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A projection model of the contributory pension expenditure of the spanish social security system: 2004-2050*

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Abstract

The need for long-term fiscal projections is self evident. Of these projections, pension expenditure is one of the most important since firstly it represents a large share of total expenditure, and secondly because of the positive correlation between this variable and demographic ageing. In this paper, we develop a model to project contributory pension expenditures in the Spanish Social Security System disaggregating the results by pension category, social security regime and sex.

The most salient of the results obtained is the expected steady growth of total expenditure in contributory pensions. This would lie around 15% of GDP around 2045 compared to its initial level of barely 8% even though the baseline scenario incorporates a substantial recovery of employment and female participation rates. By pension categories, retirement pensions are those that determine the tendency of total expenditure evolution. Interesting conclusions can also be extracted from the analysis by sex. For instance, even accounting for an increase in female retirement pensions due to their higher participation, the corresponding increase in widow male pensions implies a higher total increase of the total number of contributory pensions accruing to men.

Key words: Pensions system, sustainability, public expenditure.

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1. Introduction: the importance of the long-term pension expenditure projections

The concern about the need to make long-term fiscal projections can be dated back to the mid-1980s, just when the problem of demographic change began to emerge in industrialized countries. Regarding demographic variations, a decline in fertility rates, coupled with rising longevity, have resulted in a gradual ageing of the overall population. At that moment, the ratio of the elderly to working-age population was increasing fast in most Western countries, and the long-term projections of population gave few grounds for optimism (Franco and Munzi, 1996). The great responsiveness of the pay-as-you-go (PAYG) pension systems to population ageing foreshadowed problems of sustainability of the public finances in these countries (Heller *et al*., 1986). This is the consequence of two facts. On the one hand, the decrease in the number of workers as a result of the low fertility since eighties, and on the other hand, the considerable increase of the life expectancy that will affect the large baby-boom generation after 2020.

Many other public policies, including health and long-term care, are also clearly affected by this demographic change since their expenditure is highly dependent on the structure of the population. Concern about future prospects has invaded the political sphere beyond academic debate. In fact, the European Commission has created the Ageing Working Group devoted to analyze the future evolution of age-related expenditure and evaluate the need for reform[1]. Nevertheless, the responsiveness of PAYG pension systems to population ageing that was mentioned above, highlights the need to forecast in more detail the future evolution of these systems in order to evaluate possible reforms. This explains why, all along, the main subject embodied in age-related projections has been the public pensions systems. This fact is self-explanatory given the temporal nature of this expenditure and its quantitative importance within the national budgets. It must also be taken into account that in the European Union, public PAYG pension systems represent the most important income source for the elderly, covering about a 90% of retirement income provision.

The basic content of the public spending projections consists in modelling and assessing the annual forecasted budget cost for the main age-related expenditure programs, from a long-term perspective. As Franco *et al.* (2006) distinguish, these fiscal projections have followed two lines of research: most studies have provided projections of the ratio of some age-related expenditure to GDP, whereas other studies have pursued to get synthetic indicators of the long-term fiscal performance.

Ideally, pension expenditure simulations should be based on general equilibrium models that provide a fully microfounded representation of reality, and allow for endogenizing key economic variables like wage and other factor returns. Thus, the overlapping generations model emerges as the most adequate tool to analyse pension expenditure, as it combines individual optimization with interaction between generations. Nevertheless, the usual trade off between aplicability and theoretical consistency applies and, in practise, large scale general equilibrium models coexist with different kinds of simulation models. The later sacrifice to some extent the endogeneity of decisions, so that the general equilibrium nature of the model is partially (behavioural models) or totally (non-behavioural models) eliminated.

In fact, the literature on pensions expenditure modelling is somehow fractioned at the moment. Toghether with large scale applied overlapping generations models, microsimulation models emerge, which have necessarily a macroeconomic module. On the other hand, simple aggregate accounting models have evolved, including more heterogeneity and becoming very similar to non-behavioural microsimulation models[2]. In parallel generational accounting, an applied tecnique derived from overlapping generations models, has been used in that context or in a partial equilibrium context, becoming also similar to a static microsimulation model.

With respect to general equilibrium models, macro-micro simulation models permit to take advantatge of available micro data sets and a more detailed consideration of legal institutions and hence policy reforms. In this particular context they also allow a more flexible introduction of changing labour market conditions like employment recovery and increasing female participation. Within simulation models, the availability of data and the computational capability determine the possibility of both endogenizing behaviour and taking into account the heterogeneity of economic agents.

These simulation models usually consist of several modules. The first one involves projecting the evolution of population using demographic scenarios. Generally, this population module includes forecasts of survival rates, survivors to each age, deaths at each age, life table populations and life expectancy for males and females all by single year of age. These estimates are usually constructed from the mortality rates previously calculated. In this respect, the methodology for calculating the evolution of population by cohorts and gender is crucial to the success of pension expenditure projections. On that matter, see Lee and Tuljapurkar (2001) and HM Treasury (2005).

A second module deals with the pension system institutional aspects, like the existence of different types of contributory pensions (i.e., retirement, disability and survivors pensions), eligibility requirements, the initial pension benefit as well as other legal features determining the entry pension formula and the updating rules of pensions.

Lastly, a third module defines the macroeconomic framework applicable in the projection-horizon. Unlike the simplest models, which only confine to establish the predicted evolution of the main economic variables, there is a growing use of models which yield this forecast under the definition of relations among macroeconomic variables in accordance with basic postulates of economic theory. In fact, many of the current projection models allow to obtain the GDP growth rate taking population changes into consideration and its influence according to labour participation rate and labour productivity. Labour supply modelling is even incorporated in some models, as the Norwegian MOSART (Fredriksen and Stolen, 2005).

This three-module structure is somehow common to non-behavioural and behavioural microsimulation models. Obviously, the later allow for more interactions between economic and demographic factors during the projection-horizon. Essentially, the most valuable contribution of the dynamic microsimulation models is its potentiality for incorporating the effects induced by behavioural changes of individuals or families as a result of public policy reforms. A complete review of these models can be found in Gruber and Wise (2004) and Zaidi and Rake (2001). The long experience in using administrative micro data places the Scandinavian countries as pionners in the building of this type of long-term projection models (see Fredriksen, 1998; and Fredriksen *et al*., 2005).

Other type of models developed over recent years have a stochastic nature. Based on historical data, these models incorporate random variables to forecast the annual changes in the demographic process, operating through the number of births by gender, the number of marriages and divorces and the inmigrant flow, all by age-group and gender. Its main contribution is to offer expenditure forecasts based on iterated simulations of the model as an alternative for reducing the uncertainty about the input assumptions and its sensitivity. Meyerson and Sobelhaus (2000) describe the main features of the stochastic pension projection model prepared by the US Congressional Budget Office.

One of the most important challenges in long-term pension spending modelling is how to include sources of heterogeneity that permit to differentiate among agents depending on their ages, productivity, probability of employment, etc. Its inclusion in the model results in more accurate projections, but at the cost of increasing complexity and data needs (Jimeno *et al*., 2006). Traditional models usually take into account heterogeneity in age only, but overlook age-related aspects as heterogeneity in productivity despite that they are more relevant for wages. This matter is even more complex because other factors, such as education by cohorts or state of health are also endogenous[3]. The most important limitation for incorporating this type of differentiation is the requirement of high-quality data. Nevertheless, advances in computational software and the ever-increasing micro databases permit to be optimistic on this matter.

In this paper we develop a non-behavioural microsimulation model to project the pension expenditure for the Spanish contributory system for the period 2004-2050. Regarding technical design of the model, the main contributions relate to pensioners' heterogeneity, specifically in terms of category of pension (i.e. retirement, disability and survivors), social security regime and gender. With respect to other projection models applied to the Spanish system (Jimeno, 2003), this model deals with the whole contributory social security system. Furthermore, in contrast to Balmaseda et al. (2006) and Alonso and Herce (2003) our model explicitly links the projection of retirement pensions to the rest of contributory pensions. In fact, the number of retirement pensions as well as the pension benefit itself drive the evolution of widow and other survivors pensions. The fact that disability pensioners become retirees when reaching 65 years is also explicitly taken into account.

We also analyze gender differences in pensions. In particular we account for the entry of women in the labour market and the corresponding adjustment of female average pension benefit upwards. Differentiating between male and female allow us to improve the expenditure projections in so far as we capture the gaps associated with both the participation rate and the pension benefit. Besides, the projection model clearly specifies the way the demographic and macroeconomic modules interact with the institutional aspects module. This allows carrying out meaningful sensitivity analysis using alternative scenarios on growth productivity, labour market participation and relevant demographic aspects as the number of immigrants. We also provide a synthetic indicator of fiscal sustainability, which allows for summarizing in a single figure the overall sustainability of the system as well as the effects or different scenarios. Finally, dissagregation by regime allows us to account for special tendencies in the number of pensions or the average pension benefits. An outstanding example in the Spanish system is a special regime for retirement pensions which pays a fixed pension and which beneficiaries are expected to disappear by the end of the 2030-decade.

The structure of the paper is as follows. In Section 2 a description of the contributory pension system in Spain is provided. The projection model is presented in Section 3, and the demographic and macroeconomic scenarios in Section 4. Sections 5 and 6 are devoted to present the main results of the projection model as well as some sensitivity analysis. Finally, Section 7 summarizes the main conclusions.

