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Pensions and regional income redistribution. An analysis from the longlife perspective applied to Spain

Pensiones y distribución regional de la renta. Un análisis desde la perspectiva ciclo vital aplicado a España

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ABSTRACT

The paper tries to analyze the impact of Spanish pensions system in the regional distribution of income. A lifelong perspective is used for estimating the net present values and the internal rates of return for beneficiaries representing various regions of Spain. Although in Spain the contributory pension system is centralized and therefore the place of residence of the recipient makes no difference, the variety of impacts in the different geographical areas may be due to the existence of regional differences in longevity and the probability of survival of the average individual, as well as of periods of contributions, retirement ages, and contributed amounts to the Social Security.

RESUMEN

En este trabajo intentamos analizar el impacto del sistema de pensiones español en la distribución regional del de la renta. Se utiliza una perspectiva ciclo vital para la estimación de los valores actualizados netos y de las tasas internas de retorno para beneficiarios que representan a diversas regiones de España. Aunque en nuestro país el sistema de pensiones contributivas se encuentra centralizado y, por lo tanto, el lugar de residencia del beneficiario no hace surgir discrepancias, observamos desigual incidencia de las pensiones entre las distintas áreas geográficas, que puede ser debida a la existencia de diferencias regionales en la longevidad y en la probabilidad de supervivencia del individuo medio, así como en los períodos de cotización, la edad de jubilación y las cantidades cotizadas a la Seguridad Social.

1. INTRODUCTION

In the economic analysis of Social Security throughout the last decades, the interest has been focused on issues related to resources allocation and, therefore, on its possible effects on savings, investment, accumulation of capital, factors supply and capital markets. Although less important, the consequences of the Social Security system on income distribution have also been analyzed, especially in Spain[1]. In this filed, researches have adopted a short-term or current period perspective, but it is emerging an interest in using a lifelong approach to analyze the distributional effects of Social Security, which seems to be the most appropriate approach.

Following the nature of insurance appreciated in the financial benefits given by the Social Security System, the best way to analyze their distributional consequences should be the lifelong approach, comparing how the pensions system treats to protected persons in terms of net present values of contributions paid and benefits received along his life.

The Spanish Social Security is considered as essentially contributory, so income redistribution among the participants is not within its objectives. Its design assumes that covered risks –longevity in the case of retirement benefits– are distributed evenly within the group and, as an insurance tool, the mechanism distributes the economic consequences of the presentation of the expected risks. Therefore, any ex-post redistribution is random and unpredictable, that is to say, it can't be quantified in terms of expected values (see Monasterio, Sánchez y Blanco, 1996).

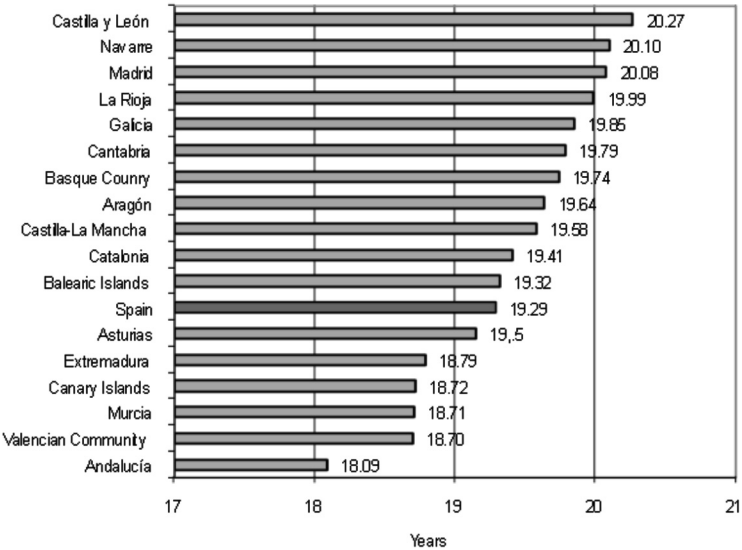
Nevertheless, the risk of longevity is distributed of heterogeneous way along the national territory, since there is verified in the tables of mortality that from time to time it elaborates by the National Institute of Statistics -Instituto Nacional de Estadística[2] (INE)-. In the year 2004 the life expectancy for both sexes at the age of 65 -legal retirement age- fluctuated between 18.09 years in Andalusia and 20.27 in Castilla y León; it attract the attention that it was smaller in many communities of the south and along the Mediterranean sea (Andalusia, Murcia, Valencian Community, Balearic Islands, Canary Islands and Extremadura) than in the north and the centre of the country (with the exception of Asturias).

Moreover, the regional discrepancy is becoming more visible during the last decades: it differed at most in 1.42 years in the life expectancy at the age of 65 years among the various regions in the mortality table for 1969-1972, and proceed to differ in 2.53 years in 1998-99, although in the last publication, the one for 2004-05, it decreased slightly to 2.18 years (Figure 1 and Table 1).

1 A summary of this literature can be found at Gómez Sala, J.S. y Sánchez Maldonado, J. (2000) and (2007).

2 The last edition is referred to data from 2004-2005 (INE, 2007).

FIGURE 1
LIFE EXPENTANCY AT THE AGE OF 65. BOTH SEXES. 2004-05



Therefore, the observed regional differences with respect to the average longevity that the system takes as reference for adjusting its parameters, could be causing a redistributive effect between people of a same generation in relation to it residence, because these differences are not considered for calculating the amounts to pay and the pensions to perceive. In addition, it should be bear in mind if exist regional differences in other important variables for determining the benefits that pensions program generate in its participants, like age of retirement, number of years or contributed amounts. If it is thus, pensions could be redistributing income between geographic areas that it could be predicted and given an expected value, for example, in terms of net present values or internal rates of return which are attributable to residents in different areas of the country.

