again, they show higher survival probabilities for each gender and age than those reflected in the INE mortality tables.

[18] As it is known, the longitudinal survival tables allow for an increase in the survival rate in relation to the static mortality tables, since they incorporate the improvement in health states of the individuals along time.

For survival tables by income levels (despite the fact that there is no official table of survival rates by individual income levels), there is some evidence that high income earners and better-educated people (both factors being correlated) enjoy better health. This produces a lower mortality rates at each age and higher life expectancy at birth. In the Spanish case, Regidor et al. [1996] show that manual workers (1.72) and workers in agriculture (1.56) suffer a higher mortality rate than managers and white collars in general (1.72 and 1.56 against a normalized value of 1, respectively)[19].

However, due to the fact that a comprehensive survival table for different earnings and age of entry to the labour market is not yet available, we have had to construct one using the existing evidence[20] and some simplifying assumptions[21]. By adopting the Reed-Merrel exponential function (see Livi-Bacci [1993]), we have converted the summarized table into a complete one.

Finally, with regard to life expectancy tables by marital status, cross-sectional studies reveal that mortality rates are lower amongst married individuals than for widows and widowers, single unmarried or divorced individuals. A possible explanation relates to the social support role played by living together. It may also help to create health behavioural factors and to avoid some psychological problems related to individual

[19] This results from a sample of males 30 to 64 years old from 8 Spanish provinces. Regidor et al. [1996] consider that these mortality differences have to do with childhood welfare (…) education and other individual psychological factors. Tobacco, alcohol consumption, lack of physical exercise and hypertension do not seem to play a major explanatory role.

[20] See *Mortalitat a la ciutat de Barcelona*, 1991, Institut Municipal de Salut Pública, Ajuntament de Barcelona. These mortality tables take five year breaks.

[21] In particular we have assumed that the mortality rate of high income workers is that of the high income Barcelona district, and similarly for low income. In addition, we have had to consider that mortality differences amongst districts of different income levels are constant for the four analysed cohorts.

isolation. Other explanations point out the fact that married people are a natural selection sample of population already gruping healthier people.

Burgoa et al. [1997a], using probabilistic models, obtain a mortality ratio, adjusted by age, of 1.67 for single males and 1.53 for single females in relation to a value of 1 for married males and females respectively. These results are used to build life expectancy tables by age groups in Burgoa et al. [1997b]. According to them, the life expectancy in 1991 of a married male 25 to 29 years old, was 52.27 additional years (44.65 for a single male). Life expectancy of a married female was 63.82 additional years.

These results affect our calculations on the direct redistribution impact between single and married workers. Moreover, we have to consider an additional effect due to the survivor's pension in favour of the widow or widower.

3.-CALCULATION

The method used to analyse how Social Security redistributes income across and within generations is based on the calculations of the expected present value of the life-time transfers (PVT) and the internal rates of return (IRR). The present value of transfers (PVT) is computed as the difference between the expected present value of the retirement benfits, PVB, and of the contributions (PVC). That is,

$$PVB = \sum_{t=65}^{m} P_0 \, (1+i)^{-(t-64)} \, Ps_{t,e} \qquad (1)$$

$$PVC = \sum_{t=e}^{64} w_t^{96} \, tc_t \, (1+i)^{-(t-64)} \, Ps_{t,e} \qquad (2)$$

$$PVT = PVB - PVC \qquad (3)$$

where ‘t’ is the contributor’s age, ‘e’ is the age of entrance into the labour market, ‘$w_t^{96'}$ are annual wages (in constant 1996 pesetas); ‘tc_t‘ is the adjusted contribution rates[22]; ‘P_0‘ is the initial retirement pension (again in 1996 pesetas); ‘i’ is the discount rate; ‘m’ refers to the age of death according to the available mortality rates; and ‘$Ps_{t,e}$‘ is the survival probability, determined by the age of entry to the labour market. This last variable is set at 25 years, in order to study both the intergenerational redistribution effects and the intra effects according to gender and marital status, and the actual values of labour market entry for the intragenerational effects for income levels, as explained before.

The real rate of discount, following previous studies (see, among others, Hurd and Shoven [1985], Boskin et al. [1987], and Steuerle y Bakija [1994]), is set at between 2% and 4% (the rate of return of a similar capital asset of relatively low risk). We will take here the central value of 3%, which is close to the long term growth in the economy. Therefore, a positive value of PVT shows a surplus or a net gain (i.e. larger expected present values of retirement benefits over the contributions). The opposite applies for negative values. The ratio between (1) and (2) indicate the relative value of the lite-time net gain or loss.

The expected internal rate of return IRR offered by the system is calculated as the real rate of discount where (1) and (2) are equal in the following equation:

$$\sum_{t=e}^{64} w_t^{96}\ tc_t\ (1+r)^{-(t-64)}\ Ps_{t,e} \;=\; \sum_{t=65}^{m} P_0\ (1+r)^{-(t-64)}\ Ps_{t,e} \qquad (4)$$

[22] That is, weighted by the share of the pensions over total contributions in the General Regime.

If $r > i = 3\%$, we will consider that the PAYG pension system is more than actuarially fair, being higher the net transfer obtained. Notice that when we study the intragenerational redistribution effects by marital status, the IRRs and PVTs calculations, the survival probability Ps does not appear as in (3) and (4). Moreover, m is proxied by the average life expectancy from entry to the labour market.