2. The contributory pension system: institutional framework

The Spanish contributory pension system is organised on a pay-as-you-go basis under a defined-benefit scheme. Workers and pensioners are classified into different regimes (i.e., the General Regime and five Special Regimes like Self-Employment, Agrarian, Coal Mining, Sea Workers and Domestic Employees)[4] covering a set of contingencies: retirement, permanent disability and survival pensions (e.g., widow, orphan and family pensions). The nature of the contributory pension system relies basically on two characteristics: first, a minimum period of contribution payments is required (as long as other conditions are met) and, second, the pension benefits determined by the past wages of the worker. In the following we present the main characteristics of each pension category.

a) Contributory retirement pension

The contributory retirement pension is an economic benefit of indefinite duration and covers the loss of income suffered by a person who, after ending his working career, reaches the retirement condition. The beneficiaries are affiliated workers (or under a situation assimilated to being affiliated) who meet the legally established conditions of a) retirement, normally at age 65, and b) a minimum period of 15 years of contribution, although 2 years must belong to the 15 years period immediately before retirement.

The initial retirement pension benefit is determined by applying the corresponding percentage (that depends on the number of contribution years) to the Regulating Base (hereafter RB). Since 2002 (after the Law 24/97, of 15 July, was passed) the RB is an average of the contribution bases of the last 15 years.[5] The percentage which is applied to the RB to deduce the initial retirement pension benefit is variable according to the number of years contributed to Social Security: 50% if the worker accredits 15 years of contributions, and it is increased by 3% for each additional year between the sixteenth and twenty fifth year and by 2% from the twenty sixth year until it reaches 100% at 35 years of payments. A differential treatment is given to workers with contributions before and after January 1st 1967, since a Spain's true modern public insurance system begins its development from 1967 on. Moreover, there is an incentive for a prolonged working career: for workers aged 65 and over the percentage to be applied to the RB increases an additional 2% as long as the worker can accredit 35 years of contribution.

Retirement pensions are subject to upper and lower limits annually determined by the Government's General Budget Act. Minimum pensions are guaranteed according to age and family responsibilities. Additionally, the system guarantees by law the real value of pensions since they are increased, at the start of each year, according to the predicted Consumer Price Index (hereafter CPI).

Ordinary retirement age in Spain is at 65, although there are exceptions to this general rule and retirement age can be reduced in some special cases: a) early retirement, b) special retirement at age 64, c) partial and flexible retirement, d) retirement of certain collectives, and e) retirement of disabled workers. Most notably, early retirement from the age of 60 was an option just reserved to those workers who had been contributors in any of the Employment Mutual before January 1st 1967. In this case, the early retirement pension benefit is computed applying to the RB a specific reduction percentage that depends on the number of contribution years. However, after the approval of the Law 35/2002, of July 12th, workers without being insured or having contributed in a Mutual Society or Mutuality before January 1st 1967, can only retire from 61 on under certain conditions[6].

b) Contributory disability pension

The objective of the contributory disability pension is to provide a social safety net against income losses associated with a total or partial loss of capability to work. Benefits are contingent upon the origin and the degree of disability, as well as the type of recipient. Four types or degrees of permanent disability are considered, nonetheless it is worth mentioning that the former gives right to a lump sum indemnification, while the compensations from the latter three take the form of a lifetime annuity. In any event, in case of a worker not reaching the minimum retirement age the legislation establishes that the disability may be subject to a revision as a consequence of a worsening or an improvement of the degree of disability or because of eventual misdiagnoses. Should we also mention that by 1997 disability pension recipients older than 65 years are categorized as retirement pensioners (with no effect on their compensations or benefits). Moreover, beyond that age no disability report is allowed.

Partial permanent disability for the usual occupation is the first degree of disability. Under this category worker's efficiency is supposed to have been reduced by no less than 33%, nonetheless he is still capable of performing the fundamental tasks the usual occupation requires. The compensation consists of a lump sum transfer (which means it is not a pension) equivalent to 24 times the RB, which served to determine the temporal disability compensation. Since it is not a pension it is not taken into account in the forecast analysis.

The second degree is total permanent disability for the usual occupation (TPD). In this case the worker is incapable of performing all or the fundamental tasks of his usual occupation, but yet can attend other kind of occupation. The eligibility criteria depend on the cause of disability (common disease, non workplace accident or causes attributable to the occupation) and the compensation consists of a lifetime annuity that represents 55% of the RB (this is augmented up to 75% of the RB once the worker has turned 55 and is jobless). The RB is determined again by the origin of the disability, or by the minimum contribution period required, whenever this one is applicable.

The third degree is an absolute permanent disability for any type of occupation (PAD). Under this category the worker is totally inhibited from taking on any occupation or activity. As in PTD, the eligibility criteria depend on the cause of disability. The benefit consists of a lifetime annuity that represents 100% of the RB. Finally, complete disability (CD) implies a total inhibition from taking on any occupation or activity and the worker needs other people-'s assistance to carry out the basic daily living activities. Eligibility criteria for compensation are the same as in the PTD case. The benefit amounts to 100% of the RB with a 50% increment for the person in charge (such an increment may be traded for room and board in a public institution financed by the Social Security Administration).

c) Contributory survivors' pensions

Contributory survivor's pensions include those pensions paid to widows and orphans (and where appropriate, other dependants) in order to compensate the financial needs of certain people. The originators of the widow pension are affiliated workers with a minimum contribution period and retired pensioners who receive contributory benefits or pensioners with permanent disability. The beneficiaries of the widow pension are: the surviving spouse (either female or male) and the separated and divorced people who have not remarried, in which case the pension benefit will be proportional to the time lived as a married couple with the deceased.

Under certain circumstances, the widow pension is compatible with the income obtained from the beneficiary's work and with the retirement or permanent disability pension. The pension benefit is obtained by applying the following percentages: a) in general, a 52% on the RB or b) a qualified 70% on the corresponding RB whenever the some requirements are met for the entire period in which the beneficiaries receive the pension[7].

The RB which serves to compute the widow pension depends on whether the deceased was an active worker or a pensioner, and on whether cause of death was a professional contingency or not: a) if the deceased was a retired or a permanent disabled pensioner, the RB is the same as it was used to determine the originator's initial pension benefit, but increased by the cumulated revaluations for the widowhood pensions[8]; b) if the deceased was an active worker, two main situations can be distinguished, according to whether the death was due to common contingencies or due to work-related injury or occupational disease. Nevertheless, there are some specific rules for part-time, relief and permanent-intermittent contracts.

Widow pensions are also subject to upper and lower limits fixed by the Government's General Budget Act. At the beginning of each year, the annual pension benefits are adjusted based on the CPI forecast for that year. The right to collect this pension can end by different causes besides mortality[9].

With regard to orphan pensions the originators are the same as for widowhood pensions, and the beneficiaries are their children under age 18. It also includes the children under 22 years old, or 24 if none of the parents survive, under some circumstances. Importantly, the pension benefit for orphans is calculated by applying a 20% on the same RB as for widowhood benefits. The orphan pension is compatible with any income from work if the orphan is under 18 (or has reduced working capabilility). Lastly, the orphan pension benefit will end when beneficiary reaches age 22, except in special circumstances related to disability, adoption and marriage.

3. The model

This section develops the simulation model. The starting point takes into account that total pension expenditure in year t (TE_t) is the result of multiplying the number of pensions during that year (NPA_t) by the average pension benefit (pm_t):

$$TE_t = NPA_t \cdot pm_t \qquad [3.1]$$

To obtain the number of pensions throughout a year t, it is important to recognize that these can belong to three different types: a) those received throughout the year, named common pensions (C_t), that is, those that were already granted on January 1st and have not caused withdrawal from Social Security by December 31st; b) the new registrations (NR_t), i.e., those pensions that were started to be received at some point in year t; and c) the withdrawals that correspond to year t (W_t), i.e., those that were no longer received during that year, at some point before December 31st.

Total pension expenditure for a year is thus the sum of the pension benefits corresponding to the three categories. Now, the new registrations and withdrawals do not receive the total benefits for the whole year under consideration, just one part is granted. Assuming that the flow of new registrations and withdrawals is distributed evenly throughout the period, they will be received during one half of the year[10]. That way, the equivalent number of pensions during the year *t* (NPA_t), which is the relevant variable in [3.1], can be obtained as:

$$NPA_t = C_t + 0{,}5NR_t + 0{,}5W_t \qquad [3.2]$$

The computation of NPA_t requires previous knowledge of the number of pensions of each type (*C*, *NR* and *W*). Since the data on the number of pensions always refers to a specific date, generally December 31st of each year, they are not readily usable for this projection model. Let NP_t be the number of existing pensions as of December 31st of the year *t*, and let NP_{t+1} be the same variable for the next period. It can then be assumed that:

$$NP_{t+1} = NP_t + NR_{t+1} - W_{t+1} \qquad [3.3]$$

That is, starting from the number of pensions at the end of year *t*, those for the year *t*+1 can be computed by summing up the new registrations and then subtracting the withdrawals for that year. To do so, it is necessary to have a projection of the number of new registrations and withdrawals for that period. In turn, the number of common pensions in *t*+1 can be obtained from the difference between the number of existing pensions at the end of *t*+1 and the withdrawals during *t*+1, that is[11]:

$$C_t = NP_t - W_{t+1} \qquad [3.4]$$

Once the new registrations and the withdrawals have been projected and the common pensions computed (as is given by [3.4]), the relevant variable for the estimation, the number of pensions throughout the period (*NPA*), can be obtained using [3.2].