Reviewing the available documentation about the distributional effects of the social spending and the Spanish Social Security system, it should be highlighted the fact that until the end of the nineties there were no studies to contrast the regional distributional effects of the financial benefits given by the Social Security adopting a life cycle perspective, until the ones made by Gomez Sala and Sanchez Maldonado (2000 and 2007), which are updated and reformulated in this article. The essential information to analyze the distributional consequences of the public pensions in the different territories will be obtained from the INE mortality tables, as well as the

TABLE 1
EVOLUTION OF THE LIFE EXPENTANCY AT THE AGE OF 65. BOTH SEXES (REGIONS ARE ARRANGED OF BIGGER THAN MINOR VALUE IN 2004-05). YEARS

					Increase	
	1969-72	1990-91	1998-99	2004-05	2005-1969	2005-1999
CASTILLA Y LEÓN	15.16	18.84	19.69	20.27	5.11	0.58
NAVARRE	14.64	18.42	19.24	20.10	5.46	0.86
MADRID	15.62	18.26	19.46	20.08	4.46	0.62
LA RIOJA	14.85	17.98	18.78	19.99	5.14	1.21
GALICIA	15.27	17.94	18.90	19.85	4.58	0.95
CANTABRIA	15.19	18.22	18.61	19.79	4.60	1.18
BASQUE COUNTRY	14.83	18.00	18.62	19.74	4.91	1.12
ARAGÓN	15.48	18.36	18.70	19.64	4.16	0.94
CASTILLA-LA MANCHA	14.63	17.89	18.50	19.58	4.95	1.08
CATALONIA	14.64	17.81	18.56	19.41	4.77	0.85
BALEARIC ISLANDS	14.67	17.10	17.73	19.32	4.65	1.59
SPAIN	14.80	17.64	18.36	19.29	4.49	0.93
ASTURIAS	15.16	17.54	17.91	19.15	3.99	1.24
EXTREMADURA	14.79	17.20	18.12	18.79	4.00	0.67
CANARY ISLANDS	15.26	17.06	17.84	18.72	3.46	0.88
MURCIA	14.38	16.78	17.25	18.71	4.33	1.46
VALENCIAN COMMUNITY	14.20	16.97	17.59	18.70	4.50	1.11
ANDALUSIA	14.30	16.69	17.16	18.09	3.79	0.93
Maximum difference	1.42	2.15	2.53	2.18		

Source: INE, “Tablas de mortalidad” and self made.

necessary regional data about contributions and benefits provided by the Social Security itself. It is also convenient to use regional values of variables such as periods of contributions, retirement ages, and average periods of benefits perception, amongst others; but, as we do not know them, we can try to estimate them from the Social Security records contained in the Continuous Sample of Working Lives

–Muestra Continua de Vidas Laborales (MCVL)–. The use of real data related to working lives is precisely the main novelty of the methodology proposed in this work (see Argimón and González, 2006).

In the following pages we try to respond to the question of whether the territorial distribution of income is being modified by the pension program. For that, we will estimate the expected value of the regional redistribution of income that may be caused by the regional differences in the variables before indicated, and the lifelong incidence of the program will be approximate by comparing the net present value of the contributions paid, on the one hand, and the benefits received by individuals representing the various regions, on the other.

For that purpose, the second section explains how the net present value (NPV) and the internal rate of return (IRR) that can be attributed to the representative beneficiaries in the various regions of Spain has been defined, in the third one, the different parameters of this measures are estimated and, in the fourth one, obtained results are shown. Finally, in the fifth section, we wonder whether the return expected by residents in different regions after participating in the pension scheme is related to their income levels, in order to deduce how the income redistribution caused by this program is taking place. This work ends with a section of the references consulted.

2. REGIONAL NPV AND IRR OF THE PROGRAM FOR RETIREMENT

For the investments analysis, Net Present Value (NPV) and Internal Rate of Return (IRR) are the tools to obtain the return on an asset investment and to select the most profitable project within several options. These tools also have been used a lot of for studying the sustainability of pay-as-you-go systems like Boskin and Puffert (1987) in United States of America, Schnabel (1997) in Germany or Jimeno and Licandro (1999) in Spain. Thus, as Murphy and Welch (1998) indicate, the concept of profitability of financial assets is used for relating the transfer between generations, since in this model people stays at their productive stage in a certain moment pays pensions of the already retired ones.

Other researchers have focused their work on transfers within a same generation. This way, as Bandrés and Cuenca (1998 and 1999) and Jimeno (2003) studied the equity of the intragenerational transfers of the old-age pensions in the Spanish case, or Rofman (1993) analyzes for United States of America the effect that on the IRR have the differences of longevity of the individuals of the same cohort caused by his sex, race, level of education or place of residence. Taking this idea, that is to say, the differences of the IRR of the program of old-age pensions produced by the heterogeneous distribution of the mortality along the territory, this paper tries to

measure the relation between the contributions paid and the retirement pensions perceived for the whole life cycle of a representative individual of every Spanish region and of every generation.

It should be clear how we define net present value and the internal rate of return and how they are used in the comparison of cash flows that are not strictly investments. Following to Bravo (1996) and Devesa et al (1999) we calculate the real actuarial value of paid contributions by a worker throughout his or her working life (NPVC) and of the retirement benefits (NPVB), both discounted at a rate r until his entry into the labour market, are calculated by the expressions:

$$NPVC = \sum_{t=1}^{R-i} {}_t p_i C_{i+t}(1+\alpha_{i+t})^t(1+\beta_{i+t})^{-t}(1+r_{i+t})^{-t} \quad (1)$$

$$NPVB = \sum_{t=R-i+1}^{T-i} {}_t p_i J_{i+t}(1+\lambda_{i+t})^{t-(R-i)}(1+\beta_{i+t})^{(R-i)-t}(1+r_{i+t})^{-t} \quad (2)$$

where:
i: Age at which the individual begins to contribute to the Social Security System
R: Retirement age
T: Age of death
${}_tp_i$: Probability that someone at the age i reaches the age of i+t years
C_{i+t}: Annual contribution at the age of i+t years
J_{i+t}: Annual retirement benefit received at the age of i+t years
r_{i+t}: Discount rate in the year in which the individual was i+t years old
α_{i+t}: Annual growth rate of contributions in the year in which the individual was i+t years old
β_{i+t}: Annual growth rate of inflation in the year in which the individual was i+ t years old
λ_{i+t}: Annual nominal growth rate of pensions in the year in which the individual was i+t years old.