4.-RESULTS

According to the hypothesis of the previous section, the results show:

Intergenerational redistribution effects

Table 6 shows the impact of Social Security on income redistribution across generations. It has been assumed that individuals entry to the labour market at age 25 and the longitudinal survival tables were adopted. We observe that workers in the 1935 cohort have clearly benefited from the Spanish public pension system: PVT varies from 4 to 23 million 1996 pesetas. This means that for this cohort, retirement benefits amount a present value ranging from an average of 68% up to 240% above life-time contributions. For the 1965 cohort, the PVT absolute values are much smaller. Even those on middle incomes with lower wage growth, and those contributors on a low income and high income get negative transfers. The 1965 low income contributors suffered a net loss of 3 million 1996 pesetas (this is, a life-time retirement pension equal to 81% of the contributions). The net loss was 21 million pesetas (73% of past contributions) for high income workers.

Table 6 here.

Rates of return mirror the situation. The IRRs for the 1935 cohort are relatively high (5% to 6.7%). This is due to the contribution bases applied during the 60s, well below real wages. The youngest cohorts get just between 2% and 3.6%. Indeed we find a lump sum transfer from the youngest to the oldest pensioners. This pattern is rather similar to the one

found in the US case. Hurd and Shoven (1985) and Steuerle and Bakija (1994) show that for 1950 and 1960 pensioners, with low life-time contributions, the Social Security system offered real rates of return above 15%, against those obtained by the workers who retired during the 70s (just half: 8%), and an estimated 2% for the pensioners retiring in the year 2000.

We have also recalculated PVTs and IRRs for an hypothetical worker who enters the labor market at age 25 and contributes for 40 years according to the observed average contribution basis during the period 1960 to 1996. By assuming a growth in the average contribution basis of 1% and 2% up to the moment of retirement, and by taking the longitudinal mortality table, we find that this contributor has an IRR of between 6.11% and 6.15%. This is a figure close to the results shown already in Table 6.

Intragenerational redistribution effects.

As in most of the literature we have surveyed, we find that there is a significant differential impact of the pension system among individuals of identical cohorts, due to differences in income, gender, and marital status.

Redistribution effects by income levels

Table 7 shows (i) the present value of the observed transfers PVT (in 1996 pesetas), (ii) the PVB to PVC ratio and (iii) the IRRs, once we take first the GRM-GRF survival table (weighted by gender composition) into account for intermediate income workers, and second, the former table

adjusted for low and high income workers. The entry to the labour market is set as in Table 1.

Table 7 here

The main results are: (i) workers with higher income levels between the maximum and minimum allowable contribution basis (the majority with an average monthly contribution wage of 175,000 1996 pesetas) achieve the highest net transfers in both absolute and relative terms, and higher IRRs. For instance, an individual born in 1955, joining the Social Security General Regime in 1977 (at age 22) with the lowest wage, but with annual increases in real terms of 2.5% up to age 55 and 2% up to retirement, after contributing for more than 40 years, ends up with a replacement rate of 89% and after life-time benefits, with a 3% discount rate, obtains a positive net transfer of 2 million 1996 pesetas. This amounts to 5% above life-time contributions, with a real IRR of 3.18%. For a worker in the same cohort, affiliated to Social Security at age 20, but with a lower wage rate increase (1% up to 55 and 0.5% up to retirement), the final wage is 46% lower. This implies a higher replacement rate (93%) but a negative transfer (6 million 1996 pesetas) which equals just 80% of his contributions. IRR is 2.3% here (well below what an alternative safe investment would yield).

In brief, the key factors for intra-generation redistribution effects are a) the role of the maximum and the minimum contribution bases permitted, b) the number of years in contributing the Social Security system in excess of 35, since it does not add benefit to the calculated pension, and c) the rate increase in earnings over time, and particularly, during the final years, since the pension is determined through these

values, and not as a result of actual life time contributions[23]. As derived from the calculations we are therefore inclined to consider the Spanish pension system as a proportional system increasing with income from the intragenerational viewpoint, and then with a social regressive impact.

(ii) As in Boskin et al. [1983], Pellechio y Goodfellow [1983], Hurd y Shoven [1985], Boskin [1986] y Steuerle y Bakija [1994] for USA; Creedy et al. [1992] in the UK and Stahlberg [1989] for Sweden, a second result shown in Table 7 offers further support for the former result. The ratio PVB/PVC and IRRs are higher for high income earners who pay according to the maximum allowable contribution basis- than for low income earners, who contribute with the minimum contribution basis. This is due to the fact that high income earners have higher survival rates and enter the labour market later (do not 'waste' contributions and do experiment the 'apropriate' earnings time profile). Take the 1955 cohort again: the high income earner, who joins the labour market at 25 and contributes for 40 years, suffers a high absolute loss (23 million 1996 pesetas). This is due to the existing regulation on maximum allowable pensions well above the limiting effects of the maximum contribution basis. However, the PVB/PVC ratio (67%) and the resulting IRR (1.66%) are higher than those resulting from the low income life-time contributor (59% and 1.42%, respectively)[24].