The average pension benefit for a given period is to be computed from the corresponding weighted average pension benefits of the different collectives (common, new registrations, and withdrawals). Denoting pmc_t, $pmnr_t$, and pmw_t the average pension benefits of the common, the new registrations, and the withdrawals, respectively, the average pension benefit can be obtained as:

$$pm_t = \frac{C_t\,pmc_t + 0{,}5NR_t\,pmnr_t + 0{,}5BW_t\,pmw_t}{C_t + 0{,}5NR_t + 0{,}5W_t} \qquad [3.5]$$

or alternatively,

$$pm_t = \delta_t\,pmc_t + \alpha_t\,pmnr_t + \beta_t\,pmw_t \qquad [3.6]$$

where δ_t, α_t, β_t represent each pension type as a proportion of NPA_t:

$$\delta_t = \frac{C_t}{C_t + 0{,}5NR_t + 0{,}5W_t};\ \alpha_t = \frac{0{,}5NR_t}{C_t + 0{,}5NR_t + 0{,}5W_t};\ \beta_t = \frac{0{,}5W_t}{C_t + 0{,}5NR_t + 0{,}5W_t} \qquad [3.7]$$

From now on, the projection model incorporates heterogeneity of beneficiaries, disaggregating by pension category, contribution regime to Social Security, age, and gender. The key variable on which the model is based is the projection of the corresponding number of new registrations for each period, as well as the average pension. The projection of the withdrawals and their corresponding average pension benefit will depend greatly on the new registrations estimation, the number of existing pensions at the end of the previous period, as well as their respective average pension benefits. At the same time, the withdrawals and their corresponding average pension will determine the number of common pensions and their average pension benefit, along with the number of pensions at the end of the previous period and their respective average pension benefit.

3.1. Retirement

The projection of retirement pension expenditure derives from the distribution of the number of pensions by gender and age cohorts as of December 31^{st} of 2003 (base year) for each contribution regime (MTAS, 2004).

a) Projection of the number of pensions

Starting from the distribution by gender and age cohorts of the pension benefits in the base year, the projection of the new registrations is implemented in accordance with the forecasted labour participation rate by gender and age cohorts in the macroeconomic scenario. In that manner, the evolution of the Social Security coverage ratio (the ratio of the number of retirement pensions to the population of more than 65 years of age) is linked to the evolution of the labour market participation rate. In the projection, it is necessary to discern the new registrations subject to a coefficient of correction when computing their pension benefit (anticipated or differed retirement).

To obtain the projection of the withdrawals, the expected mortality rates by gender and age cohorts as obtained from the demographic scenario are applied to the number of existing pension benefits at the beginning of the period (end of the previous period). They are also applied to the number of new registrations projected throughout the year.

Once the new registrations and withdrawals for the corresponding year have been projected, the projection of common pensions is made using [3.4]. The equivalent number of pensions throughout the period (NPA_t) is then estimated using [3.2]. Finally, using [3.3] the number of pension benefits at the end of the year (NP_t), which is necessary for the projection in the subsequent period, is obtained.

b) Projection of the average pension

The computation of the average pension of the new registrations is based on the legally warranted formula:

$$pmnr_t = (1 - \rho) \cdot p(n) \cdot RB\ (CB_t, CB_{t-1},..., CB_{t-15}) \qquad [3.8]$$

where *RB* is the corresponding regulating base, computed as the average contribution bases (*CB*) of the last fifteen of contribution years[12], *p(n)* is the percentage applied on the RB that depends on the number of contribution years, and ρ is the applicable coefficient of correction in the event of anticipated or differed retirement.

We start the projection by estimating the number of contribution years (*n*) for the retirement pensions from the data on the average contribution years of the retirement pensioners. Since the objective is to obtain pensions projection by gender, the separate evolution of the contribution base for men and women is necessary. Because of the unavailability of such a disaggregation, the following strategy has been adopted. Firstly, it is considered that the gap between average pensions of new registrations of men and women is the same as the one observed in the whole system. Secondly, it is assumed that the evolution of the gap will follow the same time trend as that of the participation gap. That is, the average retirement pension of female new registrations will approach that of their male counterparts as the rate of labour market participation of the former comes close to that of the latter during the projection period.

The average pensions of the withdrawals and the common pensions are obtained as a weighted average of the average pensions of the two possible collectives of origin in each case. That way, the withdrawals per year occur between the number of existing pensions at the end of the previous year and the new registrations for that year[13]. Consequently, the average pension of the withdrawals will be a weighted average of the average pension of the previous year (pm_{t-1}) and the average pension of the new registrations of the period:

$$pmw_t = \frac{NP_{t-1}}{NP_{t-1} + NR_t} pm_{t-1} \frac{I_t}{I_{t-1}} + \frac{NR_t}{NP_{t-1} + NR_t} pmnr_t \qquad [3.9]$$

where I_t stands for the price index. The common pensions in turn, as captured in [3.4], stem from the number of pensions at the end of the previous year and the withdrawals during the period. Accordingly, its average pension can be approximated as:

$$pmc_t = \frac{NP_{t-1}}{NP_{t-1} + W_t} pm_{t-1} \frac{I_t}{I_{t-1}} + \frac{W_t}{NP_{t-1} + W_t} pmw_t \qquad [3.10]$$

Once the average pensions of the new registrations, the withdrawals and the common are obtained for a given period, the average retirement pension can be found using [3.5].

3.2. Permanent disability

As discussed in Section 2, the disability pensions system consists of different compensations and collectives depending on the cause and the degree of disability. Specifically, three degrees of permanent disability that initially give right to a life annuity are considered: total[14], absolute, and complete degree of disability. It was stressed in the description of the institutional framework that, since 1997, once accomplished 65 years, the disability pensioners are classified as retirement pensioners with no effect on their characteristics. New registrations of disability for people aged 65 or more are not filed. Additionally, three possible causes of the disability that determine the corresponding regulating base are distinguished: common disease, non-workplace accident, or causes attributable to the professional activity. Consequently, the projection of the disability pension expenditures requires projecting the pensioners and the average pension (according to the degree and the cause of the disability) alike. Again, the projection starts from the disability pensions as of December 31st of 2003 (MTAS, 2004) distributed by gender, the contribution regime, the degree and the cause of the disability[15].

a) Projection of the number of pensions

To project the new registrations for each level of disaggregation, we use the disability rates by age cohort, gender, contribution regime, degree and cause of disability that are obtained from the initial distribution of the new registrations. The disability rates are defined as the new registrations for every thousand of active worker in the base year. They are kept constant during the projection period, given their good behaviour in the last years, which has put them in acceptable levels when compared to those of the surrounding countries[16].

As to the projection of the withdrawals, in the case of disability pensions consideration of a second cause of withdrawals besides mortality is necessary, i.e., the loss of compensation rights after a diagnosis reassessment. The withdrawals for reassessment for each gender and age cohort are a percentage of the surviving pensioners in each group. This percentage is obtained by comparing the number of pensioners observed at the end of each year with the one that would be obtained if the unique cause of withdrawal from the system were the mortality rate[17].

From the new registrations and withdrawals in each period we obtain the number of common pensioners using [3.3] and [3.4]. Finally, the value of *NPA* for each projection year is derived from [3.2].

b) Projection of the average pension

To compute the average pension benefit for the new registrations we start with the legally established formula, which consists in applying a percentage (π) to the regulating base (*RB*). This percentage is determined by the degree of disability,[18] while the *RB* is computed from the past contribution bases depending on the cause. Consequently, the average pension benefit of the new registrations for disability is obtained as a weighted average of the average pension benefits that correspond to each degree and cause of disability:

$$pmnr_t = \sum_{d=1}^{4} \sum_{c=1}^{3} \frac{NR_t^{dc}}{NR_t} \pi_d RB_t^c \qquad [3.11]$$

where the subscripts *d* (degree) and *c* (cause) refer to the degree and the cause of the disability, respectively. To differentiate the projection of the average pension benefit of the new registrations by gender, the same procedure used with retirement pensions is followed. Also, to project the average pensions of the withdrawals and the common pensioners, expressions [3.9] and [3.10] are used. Finally, the average pension benefit for disability is obtained from [3.5].

3.3. Survivors

As was pointed out in Section 2, survivor's benefits are designed to make up for the financial necessity that some individuals experience due to the death of others. Three categories of pensions are considered depending on the beneficiary: widowhood, orphanhood and other surviving relatives' benefits.

a) Projection of the number of pensions

In the case of survivors' pensions, there exists no reason to link its evolution to the participation rate (as is the case for retirement pensions). On the contrary, in the case of widowhood, it can be assumed that this evolution will be correlated with the withdrawals that take place in the retirement and disability pensions, as well as in the active population. In that respect, the widowhood new registrations for each gender in every period are computed in relation to the withdrawals of the retired opposite gender, as well as to the withdrawals as a consequence of mortality of the active population and the withdrawals of disability pensions. For the base year, an adjustment factor between the result obtained via this method of projection and the one observed is computed. This adjustment factor will be applied for all the years of projection.