Based on the actuarial values of contributions and benefits, the net present value (NPV) of its participation in the pension scheme is the difference between both expressions:

$$NPV = NPVB - NPVC \quad (3)$$

By discounting contributions and benefits to the moment when the employee begins to contribute, the NPV calculates the *a priori* expected net present value of the contributor throughout his or her working life, referred to the time he joins the system of retirement benefits.

Similarly, the lifelong incidence of pensions will also be estimated by comparing the internal rates of return (IRR) obtained by the individuals representing the different regions, defined as the discount rates that equal the value of contributions paid and pensions received throughout their lives. In this case, the IRR that would arise by equating the expressions 1 and 2, i.e. the actuarial value of contributions and pensions, represents the *a priori* expected return of r, as it is referred to the time of his or her incorporation to the pensions system, which would be obtained by an individual from his or her involvement in the retirement program throughout his or her life cycle.

Since our objective is to study regional differences in NPV and IRR caused by the territorial differences in longevity of cohort comprised of individuals that retire in a certain year i+t, we suppose that growth of contributions during the previous years was equal to the inflation in that period and pensions grow, and will grow in the future, at the same rate of inflation throughout the country. Consequently, the parameters α and β are equal in each of the previous years to the retirement age and λ and β also equal in the subsequent years.

This assumption simplifies the expressions of NPVB and NPVC as follow:

$$NPVC = \sum_{t=1}^{R-i} {}_t p_i C_{i+t}(1 + r_{i+t})^{-t} \tag{4}$$

$$NPVB = \sum_{t=R-i+1}^{T-i} {}_t p_i J_{i+t}(1 + r_{i+t})^{-t} \tag{5}$$

Likewise, considering that annual contributions C_{i+t} are equal to that of the year of retirement C_R and, analogous, pensions are equal to which it will perceive the next year J_{R+1}, that in both will be discounted to the constant type r, the previous expressions will be:

$$NPVC = \sum_{t=1}^{R-i} {}_t p_i C_R(1 + r)^{-t} \tag{6}$$

$$NPVB = \sum_{t=R-i+1}^{T-i} {}_t p_i J_{R+1}(1 + r)^{-t} \tag{7}$$

To calculate the NPV and the IRR for the representative individual of each region it is necessary to know:

- The survival probabilities ($_tp_i$)
- The annual contributions made by individuals during the last year of their working lives (C_R)
- The retirement age (R)

- Annual perception of contributory pension to be received the first year (J_{R+1})
- The age up to the one that statistically has possibility of living (T)
- And, finally, the discount rate (r).

Consequently, contributions are the cash flows to be discounted according to the number of years of payments made by the individual, and pensions are the future cash flows to be received after the retirement age, which should be discounted the expected number of years during which the individual will survive after this moment plus the number of years of contributions. Later on, the values used for each of these variables and how they have been obtained will be described.

3. THE DATA

In order to apply the NPV and IRR in our case, we consider the cohort comprised of individuals who retired in the year 2004, therefore, ceased to contribute and start receiving the contributory pension according to the applicable legislation. The survival probabilities used for calculating both measures are taken from the INE mortality tables of that year. The estimation of the rest of parameters also is referred to the year 2004.

3.1. The retirement age

The law establishes the retirement age at 65 years old, but it is well known that the real average age at which the retirement takes place for the whole country and the entire system is under the legal age[3]. Whether a worker retire before or after, it will depend on his or her personal circumstances and the legal regulations that affect him or her on this matter, and there is no reason to believe beforehand that it will lead to an uniform average value for all schemes and territories.

As the actual average retirement age by region and Social Security schemes is not available at the official level, as well as some of the other parameters we need, we used the subsample of individuals classified in the MCVL of 2004 as receptors of contributory pensions in that year (see Gómez Sala, J.S. y Avellaneda Bertelli, P.A. (2008).

When calculating the effective average age at which this large group retired representing all territories and regimes, there is great variability in both cases, as shown in Table 2. Thus, while in the whole system the average retirement age

3 The average retirement age in 2004 was 63.4 years old (INSS)

estimated is 63.46 years (which coincides with the data published by the Social Security), in the general scheme it is 62.84 years, in the self-employed workers scheme it is 65.39 years and in the rest of special schemes it is 64.04 years. Therefore, a retired person who belongs to the general scheme receives on average two and a half years more of pension than a self-employed person who lives the same time as him or her. Differences in the retirement age at the regional level are also significant, with extreme cases in Valencian Community (61.96 years) and Balearic

TABLE 2
AVERAGE RETIREMENT AGE BY REGION AND SCHEME. 2004
YEARS

	WHOLE SYSTEM	GENERAL SCHEME	SPECIAL SCHEMES	
			SELF-EMPLOYED	THE REST
ANDALUSIA	63.74	62.62	65.86	64.89
ARAGÓN	63.49	62.69	65.79	64.37
ASTURIAS	63.09	63.44	66.00	61.71
BALEARIC ISLANDS	64.00	63.12	65.74	64.94
BASQUE COUNTRY	63.26	62.84	65.42	63.46
CANARY ISLANDS	63.80	63.27	66.08	63.99
CANTABRIA	63.58	62.81	66.02	64.48
CASTILLA Y LEÓN	63.66	62.46	65.74	64.52
CASTILLA-LA MANCHA	63.76	62.61	65.51	65.01
CATALONIA	63.51	62.83	65.68	65.06
EXTREMADURA	63.73	62.41	65.68	65.03
GALICIA	63.97	62.97	65.88	64.41
MADRID	63.61	63.16	65.85	65.35
MURCIA	63.91	62.98	65.70	64.87
NAVARRE	63.48	62.65	65.49	65.24
RIOJA (LA)	63.43	62.36	65.66	64.89
VALENCIAN COMMUNITY	61.96	62.69	61.96	59.64
SPAIN	63.46	62.84	65.39	64.04
Difference	2.04	1.08	4.12	5.71

Source: MCVL 2004 and self made.