Redistribution effects by gender

[23] Duran (1995) shows that after 35 years of contributions and for the same wage when retire, two workers with different wage increase profiles (1% versus 4%) show very different IRRs: 3.1% and 4.7%, respectively.

[24] The relative late entry of high income workers is the key factor in this result. By assuming the same age we obtain 1.84% IRRs for low income contributors and 1.66% for high income contributors.

By looking at the intragenerational redistribution effects by gender, one observes that females obtain higher PVTs and IRRs, all things being equal. This effect is due to the higher life expectancy of women at birth and higher survival rates at 65 years old. This is the case, although female wages are lower according to all the existing data (INE E.S., Institute for Fiscal Studies Institute and the Spanish Tax Agency, 1996), reaching just 81% of male remuneration.

Table 8 here.

Table 8 shows the estimated PVT, PVB/PVC ratio and IRRs by gender. There exists a different male and female profile depending on their wage increases (2% and 1.5% for males versus 1.5% and 1% for females, up to 55 and up to 65 respectively). From this it results a 82% wage differential level at the end of a working life-time.

For instance, in the case of the 1955 cohort, male contributors have a negative net transfer of 2 million of 1996 pesetas, whereas females get a positive transfer of 1.5 million of 1996 pesetas: this amounts to a pension benefit of 94% for males, against 105% of life-time contributions for females. Thus, the IRR for males is 2.76% and 3.17% for females. We can see then why PVTs are higher for females, despite higher male wages, due to the females higher survival rate.

Redistribution effects according to marital status.

The analysis is limited to intragenerational redistribution effects according to marital status for (i) the 1965 cohort -since the life expectancies by marital status refer to the 1991 period (see Burgoa et. al.,

1997b)- and (ii) restricted to intermediate income workers, given the fact that life expectancies by marital status are not income adjusted. We take 25 as the age of entry to the labour market.

Table 9 here

Table 9 shows that those married contributors reaching an average age of 82, and leaving pensions to wives up to 92, get a positive transfer. Just the opposite is true for single contributors: lower life expectancy (79 years) and no widow's surviving pension explain this result[25].

Likewise, a married contributor with wage increases of 2% up to the age 55 and 1.5% up to 65, achieves a positive transfer of 6.7 million 1996 pesetas, i.e. pension benefits 18% above past contributions. His IRR equals 3.57%. A single contributor with an identical profile makes a net loss of 4.4 million pesetas and his IRR is 30% lower (2.5%). These results are not surprising and show similar effects to those obtained for the US by Pellechio and Goodfellow [1983], Hurd and Shoven [1985], Boskin et al. [1987], despite the existing differences on pension eligibility[26], and by Nelissen [1987], in the case of The Netherlands.

5.- ANALYSIS OF THE EFFECTS OF SOME REFORMS IN THE SPANISH PUBLIC SOCIAL SECURITY SYSTEM.

Finally, in this section, we would like to indicate the effects of some of the reform proposals of the Spanish public Social Security system on IRRs. In particular, we are interested in the following changes: a) the

[25] This is calculated as 45% of the husband's pension, as established by Social Security legislation.

[26] In USA, a retired worker living with wife or husband gets an additional 50% of the pension. Once the worker has died, the survivor gets 100% of the initial pension.

minimum retirement age is raised to 68, but the calculation formula, based on the last 8 years of contributions stays unchanged. This proposal is an attempt to address the issue of greater life expectancy and aging population; b) the present values of pensions are adjusted 0.5% below the price index, all the things remaining equal[27] and c) the calculation formula is gradually extended from 8 to 15 years, in present value terms for the whole period, and leaving the retirement age unchanged. This is in fact the formula finally adopted in Spain as a result of a political consensus (the so-called *Toledo Agreement*).

We show in Table 10 to 13 these proposals one by one and all together. They are referred to the four workers' cohorts. We adopt the longitudinal survival table, and we assume that contributors join Social Security at 25 and retire at 65.

Table 10 shows that increasing the retirement age to 68 produces a lower benefit period and a higher life-time contribution, but it does not change the initial pension or the replacement rate, since it does not increase the real contribution basis. This implies a decrease in the IRR for high income earners between 0.62 and 1.25 percentage points depending on other individual circumstances (i.e. 23% to 31% reduction in comparison to IRRs of Table I). A similar result is obtained for low income workers: IRRs fall by between 0.63 and 1.1 percentage points. For intermediate income earners the fall in rates of return is lower, depending on the rate wage increases: around 17% for workers with higher wage increases given the effects on the initial pension at age 68.

[27] Herce and Pérez-Díaz (1995) estimated that this is the most effective measure for closing the gap between existing Social Security revenues and expenditure. The 2025 deficit under this reform would amount to 1.72 against 3.46 if the system is left unchanged.

Where the computation period is extended from 8 to 15 years (as decided by the Spanish Government in October 1996), there is no effect on our hypothetical high and low income earners (see Table 11). The impact is very low for contributors who pay at around the higher and the lower contribution bases (0.068 up to 0.23 percentage points, for the 1965 cohort), due to the slight decrease in the initial pension (between 2.2% and 6.8%). This is the case despite the fact that the computation takes previous period contributions as given. Jimeno and Licandro (1996) reach a similar conclusion: a representative worker having contributed for 35 years to the Social Security General Regime with an annual real growth of contributions of 1%, retiring at age 65, and living for 17 additional years, would suffer a fall in his rate of return of 0.11 percentage points (from a payment's return of 2.5% to 2.39%) and a decrease of the initial pension (2.96%), due to the extension of the computation period to 15 years.