In the case of orphanhood and family pensions, there exists an additional difficulty, since new registrations cannot be linked to the withdrawals in retirement and disability or mortality of the active population by age cohorts. For that reason, the total number of new registrations in the base year is distributed by age cohort and gender following the available distribution pattern for total pensions of the same category. Then, the ratio of new registrations to total beneficiaries by age cohort and gender are obtained and are kept constant all through the projection period.

b) Projection of the average pension

The average pension benefit of widowhood new registrations is 52% of the regulating base that causes the benefit[19]. For orphan's pensions and other surviving relatives' benefits, except under special circumstances, this percentage goes down to 20%. Three possible causes of benefit are to be taken into consideration to obtain the regulating base: participant in the labour market, retired, or disabled. The regulating base is obtained as a weighted average of the respective regulating bases, the weights being the proportions of new registrations estimated for each of the three causes just mentioned. As to survivors' new registrations due to labour-market participants' mortality, the regulating base can be obtained directly from the average contribution bases of the active population by age cohort. However, when the new registrations are the consequence of retired or disabled mortality, it is impossible to know the regulating base that caused the pension benefit. In these two cases, the ratio of the average pension of the retired and disabled new registrations to the average pension of survivors new registrations, computed for the base year, is used and is kept constant all through the period.

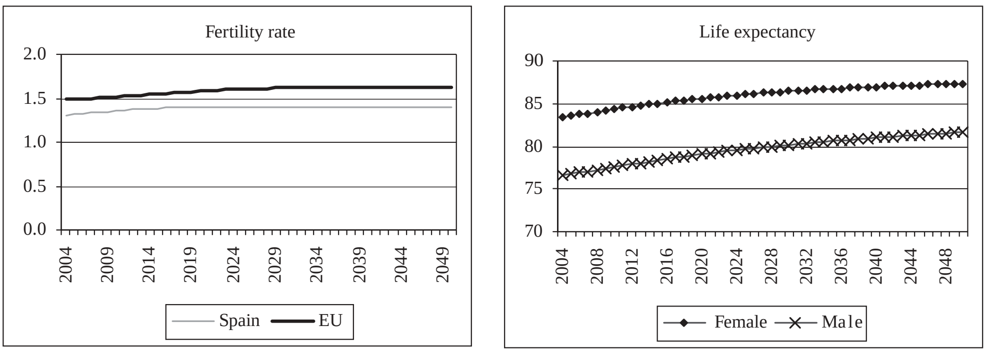
4. Demographic and macroeconomic scenarios

The projection model described above will produce results once introduced the evolution scenarios of the relevant demographic and macroeconomic variables. The scenarios adopted for the baseline projection are those elaborated for Spain by Eurostat (2005) (demographic scenario) and the Economic Policy Committee (EPC, 2006) (macroeconomic scenario). Their main traits are described next.

4.1. Demographic scenario

Population projections are carried out using three main hypotheses related to the evolution of the fertility rate, of life expectancy, and of the net migration flows. The projection implemented by Eurostat until 2050 is made by gender and age cohort, assuming that Spain will slightly recover its fertility rates during the period, although they will still be below the European Union average. So, in 2050 Spanish fertility rate will reach 1.4 children per women, while for the EU it will be 1.65. As to the life expectancy, a gradual increase for both men and women is also expected, about 4 and 5 years respectively respect the current value.

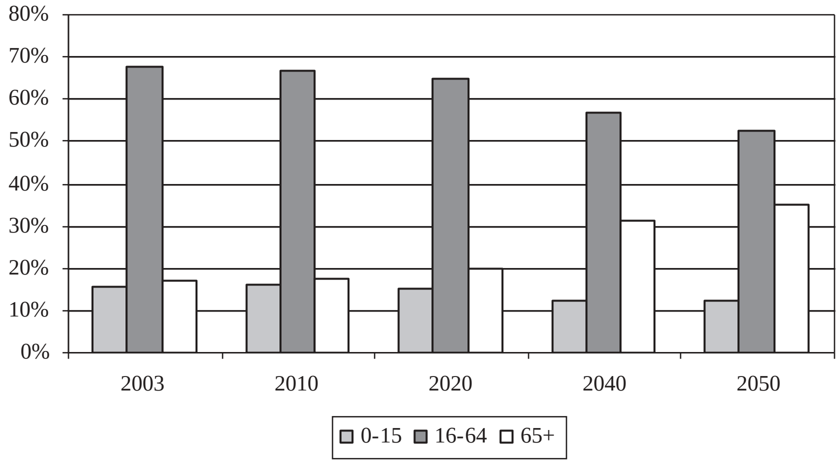
Figure 4.1. Demographic scenario: evolution of fertility and life expectancy



Source: Own elaboration from Eurostat (2005).

As far as migration is concerned, Eurostat's hypothesis is as follows: net migration flows will be stabilized at the end of this decade at a number slightly superior to 100,000 per year. This is a controversial hypothesis since during the last years net migration flows have been around 500,000 per year. In fact, Spain's Statistical Office (Instituto Nacional de Estadística, INE) has made alternative projections with net migration flows well above 250,000 per year. Although we will keep the EUROSTAT scenario to obtain de baseline results, the alternative high migration scenario elaborated by the INE will be also considered in the sensitivity analysis in order to account for possible differences.

Figure 4.2. Demographic scenario: evolution of the population composition by age



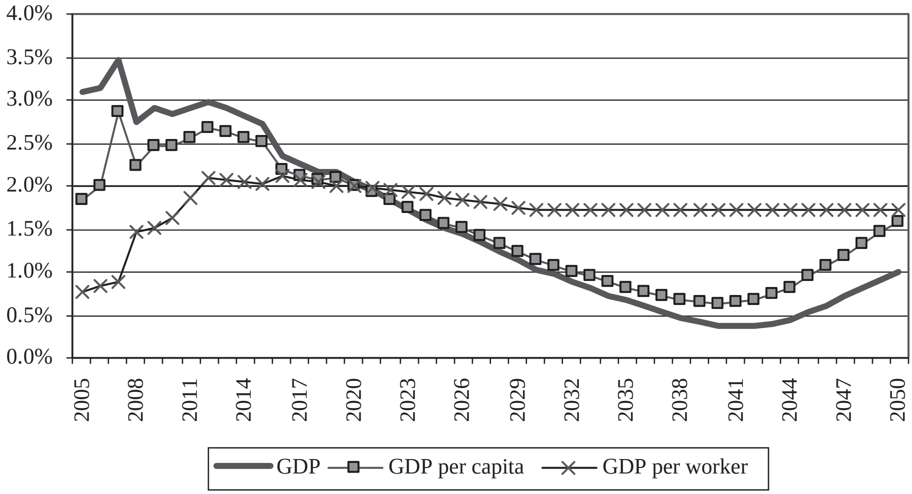
Source: Own elaboration from Eurostat (2005).

As can be observed in Figure 4.2, Eurostat's projections exhibit a strong ageing tendency of the Spanish population for the 2050 horizon. Specifically, after a sustained increase from its original 24.6%, the dependency rate (ratio of population aged 65 years and more to potential labour-market participants aged between 16 and 64) will be above 66%.

4.2. Macroeconomic scenario

The main hypotheses of the macroeconomic scenario projected by the EPC for Spain are those that relate to the evolution of the GDP, the productivity growth rate, and the labour market variables (participation rates and unemployment rates). For the GDP, although with a slowdown between 2020 and 2040, a positive growth rate is expected for the whole projection period. A more stable evolution of productivity growth is expected, going from the present low rates (around 0.5%) to 2% until 2020. From there, it would decrease to remain at around 1.7% from 2030 on. This turns out to be a relevant assumption given that even a small recovery lasts for the whole projection period raising the GDP for each future year.

Figure 4.3. Macroeconomic scenario: GDP evolution

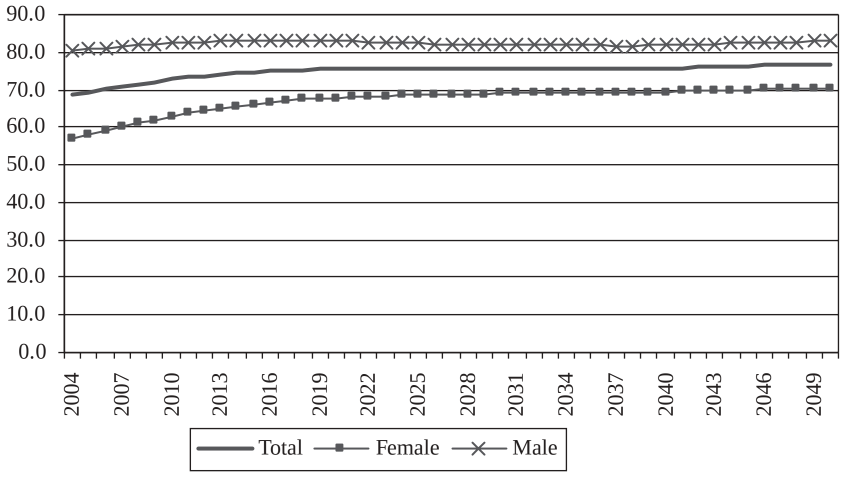


Source: Own elaboration from EPC (2006).