Islands (64.00 years). The same could be said about the average citizens in Valencia and the Balearic Islands, so the first one will receive his pension during two years more. Furthermore, differences for special schemes are greater than in the general scheme; while in the first one the average retirement age varies only in a range of 1.08 years, in the self-employed workers scheme the range is 4.12 years and in the other special regimes, 5.71 years.

Consequently, the number of cash flows corresponding to the pensions of each representative individual that we should consider is the limit on the mortality tables of survival age –100 years old– minus the retirement age that varies according to the region and the social security scheme.

3.2. The period of contribution

Regarding to the number of years during which individual representatives have contributed in the different groups at the retirement age, there is no official information by region. As this information is necessary to discount the contributions made at the time of entry into the labour market, we resort again to the MCVL from 2004 to obtain their estimate (Table 3). In Spain, and considering the whole system, the average time of contribution is a little bit less than 33 years. The breakdown by scheme is as follow: almost 36 years for the general scheme compared with the 23.39 years obtained for the self-employed workers scheme or the 30.18 years for all workers belonging to other special schemes in the Social Security System. Moreover, regional differences are important. For the whole system, the representative of Castilla-La Mancha (35.36 years), which is the one paying the longest time, pays 6.14 more years than the one in Galicia (29.22 years), which is the one who pays less time.

Specifying by schemes, the period of contribution in the general and the self-employed workers schemes varies in a smaller range –3.47 and 3.26 years respectively–, while for all the special schemes excluding the self-employed workers, the variability is much bigger –14.05 years– as the latter group includes workers in many different activities and located in certain regions, such as the scheme for coal mining or fishing, which have some unique characteristics.

3.3. Contributions paid

In order to determine the contribution made by the individual representative, it has been used the information regarding to collection published by the provincial delegations of the General Treasury of Social Security –Tesorería General de la Seguridad Social (TGSS)– and the managing bodies in the year 2004. Table 4 shows the average annual contribution paid by the individual representative per common contingencies and classified by schemes and regions. As the study focus

TABLE 3
AVERAGE TIME OF CONTRIBUTION. 2004
YEARS

	WHOLE SYSTEM	GENERAL SCHEME	SPECIAL SCHEMES	
			SELF-EMPLOYED	THE REST
ANDALUSIA	32.18	36.25	22.65	28.59
ARAGÓN	34.42	36.77	22.94	34.97
ASTURIAS	32.34	37.38	22.86	29.49
BALEARIC ISLANDS	30.56	34.41	22.18	27.04
BASQUE COUNTRY	35.25	37.82	24.58	30.20
CANARY ISLANDS	32.69	35.55	24.01	29.30
CANTABRIA	34.36	37.58	23.78	30.81
CASTILLA Y LEÓN	34.37	37.33	23.51	35.10
CASTILLA-LA MANCHA	35.36	37.09	23.01	37.72
CATALONIA	32.01	34.35	23.89	27.77
EXTREMADURA	34.02	36.49	22.66	34.83
GALICIA	29.22	34.47	21.32	26.32
MADRID	34.93	37.25	24.00	24.36
MURCIA	32.29	35.98	23.69	29.40
NAVARRE	34.79	37.21	23.35	34.21
RIOJA (LA)	34.69	36.88	24.34	38.41
VALENCIAN COMMUNITY	32.65	34.68	24.00	31.55
SPAIN	32.93	35.97	23.39	30.18
Maximum difference	6.14	3.47	3.26	14.05

Source: MCVL 2004 and self made.

on retirement benefits, which are a common contingency, collection for professional contingencies has not been taken into account.

The well-known lower contribution in the special schemes in relation to the general scheme is illustrated in this table. While for the whole of Spain the average annual contribution paid by a worker in the general system is 4,532.90 Euros, it is only 2,984.03 Euros in the special scheme for self-employed workers and it is even lower in all the other special regimes, 1,480.97 Euros. Regional differences are also

TABLE 4
AVERAGE ANNUAL CONTRIBUTION PER COMMON CONTINGENCIES. 2004 (REGIONS ARE ARRANGED OF BIGGER THAN MINOR CONTRIBUTION TO WHOLE SYSTEM)
EUROS

	WHOLE SYSTEM	GENERAL SCHEME	SPECIAL SCHEMES	
			SELF-EMPLOYED	THE REST
BASQUE COUNTRY	4,996.35	5,546.80	3,200.52	2,356.45
NAVARRE	4,661.85	5,180.33	3,241.69	1,540.97
MADRID	4,645.24	4,961.70	3,109.09	1,611.41
ASTURIAS	4,438.82	4,678.63	3,142.03	5,104.25
CATALONIA	4,375.19	4,746.04	3,064.92	1,718.20
ARAGÓN	4,180.21	4,590.42	3,080.86	1,932.54
CANTABRIA	4,098.83	4,549.28	3,031.60	1,704.41
SPAIN	4,034.80	4,532.90	2,984.03	1,480.97
BALEARIC ISLANDS	3,999.09	4,371.75	2,859.55	1,841.63
LA RIOJA	3,964.84	4,507.64	3,000.00	1,337.28
CASTILLA Y LEÓN	3,947.19	4,402.12	2,954.64	2,247.91
VALENCIAN COMMUNITY	3,820.93	4,195.59	2,951.11	1,410.33
CANARY ISLANDS	3,704.24	3,986.57	2,695.97	1,728.19
GALICIA	3,650.77	4,102.05	2,951.88	1,892.09
CASTILLA-LA MANCHA	3,644.87	4,112.07	2,837.03	1,447.65
MURCIA	3,371.57	3,900.44	2,907.39	1,325.91
ANDALUSIA	3,363.76	4,194.73	2,853.67	1,069.95
EXTREMADURA	3,078.67	3,935.28	2,746.16	1,114.99

Source: TGSS, "Informe estadístico 2004" and self made.

significant. As an example, it is enough to compare the amount of 4,996.35 Euros paid by the individual representative in the Basque Country with the 3,078.67 Euros in Extremadura (1,917.68 Euros of difference).