The proposal of reducing pensioners purchasing power to 0.5% a year, as we show in Table 12, produces a fall of 0.17 percentage points for all representative workers. Again, Jimeno and Licandro (1996) reach a similar result to ours. These changes are not clearly enough to balance Spanish Social Security accounts.

Finally, in Table 13 we show the effect of combining the three different reform proposals a), b) and c). For the 1935 cohort, all the proposals together reduce IRRs between 1.2% and 1.6 percentage points. For the 1965 cohort the figures are 0.8 and 1 percentage points (between 30% and a 38%), respectively. Within this last cohort (individuals who will retire in 2029), IRRs decrease to 39% for high earnings contributors, 29% for intermediate income earners and 34% for low income workers.

6.- DISCUSSION

In short, this paper has shown, first, the nature of the intergenerational effects of the Social Security system in Spain. The 1935 cohort has always clearly benefited in relation to the 1965 cohort. This is basically due to the observed gap between current wages and contribution bases in the 60s and 70s in Spain. Secondly, we have detected the existence of important intragenerational effects by income levels. For participants who pay between the minimum and the maximum contribution basis permitted, the system offers a larger share in actuarial terms for high income earners: net transfers and IRRs are higher for high income contributors than for low income workers since they contribute at the minimum basis. The social security 'deal' is then more profitable for high income individuals due to their later entry to the labour market and higher survival rate. The system tends to favour women, despite the fact that their wages are lower than those of males, due to the differential incidence of their higher survival rates. Married individuals reach a higher PVT and IRR too than single contributors due to their higher life expectancy and to receipt of a pension for a dead spouse.

In deriving these results, we have not considered the potential impact of different unemployment rates for each of our hypothetical workers, despite knowing that they differ depending on gender, income and education. However, we do not have data by class or on for how long they are on the dole. Neither did we have data on actual retirement ages (by cohort and class in each cohort). Data from cross-section studies on real wage differences, which relate them to age and productivity, cannot be used here given our focus on life-time redistribution.

Moreover, we have not analysed here the redistribution effects by branches of economic activity, in accordance with the different

possibilities of ‘buying’ pensions (adjusting the contribution period and the contribution increases to an optimal pension claim), payroll tax evasion and ‘free riding’ the minimum pension benefits.

Finally, we have not considered either contributions or pension benefits net of taxes for each of our hypothetical workers, nor their final incidence. Due to data availability, the impact of all these factors on the distribution effects of the Spanish Social Security system, despite its relevance, has had to be excluded from our research for the time being.

TABLE 6

Intergenerational redistributive effects for born cohorts in 1935, 1945, 1955 and 1965 (in thousands 1996 ptas.).

Cohorts: Year of birth	High Income Earners	Intermediate Income Earners				Low Income Earners
		Real Wage Inc. (2.5%;2%)	Real Wage Inc. (2%;1.5%)	Real Wage Inc. (1.5%;1%)	Real Wage Inc. (1%;0,5%)	
1935	PVT= 20,673.9 PVB/PVC= 1.77 IRR= 5.334 %	PVT= 23,373.9 PVB/PVC= 2.39 IRR= 6.745 %	PVT= 18,805.7 PVB/PVC= 2.27 IRR= 6.466 %	PVT= 14,988.9 PVB/PVC= 2.14 IRR= 6.150 %	PVT = 11.806,4 PVB/PVC = 2,01 IRR = 5,827 %	PVT = 4.357,4 PVB/PVC = 1,68 IRR = 4,915 %
1945	PVT= 5,332.4 PVB/PVC= 1.12 IRR= 3.379 %	PVT= 17,259.4 PVB/PVC= 1.66 IRR= 4.840 %	PVT= 12,948.0 PVB/PVC= 1.56 IRR= 4.572 %	PVT= 9,433.5 PVB/PVC= 1.45 IRR= 4.303 %	PVT = 6.580,0 PVB/PVC = 1,35 IRR = 4,033 %	PVT = 1.508,5 PVB/PVC = 1,15 IRR = 3,461 %
1955	PVT= - 13,740.5 PVB/PVC= 0.80 IRR= 2.324 %	PVT= 11,392.4 PVB/PVC= 1.32 IRR= 3.926 %	PVT= 7,200.4 PVB/PVC= 1.23 IRR= 3.662 %	PVT= 2,860.0 PVB/PVC= 1.13 IRR= 3.397 %	PVT = 1.120,5 PVB/PVC = 1,04 IRR = 3,131 %	PVT = - 1.280,2 PVB/PVC = 0,90 IRR = 2,699 %
1965	PVT= - 21,172.4 PVB/PVC= 0.73 IRR= 2.057 %	VAT= 8,474.2 PVB/PVC= 1.21	PVT= 4,395.0 PVB/PVC= 1.12 IRR= 3.368 %	PVT= 1,134.1 PVB/PVC= 1.03 IRR= 3.107	PVT = - 1.450,7 PVB/PVC = 0,95 IRR = 2,846 %	PVT = - 2.979,9 PVB/PVC = 0,81 IRR = 2,376 %

		IRR= 3.628 %		%		

Note: The Present Value of Transfer (PVT) is computed with a real rate of discount of 3%. A positive value of PVT shows a lifetime net gain, while a negative value shows a net loss. The coefficient PVB/PVC is the ratio between the Present Value of Benefits and the Present Value of Contributions, and it shows the relative amount of the lifetime net gain or loss. The Internal Rate of Return (IRR) points out the expected real rate of return of the lifetime benefits and contributions. This Table has been estimated the entrance into the labour market at age 25, a real wage increase up to age 55 and since this age to retirement, at different rates and by adopting the longitudinal survival probabilities.