The persistence of high unemployment rates and low female participation rates shape the evolution of the Spanish labour market. A salient feature of the macroeconomic scenario is precisely the increase of the female participation rate, particularly until 2020. In the baseline scenario, female participation will grow from 56.8% to 70.4% until 2050. In turn, aggregate male participation rate in the labour market remains basically unchanged throughout the whole period at a quite high value (over 80%). It is however important to mention some particular feature for age cohorts. For instance, youth (both men and women less than age 24) participation rate slightly declines during the first years of projection. Nevertheless, female participation rate for the remaining cohorts (up to 64 years) experiences a substantial increase. Meanwhile, only the 54-64 male age cohorts experience a higher participation rate, but still lower than that of their female counterpart. It is important to put into relief that a higher participation rate for the superior age cohorts (between 65 and 71) is expected for both men and women alike. Their participation rate would be around 12%, compared with a 4% as of 2004.

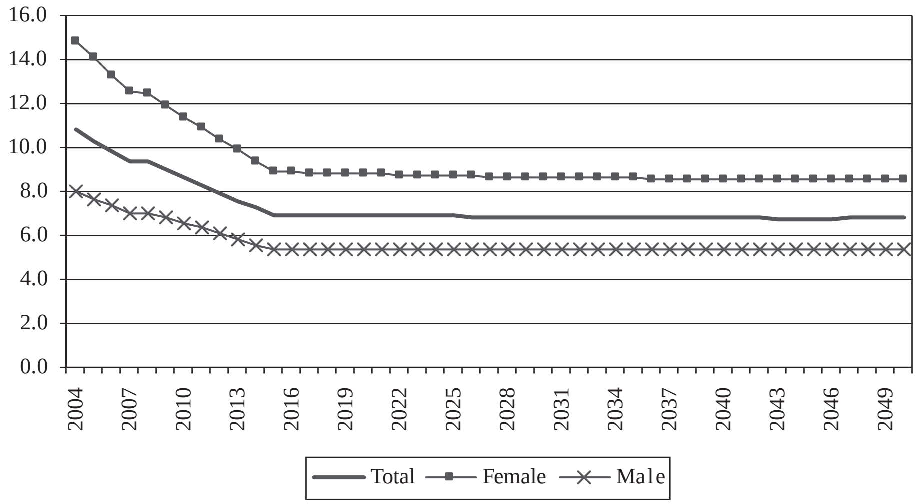
The expected evolution of unemployment for both men and women is a constant decline until it reaches an average value of 6.9% in 2015 (about 5.3% for men and 8.7% for women), which will basically remain unchanged until the end of the projection period.

Figure 4.4. Macroeconomic scenario: evolution of participation rates



Source: Own elaboration from EPC (2006).

Figure 4.5. Macroeconomic scenario: evolution of unemployment rates



Source: Own elaboration from EPC (2006).

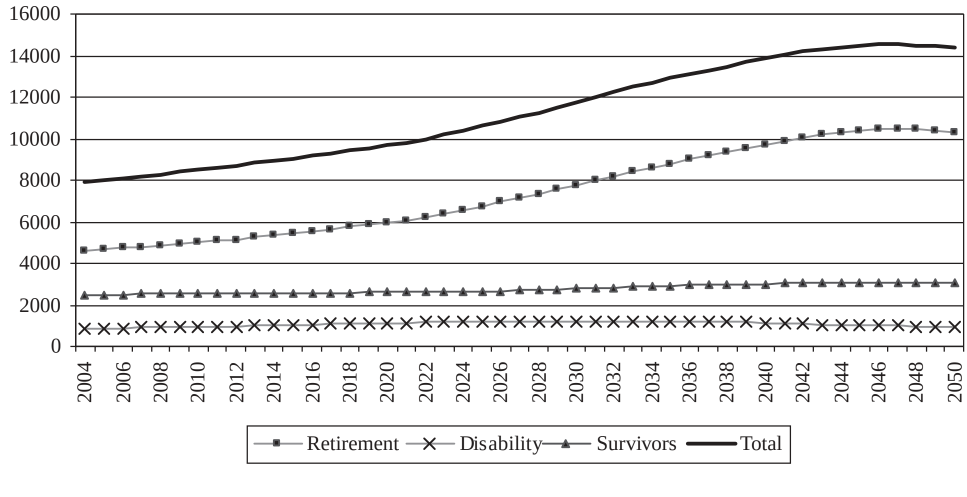
5. Baseline results

In this section the results of the projection model of contributory pension expenditure in Spain using the demographic and macroeconomic scenarios described above are presented.

5.1. Number of pensions

The evolution of the number of total pensions and pensions by category is illustrated in Figure 5.1 and Table 5.1. As is shown in Figure 5.1, a sustained growth of contributory pensions is expected at an annual average cumulative rate of 1.3%. That way, in 2050 we would surpass the 14 million pension threshold, compared with barely 8 million in 2004. This evolution is nonetheless not lineal throughout the projection period. The number of pensions would grow at approximately 1% until the beginning of the 2020s. From that moment, with the retirement of the baby-boomers, the most populated cohorts, the rate of growth would double. From 2040 on, the rate of growth decreases to even become negative by 2047. From Figure 5.1, it is straightforward to notice that retirement pensions are responsible for the observed tendency of total pensions, since the other benefits (disability and survivors) exhibit a much more stable tendency. In fact, as can be seen in Table 5.1, the importance of the retirement pensions with respect to total contributory pensions exhibits a continuous growth in detriment of the other categories (in 2050 they represent more than 71%, against 58.6% in 2004).

Figure 5.1. Evolution of the number of contributory pensions by category



Note: Figures are expressed in thousand of beneficiaries.
Source: Own elaboration.

The projection analysis by gender allows drawing some interesting results. On the one hand, the total number of pensions accruing to both men and women is very similar in the base year, although a clearly differentiated structure can be observed by pension category. In that vein, male retirement pensions are substantially more numerous, while disability pensions rank second (respectively, 77.5% and 14.2% in 2004). Female widowhood pensions in turn outweigh those for retirement (more than 50% versus 39.3% in 2004).

The projection also shows differentiated tendencies in its future evolution. The total number of contributory pensions will grow proportionately more for men. Specifically, on average some 1.5% annual cumulative over the period, versus 1.1% for their female counterpart. As a consequence, the number of male pensions will be relatively more important and would represent 1.3 times those of female in 2050, which brings down the originally observed equality.

For both sexes, the retirement pensions are expected to be increasingly important, in particular for the women, who start off with a relatively inferior weight. For the first part of the projection, that is, until 2020, the average annual cumulative growth rate is about 1.6% for men and 1.5% for women. However, this trend is inverted between 2020 and 2050 to become 2% and 1.8% for women and men, respectively. So, by 2050 the number of retirement pensions accruing to women would represent approximately 53.2% that going to men, compared with the original 49.6%. Female retirement pensions from the total would grow more than 17 points with respect to the base year, while it would be a barely 6 points increment for their male counterpart.

The widowhood benefits exhibit the reverse trend. The number of male beneficiaries is expected to grow at approximately an annual cumulative average rate superior to 2.5%, while this figure would be 0.3% for the female. This result is in line with the assumptions made on the female labour market participation, which will give greater access to widower's pensions. However, at the end of the projection widowhood benefits would continue to be more important for women, representing 35.4% of the total female contributory pensions compared with 6.2% for men.

The growth of the number of pensioners for the remaining pension categories is expected to be negligible for both sexes and would be below 0.5% annual cumulative average. Both the disability pensions and the orphan's pensions and other surviving relatives' benefits lose importance with respect to total number of pensions for both sexes.

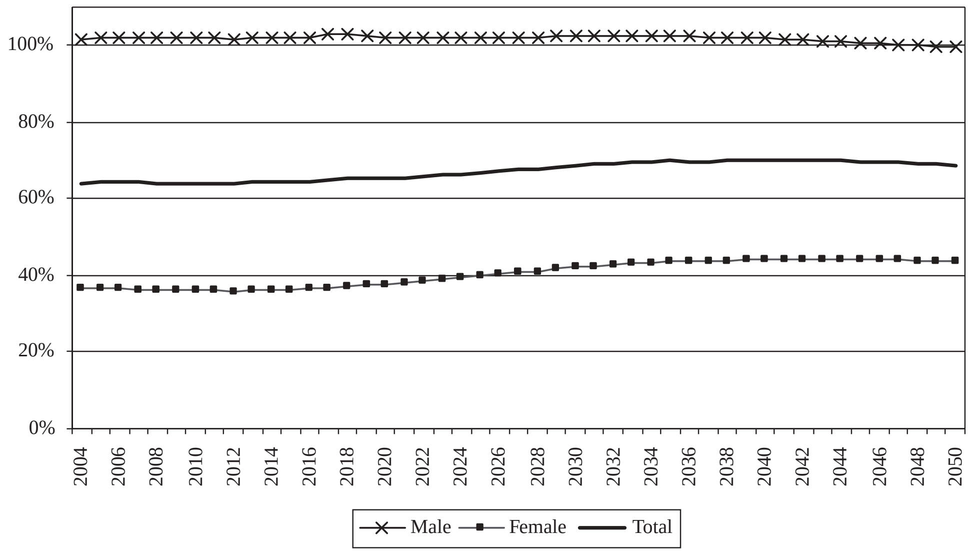
Finally, it is important to notice that this expected evolution for the number of pensions appears to be a corollary of the starting demographic scenario, where a clear tendency of population ageing is observed, as well as the assumptions on the evolution of the labour market. In effect, the increase in participation rates has a direct impact on the increase of the retirement pension coverage rate (ratio of the number of pensions to the population over 65 years), which in fact goes from 64.1% in 2004 to about 70% around 2040 (Figure 5.2).