Contributions for common contingencies are assigned to cover the risk of survival and other situations resulting from common diseases, non-working accidents, maternity, etc. Therefore, only a portion of the money collected could be considered

to finance retirement pensions, which has been estimated at 61.97%. This figure is the percentage that the total of retirements benefits paid during 2004 represents over the total amount collected in that year for common contingencies (Table 5). The resulting amount is what the individual representative paid in 2004 to generate the right to receive a pension after retiring and, therefore, it will be one of the cash-flows to be capitalized in order to calculate his or her NPV and IRR.

TABLE 5

PART ESTIMATED OF THE ANNUAL AVERAGE CONTRIBUTION FOR FINANCING RETIREMENT PENSIONS. (REGIONS ARE ARRANGED OF BIGGER THAN MINOR CONTRIBUTION TO WHOLE SYSTEM)

EUROS

	WHOLE SYSTEM	GENERAL SCHEME	SPECIAL SCHEMES	
			SELF-EMPLOYED	THE REST
BASQUE COUNTRY	3,096.24	3,437.35	1,983.36	1,460.29
NAVARRE	2,888.95	3,210.25	2,008.87	954.94
MADRID	2,878.66	3,074.76	1,926.70	998.59
ASTURIAS	2,750.74	2,899.35	1,947.12	3,163.10
CATALONIA	2,711.31	2,941.12	1,899.33	1,064.77
ARAGÓN	2,590.47	2,844.68	1,909.21	1,197.59
CANTABRIA	2,540.05	2,819.19	1,878.68	1,056.22
SPAIN	2,500.37	2,809.04	1,849.21	917.75
BALEARIC ISLANDS	2,478.23	2,709.18	1,772.06	1,141.26
LA RIOJA	2,457.01	2,793.39	1,859.10	828.71
CASTILLA Y LEÓN	2,446.07	2,728.00	1,830.99	1,393.03
VALENCIAN COMMUNITY	2,367.83	2,600.01	1,828.80	873.98
CANARY ISLANDS	2,295.52	2,470.48	1,670.69	1,070.96
GALICIA	2,262.39	2,542.04	1,829.28	1,172.53
CASTILLA-LA MANCHA	2,258.73	2,548.25	1,758.11	897.11
MURCIA	2,089.36	2,417.10	1,801.71	821.67
ANDALUSIA	2,084.52	2,599.48	1,768.42	663.05
EXTREMADURA	1,907.85	2,438.69	1,701.79	690.96

Source: TGSS, "Informe estadístico 2004" and self made.

3.4. Pensions received

Finally, it remains to obtain the amount of the pension the individual representative is entitled to receive at his or her retirement age in 2004. Knowing the contribution paid for common contingencies, it is possible to obtain the contribution base for this concept, since it is the 28.3% of it. If we suppose amounts paid didn't change along his or her working years and we apply to the regulatory base[4] the percentage that corresponds to each individual depending on the number of years that he or she has contributed (Table 3), we will obtain the initial monthly pension at retirement. Table 6 contains annual pensions taking into account that 14 identical pays will be received along the year.

Table 6

Once the cash-flows and the periods of time to use at discounting have been estimated, it is feasible to calculate the NPV and the IRR for the individual representative of each group under study. Throughout the process there have been a number of assumptions which would be interesting to describe:

The average number of years of contribution is assumed to be produced continuously over time and, therefore, that there are not periods in which the individual representative is outside the system.

As a central part of the estimates, it is assumed that individuals form their expectations on pension contributions and benefits.

Contributions and retirement pensions remain constant throughout the life.

Cash-flows are discounted to the moment when the individual joins the labour market.

Contributions and benefits are paid annually and at the end of each year.

Rate of discount used for calculating NPV is 3%, equivalent to the average growth of the real GDP in the last 30-40 years. Most of the works on pensions usually to take this figure.

In order to calculate the initial benefit from the contributions, estimates are referred only to contributory retirement benefits.

4. Results

Tables 7, 8 and 9 summarize the results achieved. At the national level and for the whole system, the NPV that the individual representative could rationally expect at the beginning of his or her contributions is slightly over 17,071 Euros (Table 7); it can be appreciated the generosity of the system with the special schemes in comparison to the general scheme. Thus, while the individual representative pays more in the latter, his or her NPV of 16,597.56 Euros (Table 8) is less than in the system