TABLE 7

Intragenerational redistributive effects by income levels for born cohorts in 1945, 1955 and 1965 (in thousands 1996 ptas.).

Cohorts: Year of birth	High Income Earners	Intermediate Income Earners				Low Income Earners
		Real Wage Inc. (2.5%;2%)	Real Wage Inc. (2.0%;1.5%)	Real Wage Inc. (1.5%;1%)	Real Wage Inc. (1%;0.5%)	
1945	PVT= - 4,670.6 PVB/PVC= 0.90 IRR= 2.609 %	PVT = 9,045.9 PVB/PVC = 1.30 IRR = 4.024 %	PVT = 5,559.3 PVB/PVC = 1.21 IRR = 3.729 %	PVT = 2,829.7 PVB/PVC = 1.12 IRR = 3.414 %	PVT = 661.2 PVB/PVC = 1.03 IRR = 3.113 %	PVT = - 2,393.3 PVB/PVC = 0.78 IRR = 2.182 %
1955	PVT = - 22,838.3 PVB/PVC = 0.67 IRR = 1.663 %	PVT = 2,088.2 PVB/PVC = 1.05 IRR = 3.179 %	PVT = - 997.3 PVB/PVC = 0.97 IRR = 2.902 %	PVT = - 4,211.8 PVB/PVC = 0.87 IRR = 2.554 %	PVT = - 5,993.1 PVB/PVC = 0.80 IRR = 2.272 %	PVT = - 6,483.7 PVB/PVC = 0.59 IRR = 1.422 %
1965	PVT = - 24,110.0 PVB/PVC = 0.65 IRR = 1.541 %	PVT = - 245.8 PVB/PVC= 0.99 IRR = 2.977 %	PVT = - 2,710.1 PVB/PVC = 0.92 IRR = 2.711 %	PVT = - 6,555.5 PVB/PVC = 0.80 IRR = 2.280 %	PVT = - 8,014.7 PVB/PVC = 0.74 IRR = 2.007 %	PVT = - 7,828.3 PVB/PVC = 0.50 IRR = 1.131 %

Note: This Table has been constructed assuming different ages of entrance into the labour market (see, Table I), a real wage increase until age 55 and from this age, up to retirement at different rates and according to the survival probabilities of the type GRM-GRF of 1970 and 1980, for each gender for the intermediate income earners and the GRM-GRF survival probabilities of 1970 and 1980, each gender, weighted by income levels for the high and low income earner.

TABLE 8

Intragenerational redistributive effects by gender for the 1935, 1945, 1955 and 1965 cohorts (in thousands 1996 ptas.).

Cohorts: Year of birth	Males Real Wage Inc. (2 %; 1.5 %)	Females Real Wage Inc. (1.5 %; 1 %)
1935	PVT= 11,867.2 PVB/PVC= 1.80 IRR= 5.711 %	PVT = 13,199.8 PVB/PVC = 1.97 IRR = 5.995 %
1945	PVT = 3,524.1 PVB/PVC = 1.15 IRR = 3.554 %	PVT = 5,526.1 PVB/PVC = 1.26 IRR = 3.869 %
1955	PVT = - 2,016.7 PVB/PVC = 0.94 IRR = 2.766 %	PVT = 1,479.1 PVB/PVC = 1.05 IRR = 3.168 %
1965	PVT = - 6,080.3 PVB/PVC = 0.83 IRR = 2.342 %	PVT = - 2,287.3 PVB/PVC = 0.93 IRR = 2.758 %

Note: This Table has been constructed assuming the entrance into the labour market at age 25, a real wage increase until age 55, and since then up to retirement at different rates for males and females, and taking the employment of survival probabilities of the type GRM-GRF of 1970 and 1980.

TABLE 9

Intragenerational redistributive effects by marital status for the 1965 cohort (in thousands 1996 ptas.)

	Real Wage Inc. (2.5%; 2%)	Real Wage Inc. (2%; 1.5%)	Real Wage Inc. (1.5%; 1%)	Real Wage Inc. (1%; 0.5%)
Married	PVT= 11,382.3 PVB/PVC= 1.28 IRR= 3.847%	PVT = 6,782.9 PVB/PVC = 1.18 IRR = 3.571 %	PVT = 3,087.9 PVB/PVC = 1.09 IRR = 3.294 %	PVT = 143.3 PVB/PVC = 1.0 IRR = 3.015
Singles	PVT = - 1,992.8 PVB/PVC = 0.95 IRR = 2.804	PVT = - 4,400.1 PVB/PVC = 0.88 IRR = 2.512	PVT = - 6,254.0 PVB/PVC = 0.81 IRR = 2.218 %	PVT = - 7,655.2 PVB/PVC = 0.75 IRR = 1.923 %

Note: This has been calculated once we assume the entrance into the labour market at age 25, a real wage increase until age 55 and since then, up to retirement, at different rates and through the employment of the life expectancy approach (82 years for married contributors and 92 years old for their spouses, against 79

years for single contributors, -see Burgoa et al. [1997b]). The survival benefit has been computed taking a 45 per cent to the Regulatory Basis.