Table 5.1
EVOLUTION OF THE NUMBER OF PENSIONS BY GENDER AND CLASS (IN NUMBER AND AS PERCENTAGE OF TOTAL)

	Retirement		Disability		Widow		Other		TOTAL
Both sexes									
2004	4,625,846	58.6%	817,392	10.4%	2,135,325	27.0%	318,708	4.0%	7,897,270
2005	4,677,186	58.2%	861,993	10.7%	2,166,665	27.0%	324,167	4.0%	8,030,012
2010	4,985,975	58.7%	951,648	11.2%	2,207,785	26.0%	342,866	4.0%	8,488,274
2015	5,430,056	60.1%	1,028,599	11.4%	2,239,406	24.8%	343,637	3.8%	9,041,698
2020	5,963,505	61.5%	1,124,639	11.6%	2,244,018	23.2%	357,601	3.7%	9,689,762
2025	6,750,004	63.7%	1,193,017	11.2%	2,285,842	21.6%	376,000	3.5%	10,604,864
2030	7,772,770	66.0%	1,223,497	10.4%	2,395,419	20.3%	385,036	3.3%	11,776,722
2035	8,805,681	68.1%	1,208,128	9.3%	2,533,406	19.6%	383,106	3.0%	12,930,320
2040	9,737,186	70.2%	1,130,660	8.2%	2,626,274	18.9%	376,495	2.7%	13,870,616
2045	10,391,688	71.7%	1,015,547	7.0%	2,715,873	18.7%	370,930	2.6%	14,494,038
2050	10,322,379	71.9%	944,581	6.6%	2,721,686	19.0%	366,625	2.6%	14,355,270
Male									
	Retirement		**Disability**		**Widow**		**Other**		**TOTAL**
2004	3,092,548	77.5%	566,647	14.2%	159,953	4.0%	172,204	4.3%	3,991,351
2005	3,135,543	77.0%	595,107	14.6%	169,456	4.2%	174,062	4.3%	4,074,168
2010	3,368,448	76.4%	646,954	14.7%	210,653	4.8%	183,260	4.2%	4,409,315
2015	3,669,950	76.4%	692,149	14.4%	257,922	5.4%	184,043	3.8%	4,804,064
2020	4,007,087	76.2%	756,304	14.4%	306,387	5.8%	190,928	3.6%	5,260,707
2025	4,475,686	76.7%	803,703	13.8%	356,852	6.1%	200,074	3.4%	5,836,314
2030	5,101,900	78.0%	825,514	12.6%	406,384	6.2%	205,008	3.1%	6,538,806
2035	5,745,454	79.6%	814,274	11.3%	450,137	6.2%	204,901	2.8%	7,214,766
2040	6,352,639	81.5%	760,518	9.8%	478,374	6.1%	203,012	2.6%	7,794,544
2045	6,777,855	83.1%	679,495	8.3%	498,160	6.1%	201,935	2.5%	8,157,444
2050	6,739,224	83.5%	629,827	7.8%	498,543	6.2%	201,079	2.5%	8,068,672
Female									
	Retirement		**Disability**		**Widow**		**Other**		**TOTAL**
2004	1,533,297	39.3%	250,745	6.4%	1,975,372	50.6%	146,504	3.8%	3,905,919
2005	1,541,643	39.0%	266,887	6.7%	1,997,209	50.5%	150,105	3.8%	3,955,844
2010	1,617,526	39.7%	304,694	7.5%	1,997,132	49.0%	159,606	3.9%	4,078,959
2015	1,760,105	41.5%	336,450	7.9%	1,981,484	46.8%	159,594	3.8%	4,237,633
2020	1,956,417	44.2%	368,334	8.3%	1,937,631	43.7%	166,672	3.8%	4,429,054
2025	2,274,319	47.7%	389,314	8.2%	1,928,991	40.5%	175,927	3.7%	4,768,550
2030	2,670,870	51.0%	397,982	7.6%	1,989,035	38.0%	180,028	3.4%	5,237,916
2035	3,060,227	53.5%	393,854	6.9%	2,083,270	36.4%	178,204	3.1%	5,715,554
2040	3,384,547	55.7%	370,142	6.1%	2,147,900	35.4%	173,483	2.9%	6,076,072
2045	3,613,834	57.0%	336,052	5.3%	2,217,713	35.5%	168,995	2.7%	6,336,594
2050	3,583,155	57.0%	314,753	5.0%	2,223,144	35.4%	165,546	2.6%	6,286,598

Source: Own elaboration.

Figure 5.2. Evolution of retirement pension coverage rate



Source: Own elaboration.
Note: The coverage rate is obtained as the number of pensions divided by the population aged 65 and more. The coverage rate can be over 100% due to the existence of retirement pensioners under 65 years.

5.2. Average pension benefit

The estimated evolution of the average pension benefit in real terms by gender and category, as well as the expected annual growth rates, are shown in Table 5.2.

The evolution of the average pension is differentiated for both pension category and gender (see Figure 5.3). The behaviour of the average pension for the new registrations and the proportion of new registrations with respect to yearly total pensions are of central salience in that evolution. This can be seen from [3.5]-[3.7], for the benefits accruing to common pensions and withdrawals are only indexed by the annual inflation rate (applicable to all pension categories and both sexes). On Figure 5.4, the number of new registrations in relation to total number of pensions by gender and category are presented for the base year (2004).

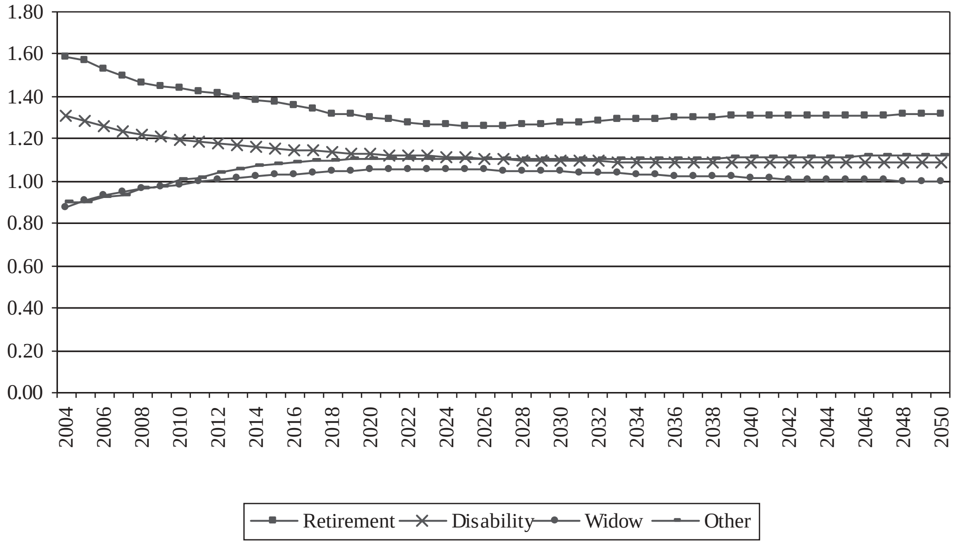
With respect to retirement, the average pension for men starts 1.6 times that of women. This gap would be reduced to 1.3 in 2050. The greater access of women into the labour market, along with the wage equality tendency, are the key factors explaining the breaching of the gap. Nevertheless, it is important to note that, although a clear tendency of convergence between men and women average retirement pensions can be observed until 2025, from that moment this trend is inverted and the gap starts to widen again (see Figure 5.5). Mainly, the explanation for this evolution lies in the fact that the proportion of new registrations with respect to total pensions each year is greater for men (see Figure 5.4). This is because women

Table 5.2
PROJECTED EVOLUTION OF THE AVERAGE PENSION BENEFIT AND ITS GROWTH RATE BY GENDER AND CLASS (AVERAGE ANNUAL GROWTH RATES)