4 It is the sum of the last 180 monthly contribution bases divided by 210.

TABLE 6
INITIAL PENSIONS. 2004
(REGIONS ARE ARRANGED OF BIGGER THAN MINOR PENSION)
EUROS

	INITIAL ANNUAL PENSION			
	WHOLE SYSTEM	GENERAL SCHEME	SPECIAL SCHEMES	
			SELF-EMPLOYED	THE REST
BASQUE COUNTRY	17,654.95	19,600.01	8,708.14	7,494.00
NAVARRE	16,143.52	18,305.07	8,476.50	5,336.22
MADRID	16,085.99	17,532.49	8,459.35	4,384.39
ASTURIAS	14,743.79	16,532.26	7,882.84	15,871.87
CATALONIA	14,532.44	16,435.05	8,014.28	5,099.95
ARAGÓN	14,475.63	16,220.57	7,729.36	6,692.17
CANTABRIA	14,193.83	16,075.18	7,927.14	5,420.38
LA RIOJA	13,729.85	15,928.06	8,162.54	4,725.37
CASTILLA Y LEÓN	13,668.70	15,555.21	7,725.90	7,943.14
SPAIN	13,401.82	16,017.30	7,802.77	4,709.79
CASTILLA-LA MANCHA	12,879.41	14,530.28	7,418.37	5,115.37
BALEARIC ISLANDS	12,717.94	15,138.93	7,174.13	5,466.32
VALENCIAN COMUNITY	12,691.42	14,528.91	7,716.68	4,584.82
CANARY ISLANDS	12,303.83	14,086.82	7,335.32	5,373.87
GALICIA	11,352.23	14,204.99	7,092.86	5,482.38
MURCIA	11,198.85	13,782.46	7,602.36	4,122.98
ANDALUSIA	11,172.93	14,822.37	7,159.37	3,251.42
EXTREMADURA	10,661.11	13,905.57	6,889.66	3,861.08

Source: TGSS, "Informe estadístico 2004" and self made.

as a whole and than in the self-employed workers scheme in particular (18,238.87 Euros). By regions, the highest NPV corresponds to Navarra (19,921.13 Euros), followed by Madrid, Galicia, Asturias and Balearic Islands, all above the national NPV. The rest of the regions are below the average NPV. The three regions with the lowest income level are at the end of the list: Castilla-La Mancha, Andalusia and

Extremadura. The difference between the maximum and minimum values of NPV is 11,692.24 Euros, and in the territory which is in the last position, Extremadura, it is 8,228.89 Euros, less than half from the NPV of Navarra.

TABLE 7

LIFE CYCLE PROFITABILITY DERIVED FROM RETIREMENT PENSIONS AND AVERAGE CONTRIBUTIONS. WHOLE SYSTEM. 2004

	NPV (3%)			IRR	
		Euros			%
1	NAVARRE	19,921.13	1	GALICIA	4.353%
2	MADRID	19,306.93	2	BALEARIC ISLANDS	4.183%
3	GALICIA	18,785.05	3	VALENCIAN COMMUNITY	4.046%
4	ASTURIAS	18.403.34		**SPAIN**	**4.004%**
5	BALEARIC ISLANDS	18,372.14	4	ASTURIAS	3.993%
	SPAIN	**17,071.02**	5	NAVARRE	3.930%
6	VALENCIAN COMMUNITY	16,975.51	6	LA RIOJA	3.915%
7	LA RIOJA	16,550.34	7	MADRID	3.908%
8	BASQUE COUNTRY	14,712.08	8	MURCIA	3.868%
9	CASTILLA Y LEÓN	14,476.21	9	CANARY ISLANDS	3.831%
10	ARAGÓN	13,735.19	10	CASTILLA Y LEÓN	3.822%
11	CANTABRIA	13,613.46	11	CANTABRIA	3.757%
12	CANARY ISLANDS	12,392.22	12	ARAGÓN	3.752%
13	CATALONIA	11,993.14	13	ANDALUSIA	3.740%
14	MURCIA	11,799.45	14	CATALONIA	3.708%
15	CASTILLA-LA MANCHA	10,792.60	15	CASTILLA-LA MANCHA	3.660%
16	ANDALUSIA	9,758.25	16	BASQUE COUNTRY	3.656%
17	EXTREMADURA	8,228.89	17	EXTREMADURA	3.630%

Source: Self made.

Regarding to the estimated IRRs for the whole system, they range from 3.630% (Extremadura) to 4.353% (Galicia) and, therefore, expected yields to be gained by the representative individuals for their contributions to the retirement pensions system have a range of variation of 0.723 percentage points. After Galicia, the highest IRR belongs to the Balearic Islands and Valencian Community, with rates of return above the national average (4.004%). On the contrary, together with Extremadura, regions with a lower IRR are Basque Country, Castilla-La Mancha, Catalonia and Andalusia.

TABLE 8

LIFE CYCLE PROFITABILITY DERIVED FROM RETIREMENT PENSIONS AND AVERAGE CONTRIBUTIONS. GENERAL SCHEME. 2004

	NPV (3%)			IRR	
		Euros			%
1	CATALONIA	17,637.72	1	GALICIA	3.834%
	SPAIN	16,597.56	2	CATALONIA	3.832%
2	LA RIOJA	16,184.09	3	BALEARIC ISLANDS	3.829%
3	BALEARIC ISLANDS	16,181.32		SPAIN	3.783%
4	GALICIA	15,376.45	4	LA RIOJA	3.738%
5	ARAGÓN	14,987.23	5	VALENCIAN COMMUNITY	3.710%
6	NAVARRE	13,383,69	6	ARAGÓN	3.680%
7	VALENCIAN COMMUNITY	12,953.70	7	MURCIA	3.633%
8	MADRID	12,372.26	8	CANARY ISLANDS	3.574%
9	BASQUE COUNTRY	11,228.85	9	EXTREMADURA	3.574%
10	MURCIA	11,052.37	10	NAVARRE	3.534%
11	CASTILLA Y LEÓN	10,800.08	11	MADRID	3.518%
12	EXTREMADURA	10,546.36	12	CASTILLA Y LEÓN	3.509%
13	CANARY ISLANDS	10,163.92	13	CASTILLA-LA MANCHA	3.465%
14	CANTABRIA	9,499.89	14	CANTABRIA	3.440%
15	CASTILLA-LA MANCHA	9,058.92	15	BASQUE COUNTRY	3.428%
16	ANDALUSIA	7,146.67	16	ANDALUSIA	3.385%
17	ASTURIAS	-7.53	17	ASTURIAS	3.000%

Source: Self made.