TABLE 10

Internal rates of return. Retirement at age 68.

Cohorts: Year of birth	High Income Earners	Intermediate Income Earners				Low Income Earners
		Real Wage Inc. (2.5%; 2%)	Real Wage Inc. (2.%; 1.5%)	Real Wage Inc. (1.5%; 1%)	Real Wage Inc. (1.0%;0.5%)	
1935	4.088 %	5.573 %	5.263 %	4.946 %	4.638 %	3.828 %
1945	2.525 %	4.053 %	3.829 %	3.603 %	3.376 %	2.656 %
1955	1.658 %	3.249 %	2.979 %	2.708 %	2.436 %	2.017 %
1965	1.433 %	3.000 %	2.733 %	2.465 %	2.196 %	1.745 %

Note: IRRs are computed by assuming that retirement age is at 68, the initial pension is calculated through the current Regulatory Basis formula (the last 8 years contribution basis), the entrance age into the labour market at 25 and according to a longitudinal survival probability table.

TABLE 11

Internal rates of return. Regulatory Basis expanded to the last 15 years.

Cohorts: Year of birth	High Income Earners	Intermediate Income Earners				Low Income Earners
		Real Wage Inc. (2.5%; 2%)	Real Wage Inc. (2%; 1.5%)	Real Wage Inc. (1.5%; 1%)	Real Wage Inc. (1%; 0.5%)	
1935	5.334 %	6.682%	6.394 %	6.106 %	5.815 %	4.931 %
1945	3.379 %	4.581 %	4.373 %	4.165 %	3.955 %	3.461 %
1955	2.324 %	3.693 %	3.484 %	3.274 %	3.063 %	2.699 %
1965	2.057 %	3.397 %	3.192 %	2.986 %	2.778 %	2.376 %

Note: IRRs are computed by taking into account a gradual extension of the Regulatory Basis to the last 15 contribution years (11 years for the case of the 1935 cohort) -but without indexing the last two years-, retirement at age 65, entrance age into the labour market at age 25 and adopting the longitudinal survival probability table.

TABLE 12

Internal rates of return. Retirement benefits below the price index evolution.

Cohorts (Year of birth)	High Income Earners	Intermediate Income Earners				Low Income Earners
		Real Wage Inc. (2.5%;2.0%)	Real Wage Inc. (2.0%;1.5%)	Real Wage Inc. (1.5%;1.0%)	Real Wage Inc. (1.0%;0.5%)	
1935	5.154 %	6.613 %	6.294 %	5.974 %	5.652 %	4.750 %
1945	3.199 %	4.669 %	4.398 %	4.130 %	3.862 %	3.290 %
1955	2.147 %	3.754 %	3.489 %	3.224 %	2.958 %	2.526 %
1965	1.876 %	3.451 %	3.191 %	2.931 %	2.669 %	2.200 %

Note: IRRs are computed assuming that retirement benefits grow 0.5 percentage points below the price evolution, the initial pension is calculated through the current Regulatory Basis formula (the last 8 years contribution basis), the entrance age into the labour market at age 25, a retirement age at 65 and according to the longitudinal survival probability table.

TABLE 13

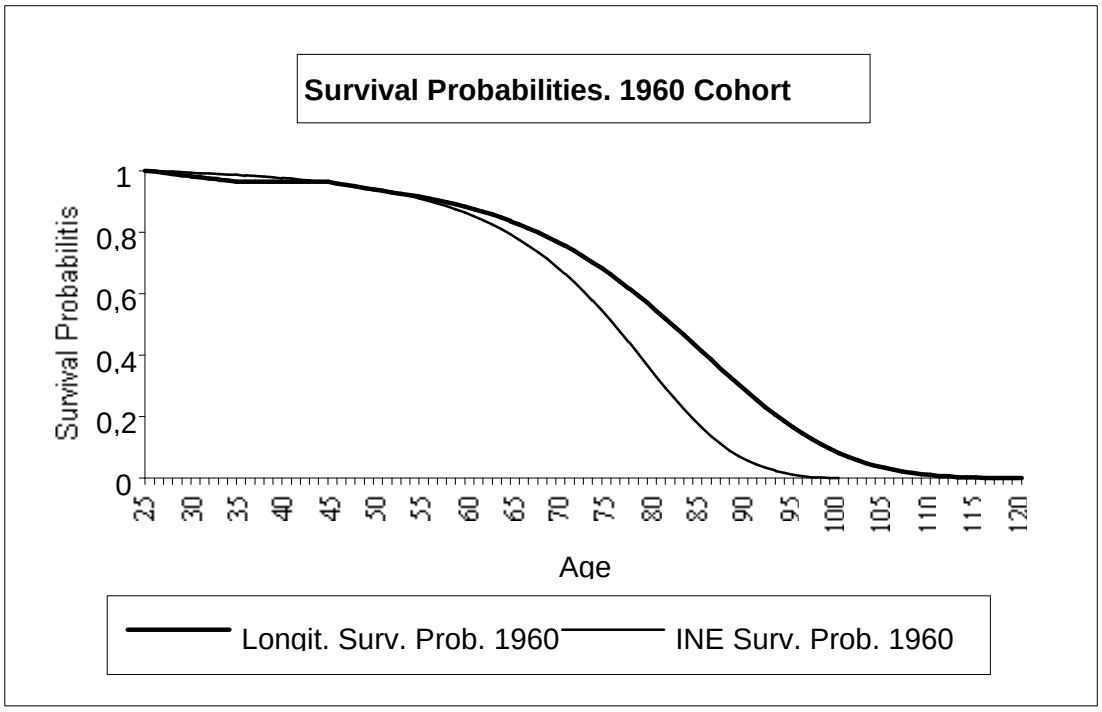
Internal rates of return. The proposals all together.