	Both sexes							
	Retirement		Disability		Widow		Other	
2004	673		663		439		247	
2005	679	0.8%	679	2.4%	452	2.8%	259	4.7%
2010	751	2.0%	756	2.2%	506	2.3%	313	3.8%
2015	781	0.8%	824	1.7%	519	0.5%	395	4.8%
2020	847	1.6%	900	1.8%	540	0.8%	453	2.8%
2025	946	2.2%	980	1.7%	568	1.0%	496	1.8%
2030	1,053	2.2%	1,062	1.6%	595	0.9%	526	1.2%
2035	1,149	1.8%	1,149	1.6%	618	0.7%	548	0.8%
2040	1,267	2.0%	1,235	1.5%	640	0.7%	571	0.8%
2045	1,343	1.2%	1,323	1.4%	650	0.3%	600	1.0%
2050	1,379	0.5%	1,420	1.4%	658	0.2%	635	1.1%
	Male							
	Retirement		**Disability**		**Widow**		**Other**	
2004	768		715		390		232	
2005	771	0.5%	729	2.0%	413	5.6%	242	4.1%
2010	834	1.6%	798	1.8%	499	3.9%	315	5.4%
2015	857	0.5%	862	1.5%	532	1.3%	417	5.8%
2020	917	1.4%	935	1.6%	564	1.2%	487	3.2%
2025	1,017	2.1%	1,013	1.6%	594	1.0%	535	1.9%
2030	1,137	2.2%	1,093	1.5%	617	0.8%	569	1.2%
2035	1,248	1.9%	1,180	1.5%	633	0.5%	594	0.9%
2040	1,380	2.0%	1,269	1.5%	648	0.5%	622	0.9%
2045	1,463	1.2%	1,360	1.4%	654	0.2%	656	1.1%
2050	1,504	0.6%	1,460	1.4%	659	0.2%	696	1.2%
	Female							
	Retirement		**Disability**		**Widow**		**Other**	
2004	483		546		443		257	
2005	492	1.7%	569	4.0%	455	2.7%	270	4.9%
2010	578	3.3%	666	3.2%	506	2.2%	314	3.0%
2015	624	1.6%	746	2.3%	517	0.4%	387	4.3%
2020	705	2.5%	828	2.1%	537	0.8%	441	2.7%
2025	805	2.7%	912	1.9%	564	1.0%	483	1.8%
2030	893	2.1%	997	1.8%	591	1.0%	514	1.2%
2035	964	1.5%	1,083	1.7%	614	0.8%	537	0.9%
2040	1,057	1.9%	1,165	1.5%	638	0.8%	560	0.8%
2045	1,117	1.1%	1,247	1.4%	650	0.4%	587	1.0%
2050	1,143	0.5%	1,340	1.4%	658	0.3%	620	1.1%

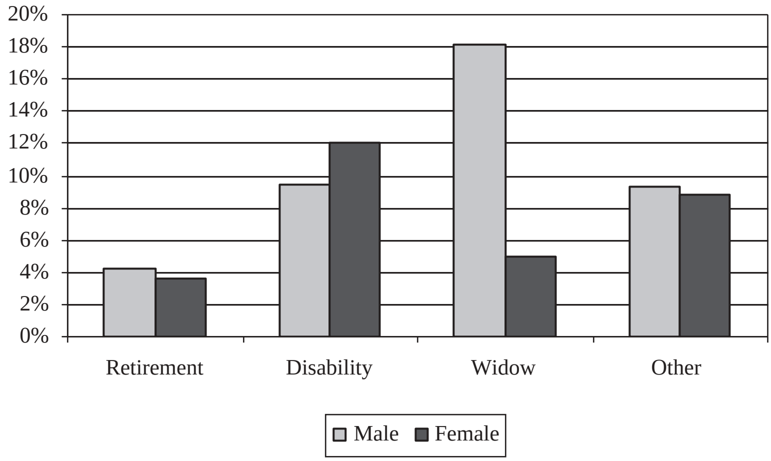
Source: Own elaboration.
Note: Figures are expressed in constant euros of 2004 per month without including extraordinary payments.

Figure 5.3. Evolution of the gender gap for average pension benefit by category



Source: Own elaboration.

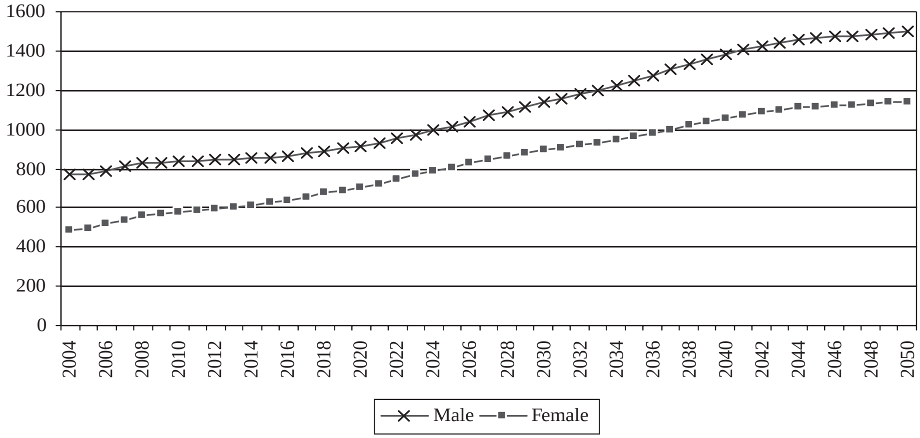
Figure 5.4. New registrations related to the total number of pensions by gender and category in 2004



Source: Own elaboration from MTAS (2005).

have higher life expectancy and consequently on average they collect pension benefits for more years than men. And, since the average pension benefit for the new registrations has less weight when computing the average pension benefit (see [3.6]), this makes the female

Figure 5.5. Evolution of average retirement benefit pension by gender.



Source: Own elaboration from MTAS (2005).
Note: Figures expressed in constant € of 2004 per month (without extraordinary payments).

retirement average pension benefit grow at a rate below that of their male counterpart. As is explained in subsection 3.1, this effect is temporarily counterbalanced to the extent that the model diminishes the gap between the average pension benefit of the new registrations for men and women as the participation rates of the macroeconomic scenario become closer. But even though the participation rates gap is breached substantially between 2004 and 2020, from that moment the closing rate is quite inferior. All this provokes a renewed increase of the total gap between sexes for all the beneficiaries, besides the fact that the gap for average pension benefits that correspond to the new registrations in the system remains unchanged.

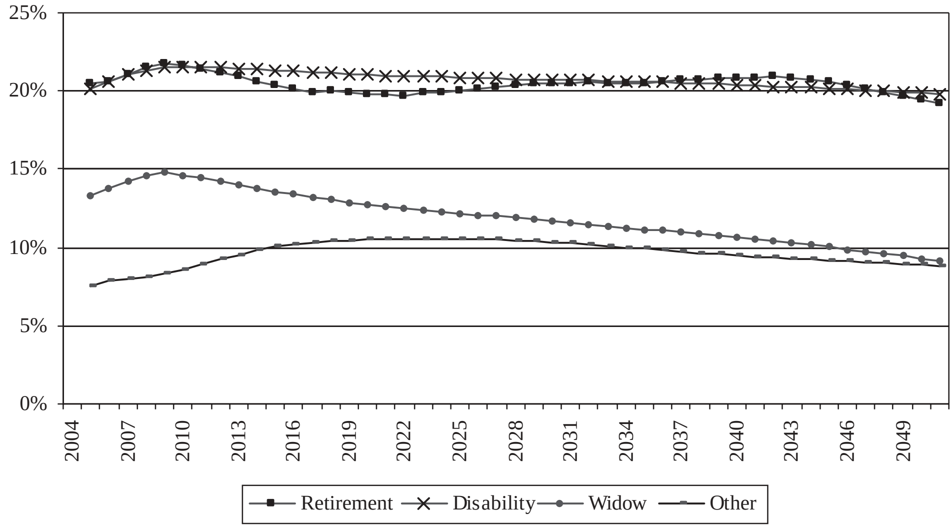
Concerning disability pensions, they are initially higher for men than for women, although the gap is less important than in the case of retirement benefits. As is shown in Figure 5.6, the temporal evolution depicts a clear trend toward reducing the gap in the average benefit by gender: in the base year male average pension benefit represented 1.3 that of their women counterpart, while in 2050 this proportion declines to 1.1. It is important to mention that just for disability pensions the women have initially a higher proportion of new registrations to total pensions than men. But that difference would decrease gradually and both proportions would become equal around 2030. This evolution of the proportion of new registrations is the key explanatory factor for the considerable decline of the gender gap in the average pensions until 2030. From that moment, this gap would tend remain constant (see Figure 5.3).

As for widowhood benefits, the ratio of new registrations to total pensions is quite higher for men than for women (se Figure 5.4). The main reason for this result is that total number of female pensions is superior to the male ones (in 2004 widowhood pension benefits accruing to men represented about 7% of the total). The expected evolution of labour market, with a considerable increase of women participation rates and employment, leads one to

Figure 5.6. Evolution of average disability benefit pension by gender

Source: Own elaboration.
Note: Figures expressed in constant € of 2004 per month (without extraordinary payments).

Figure 5.7. Evolution of average pension benefit as a percentage of the productivity ratio (GDP per worker)



Source: Own elaboration.

believe in a considerable increase of widower's pensions. As the projection results show, the latter's relative importance is superior to that of the former. Despite the fact that men average pension benefit is initially slightly inferior to that of women, because of their higher rates of new registrations, widowhood average pension benefit for the former grows at a faster rate than that of the latter during great part of the projection period. Something similar occurs to the rest of pensions accruing to survivors, where the ratio of new registrations is also inferior for men and tends to become more important during the projection period. So, even though initially the pension benefit is slightly superior for women, men pension benefits would surpass it around 2010 and keep that position during the remaining projection period.