TABLE 9
LIFE CYCLE PROFITABILITY DERIVED FROM RETIREMENT PENSIONS AND AVERAGE CONTRIBUTIONS. SELF-EMPLOYED SCHEME. 2004

	NPV (3%)			IRR	
		Euros			%
1	VALENCIAN COMMUNITY	23,374.28	1	VALENCIAN COMMUNITY	5.469%
2	NAVARRE	20,382.95	2	GALICIA	5.349%
3	BASQUE COUNTRY	19,952.03	3	ARAGÓN	5.288%
4	ARAGÓN	19,748.64	4	NAVARRE	5.156%
5	MADRID	19,155.96	5	CASTILLA Y LEÓN	5.121%
6	CATALONIA	18,712.94		SPAIN	5.107%
7	CASTILLA Y LEÓN	18,274.52	6	CATALONIA	5.094%
	SPAIN	18,238.87	7	CASTILLA-LA MANCHA	5.082%
8	LA RIOJA	18,094.64	8	MADRID	5.024%
9	GALICIA	17,861.62	9	BASQUE COUNTRY	5.020%
10	CANTABRIA	17,374.18	10	ASTURIAS	5.019%
11	CASTILLA-LA MANCHA	16,833.84	11	CANTABRIA	5.005%
12	ASTURIAS	16,766.47	12	LA RIOJA	4.991%
13	MURCIA	14,798.94	13	EXTREMADURA	4.964%
14	BALEARIC ISLANDS	14,103.64	14	BALEARIC ISLANDS	4.954%
15	EXTREMADURA	14,101.19	15	MURCIA	4.851%
16	ANDALUSIA	13,227.74	16	ANDALUSIA	4.826%
17	CANARY ISLANDS	11,183.87	17	CANARY ISLANDS	4.505%

Source: Self made.

By comparing the positions occupied by the different regions in classifications of VAN and TIR, we can see that, four of them are in the same position in both rankings, other six regions raise or lower one or two steps and the rest three or more. It attracts attention Murcia and Basque Country with six and eight positions, respectively.

If the results are broken down by schemes, in the general scheme (Table 8) Catalonia has the highest NPV with 17,637.72 Euros, followed by La Rioja, Balearic Islands and Galicia. It is important to highlight the fact that the last region in the list, Asturias, have a negative NPV discounted at 3% and therefore, its contributors

would not recover in average the money they paid. In general, there are significant differences in the positions occupied by the regions with the ones they have when analyzing the whole system. The most striking cases are Asturias, which was in the fourth position and here is in the last one, and Catalonia which leaves the thirteenth position to become the first one in the list. The reason for such a drastic change is, of course, the greater or lesser weight of the self-employed workers scheme and other special schemes in the entire pensions system in the region. Regarding to the IRR, variability is higher in this case because this magnitude presents a maximum difference of 0.834 percentage points compared to 0.723 of the overall system.

As for the correlation between the positions of the regions in the classifications of VAN and TIR, a situation similar to the whole system is observed when we consider only the general scheme.

Finally, Table 9 clearly shows that the self-employed workers scheme (with an IRR of 5.107%) provides to its members, on average, a return on their contributions well above to those in the general scheme whose IRR is 1.324 percentage points lower.

5. CONCLUSIONS

Once the expected return of participating in the retirement pensions system has been estimated for the representatives individuals of each region, we should wonder if this is related or not to their incomes levels, in order to deduce how it is taking place the income redistribution promoted by the program. When comparing the position of each region in terms of the lifelong impact caused by the retirement pensions (first columns of Table 10), with the position in terms of Gross Domestic Product (GDP) per capita in the year 2004 (last columns of Table 10), it is not clear whether the redistribution promoted by the pensions system among individuals in different regions is favourable to any particular category of regions according to its income level.

Among the regions with the highest IRR, and therefore favoured in lifelong terms by the pensions, there are regions with a low economic development such as Galicia and Asturias (14 and 12 in GDP per capita, respectively) together with other as the Balearic Islands, Navarre, La Rioja and Madrid which are among the most developed. Similarly, regions with low IRR Andalusia, Castilla-La Mancha and Extremadura (13, 15 and 17), which occupy positions a long way behind in terms of GDP per capita (16, 15 and 17), in a similar position than the Basque Country and Catalonia which are the third and forth one regarding to the income level.

Focusing the comparison on the general scheme (Table 11) which comprises the majority of the members of the Social Security System, the result is similar except for the striking cases of Asturias and Catalonia as discussed earlier.

TABLE 10
COMPARISON BETWEEN IRR OF PENSIONS SYSTEM AND GDP PER CAPITA. 2004

	IRR			GDP PER CAPITA	
		%			Euros
1	GALICIA	4.353%	1	MADRID	25,816
2	BALEARIC ISLANDS	4.183%	2	NAVARRE	24,711
3	VALENCIAN COMMUNITY	4.046%	3	BASQUE COUNTRY	24,626
	SPAIN	**4.004%**	4	CATALONIA	23,563
4	ASTURIAS	3.993%	5	BALEARIC ISLANDS	22,234
5	NAVARRE	3.930%	6	LA RIOJA	21,357
6	LA RIOJA	3.915%	7	ARAGÓN	20,980
7	MADRID	3.908%		**SPAIN**	**19,700**
8	MURCIA	3.868%	8	CANTABRIA	19,125
9	CANARY ISLANDS	3.831%	9	CASTILLA Y LEÓN	18,493
10	CASTILLA Y LEÓN	3.822%	10	VALENCIAN COMMUNITY	18,362
11	CANTABRIA	3.757%	11	CANARY ISLANDS	18,130
12	ARAGÓN	3.752%	12	ASTURIAS	16,975
13	ANDALUSIA	3.740%	13	MURCIA	16,572
14	CATALONIA	3.708%	14	GALICIA	15,853
15	CASTILLA-LA MANCHA	3.660%	15	CASTILLA-LA MANCHA	15,525
16	BASQUE COUNTRY	3.656%	16	ANDALUSIA	15,203
17	EXTREMADURA	3.630%	17	EXTREMADURA	13,070

Source: INE and self made.