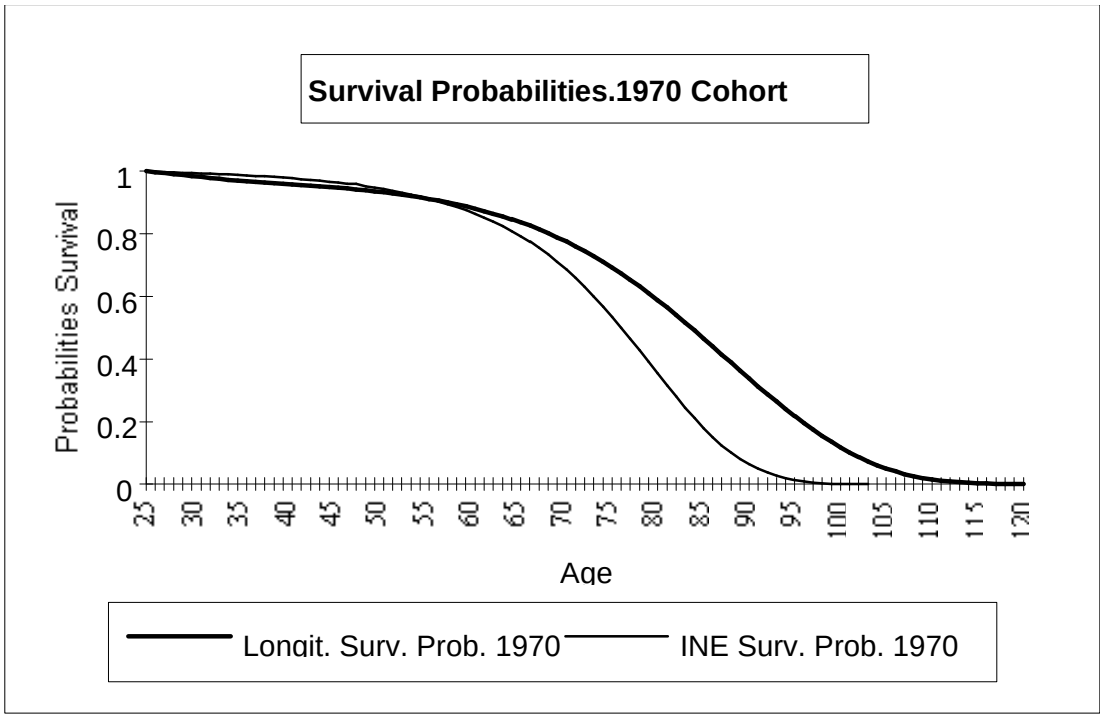
Cohorts (Year of birth)	High Income Earners	Intermediate Income Earners				Low Income Earners
		Real Wage Inc. (2.5%;2.0%)	Real Wage Inc. (2.0%;1.5%)	Real Wage Inc. (1.5%;1.0%)	Real Wage Inc. (1.0%;0.5%)	
1935	3.915 %	5.158 %	4.910 %	4.655 %	4.407 %	3.698 %
1945	2.353 %	3.887 %	3.664 %	3.440 %	3.213 %	2.493 %
1955	1.489 %	2.864 %	2.649 %	2.433 %	2.215 %	1.852 %
1965	1.262 %	2.616 %	2.404 %	2.189 %	1.973 %	1.578 %

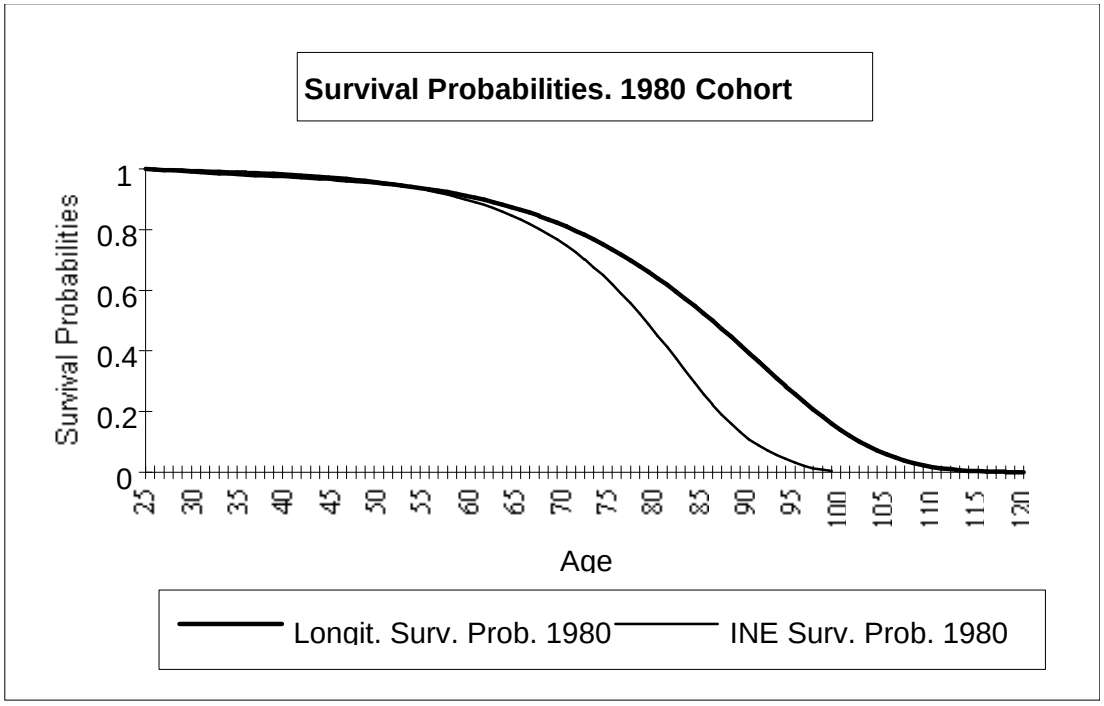
Note: IRRs are computed assuming the joint implementation of all the commented measures. This is, (i) the retirement age at 68, (ii) the Regulatory Basis being calculated through the last 15 years contribution record -but without indexing the last two contribution years-, (iii) the retirement benefits grow 0,5 percentage points below the evolution of the price index, (iv) an entrance age into the labour market at age 25 and (v) adopting to the longitudinal survival probability table.

APPENDIX 1

We show here a comparison between the longitudinal survival and the static INE tables, once we consider that workers in each of the four cohorts join the labour market at age 25 (i.e. for the years 1960, 1970, 1980 y 1990). The main difference which emerges relates to the higher survival rate of the elderly population, resulting from medical advances.



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Survival Probabilities
1
0.8
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Age
Longit. Surv. Prob. 1980
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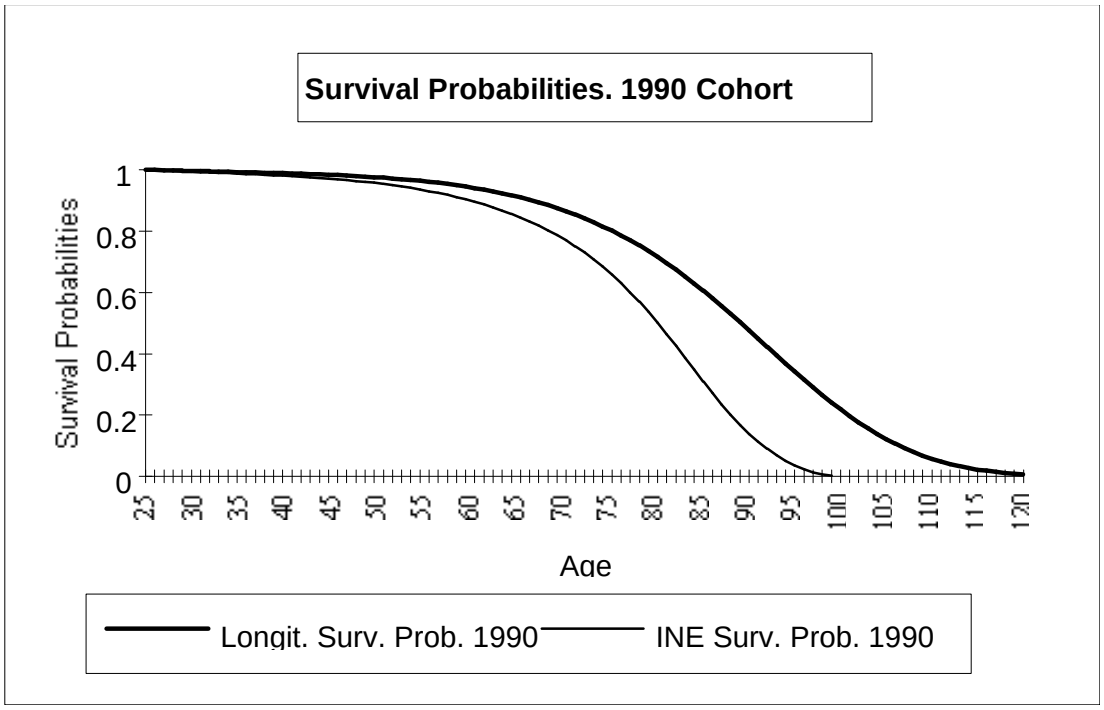
Survival Probabilities. 1990 Cohort
Survival Probabilities
1
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25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
Age
Longit. Surv. Prob. 1990
INE Surv. Prob. 1990

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