Therefore, at first glance, it could not be concluded that, in general, regions with the greatest income level obtain a lower return on their contributions to the pensions system because it transfers income to less developed regions.

If we adjust an equation by using the ordinary least squares method for the general scheme that it includes the most of the affiliated ones, in which the IRR is explained by the GDP per capita in logarithmic form for each region, the annual contributions and the main factors of temporary character, period of contribution

TABLE 11
COMPARISON BETWEN IRR OF GENERAL SCHEME AND GDP PER CAPITA. 2004

	IRR			GDP PER CAPITA	
		%			Euros
1	GALICIA	3.834%	1	MADRID	25,816
2	CATALONIA	3.832%	2	NAVARRE	24,711
3	BALEARIC ISLANDS	3.829%	3	BASQUE COUNTRY	24,626
	SPAIN	**3.783%**	4	CATALONIA	23,563
4	LA RIOJA	3.738%	5	BALEARIC ISLANDS	22,234
5	VALENCIAN COMMUNITY	3.710%	6	LA RIOJA	21,357
6	ARAGÓN	3.680%	7	ARAGÓN	20,980
7	MURCIA	3.633%		SPAIN	**19,700**
8	CANARY ISLANDS	3.574%	8	CANTABRIA	19,125
9	EXTREMADURA	3.574%	9	CASTILLA Y LEÓN	18,493
10	NAVARRE	3.534%	10	VALENCIAN COMMUNITY	18,362
11	MADRID	3.518%	11	CANARY ISLANDS	18,130
12	CASTILLA Y LEÓN	3.509%	12	ASTURIAS	16,975
13	CASTILLA-LA MANCHA	3.465%	13	MURCIA	16,572
14	CANTABRIA	3.440%	14	GALICIA	15,853
15	BASQUE COUNTRY	3.428%	15	CASTILLA-LA MANCHA	15,525
16	ANDALUSIA	3.385%	16	ANDALUSIA	15,203
17	ASTURIAS	3.000%	17	EXTREMADURA	13,070

Source: INE and self made.

the life expectancy at retirement age (Table 12), it is obtained a statistically significant relationship between the IRR and these variables, positive in the case of the GDP and life expectancy and negative regarding to the period of contribution and the contributions. These four variables together explain more than 81% of the variability of the IRR. Thus, it is concluded that regions with a greater economic development and life expectancy receive favourable treatment of the pensions system and those where the average time of contribution and the amount paid are higher, are harmed.

TABLE 12

Variable	Parameter	t-Student	Probability
LOGGDP	0.610320	6.704696	0.0000
CONTRIB	-0.000465	-4.540121	0.0006
TIMCON	-0.115895	-5.708256	0.0001
LIFEXP	0.144458	3.504728	0.0039
Whole statistics			
R^2		0.818194	
DW		1.980937	
F		14.01481	0.000179

LOGGDP: Logarithm of GDP per capita
CONTRIB: Part estimated of the annual average contribution for financing retirement pensions
TIMCON: Time of contribution in the general scheme
LIFEXP: Life expectancy at retirement age in the general scheme

Source: Self made.

TABLE 13

Variable	Parameter	t-Student	Probability
C	6.059659	6.580647	0.0000
TIMCON	-0.163170	-6.748316	0.0000
LIFEXP	0.162784	4.130570	0.0010
Whole statistics			
R^2		0.772532	
DW		2.404995	
F		23.77350	0.000032

C: Constant
TIMCON: Time of contribution in the general scheme
LIFEXP: Life expectancy at retirement age in the general scheme

Source: Self made.

If we eliminate GDP and the annual contribution because both variables are strongly correlated[5] to each other, we will obtain a new model in which the IRR is only explained by the two relevant temporary variables: the period of contribution and the number of years that it's statistically expectable that the representative individual survives after its retirement age. In this case, the percentage of explanation of the dependent variable exceeds 77% (Table 13) and the relationship has the indicated sense, negative with the first variable and positive with the second one.

In conclusion, from this approach to the analysis of the regional impact of the contributory pensions scheme it is not possible to be concluded that the most developed regions of Spain are "damaged" by their work, because the level of economic development does not seem to be the main factor for individuals residing in such regions to expect a higher return in the medium and long-term on the amounts of contributions paid. Life expectancy at retirement age and the period of contributions to gain the status of "retired person" will determine whether the resident in any region will be benefited or harmed by the system. Main factors are therefore associated with demography and labour market characteristics of each region, making the retirement program more or less beneficial. As the income level of the regions is linked with these variables (i.e. longevity)[6], it is possible that the system transfers income between regions as a consequence of the retirement pensions scheme. In this sense, as a remarkable positive correlation between the GDP per capita and the life expectancy exists, it could exist a redistribution of income in favour of regions where people usually lives more years, consequently, the most developed regions economically.

Finally, from a political point of view, from the regional analysis of the lifelong incidence it would be also possible that if the most developed regions manage their competences concerning to this field, some would lose the advantage that gives them their greater longevity, but they would obtain budgets relatively higher than other regions. As individuals living in the most developed regions expect higher returns in the medium and long term on the amounts of contribution paid to finance the contributory pensions scheme, it can be concluded that Social Security System would be carrying out a redistribution which is not completely random, but predictable, between individuals residing in different regions of Spain, and which is somewhat regressive.

5 The linear correlation coefficient between the logarithm of GDP per capita and annual contributions for receiving a pension is 0.811

6 The linear correlation coefficient between life expectancy at the retirement age and the logarithm of GDP per capita is 0.623

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