An interesting result is obtained by comparing the evolution of the average pension benefit with respect to productivity ratio (GDP per worker). From Figure 5.7, one can deduct that no important fluctuations of the disability and retirement pension benefits are to be expected during the projection period. As to widowhood pension benefit, a slight increase is observed during the first years. This would start decreasing steadily afterwards to eventually reach, by 2050, an average pension benefit below 10% the average productivity versus the 15% maximum that it would reach in 2010. For the rest of the survivors' pensions an initial increase is also observed. This would continue until 2025 but would begin to decline after, yet at a lower rate than that observed for widowhood.

5.3. Total pension expenditure

The results for the projection of contributory pension's total expenditure for the spell 2004-2050 are shown in Table 5.3. Their evolution with respect to GDP can be captured in Figure 5.8. It is expected that total pension expenditure in real terms will increase significantly, at an average annual cumulative rate close to 3%. The important increase of the retirement pensions stands out. These grow at a 3.4% annual rate and, given their relative importance, they determine the evolution of total expenditure (they represent 66% at the beginning and are above 80% of total expenditure in 2050).

Table 5.3
EVOLUTION OF CONTRIBUTORY PENSION EXPENDITURE BY CATEGORY

	Retirement		Disability		Widow		Other		TOTAL
2004	42,546	66.2%	7,532	11.7%	13,125	20.4%	1,104	1.7%	64,307
2005	44,472	65.8%	8,199	12.1%	13,705	20.3%	1,178	1.7%	67,554
2010	52,414	65.8%	10,070	12.6%	15,631	19.6%	1,501	1.9%	79,617
2015	59,400	66.4%	11,863	13.3%	16,249	18.2%	1,898	2.1%	89,411
2020	70,732	67.9%	14,170	13.6%	16,956	16.3%	2,265	2.2%	104,124
2025	89,369	70.7%	16,364	12.9%	18,156	14.4%	2,604	2.1%	126,495
2030	114,581	73.7%	18,190	11.7%	19,925	12.8%	2,829	1.8%	155,527
2035	141,651	76.2%	19,426	10.5%	21,857	11.8%	2,935	1.6%	185,869
2040	172,763	79.0%	19,546	8.9%	23,483	10.7%	3,008	1.4%	218,800
2045	195,330	80.7%	18,809	7.8%	24,709	10.2%	3,112	1.3%	241,960
2050	199,223	80.9%	18,780	7.6%	25,068	10.2%	3,254	1.3%	246,320

Source: Own elaboration from MTAS (2005).
Note: Figures are expressed in millions of constant € of 2004, and as percentage of total.

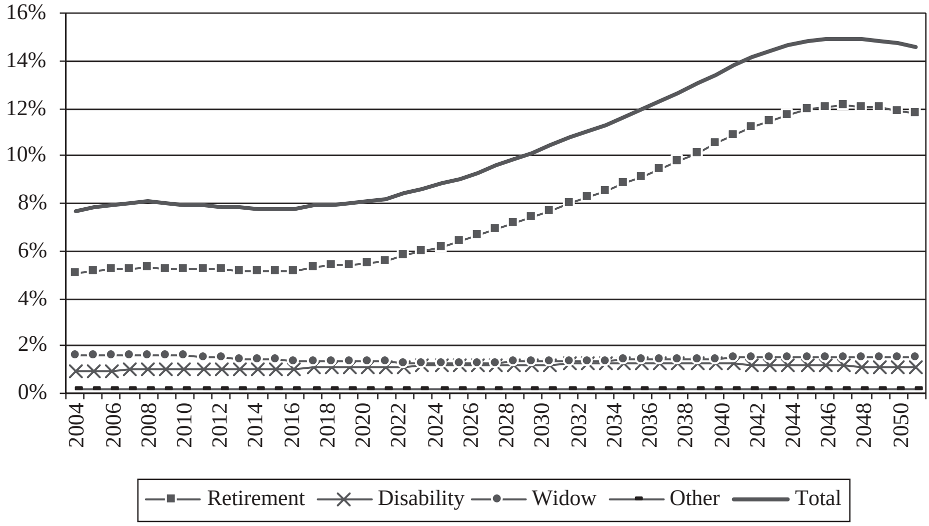
It is however important to mention that the evolution of expenditure is non lineal during the projection period. On the contrary, looking at the growth rate, different stages can be discerned. During the first part, approximately until 2020, the average annual cumulative rate of growth is about 3% and would intensify to reach 3.8% after that year. During the last part of the projection period, more or less from 2040, an inflection point can be observed in the variation rate, which would exhibit from that moment less significant values (some 1.2% between 2040 and 2050) or even becomes negative for some pension categories during specific periods.

Once again, the evolution of retirement pensions determines the trend of global expenditure. Until 2020 its growth is about 3.2% annually, compared with an average of 4.6% between 2020 and 2040. This is without doubt due to the baby-boomers retirement (this was shown in Figure 5.1). In the last years, it can be clearly observed that their decline starts to have an echo on the rate of growth of expenditure, which is reduced to 1.4% on average between 2040 and 2050 (this rate is only 0.5% in the last five years). In the case of disability pensions, expenditure grows significantly (around 4% annually) until 2020. From that moment the rate of growth slows down (around 1.6% between 2020 and 2040) and becomes negative by 2039 (only in the last two years a slight positive growth rate, inferior to 0.5%, is observed). The expenditure in survivor pensions to orphans and other family members exhibits an evolution similar to that of disability. Only in the first half of the projection period one can observe significant rates of growth, exhibiting on average some 4.6% annual cumulative rate between 2004 and 2020. After that period, the values are lower, although the variation rates are not negative. Finally, expenditure in widowhood benefits grows less rapidly than the rest of the categories. The average annual cumulative rate is 1.6% between 2004 and 2020 (to remain basically unchanged between 2020 and 2040), while it goes down to 0.7% in the last ten years.

With respect to GDP, the total expenditure in contributory pensions will remain basically constant until 2017 at a level about 8%, and will begin a sustained growth afterwards to reach a maximum value of about 15% of GDP around 2045 (Figure 5.8). This figure is quite substantial given that the baseline scenario incorporates a recovery of employment and female participation rates, which increase the denominator, the GDP.

The present results could be altered by the recent agreement on Social Security pushed by the Declaring for Social Dialogue (DSD)[20]. The current lack of micro data —and in some cases the absence of detailed legal developments— precludes at the moment a rigorous analysis of the potential effects of the agreement. Nevertheless, overall it is not expected to solve the difficulties of the Spanish pensions system[21]. As previous reform attempts in line with the Toledo agreement, this reform focuses on conflicting goals, namely consolidating the system and improving its sustainability. As a consequence, although most measures are attempted to reduce expenditure, inevitably some other are expected to increase it. But even the former can have ambiguous effects. First, reform measures aiming at reducing expenditure act reinforcing the relationship between contributions and benefits both in retirement pensions and disability pensions, implying a clear, though reduced, cut in pension entitlements[22]. Second, the effectiveness of measures addressed to prolong working life —both penalising early retirement and rewarding delayed retirement— might be reduced by the incentives associated with them.

Figure 5.8. Evolution of contributory pension expenditure as a percentage of GDP



Source: Own elaboration.

5.4. Comparison with previous results

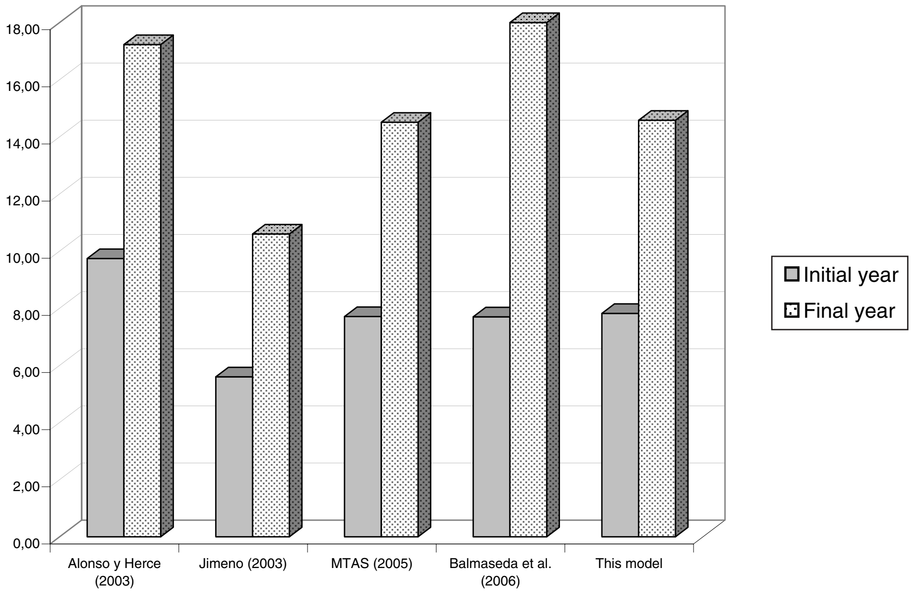
Our results can now be compared with those obtained by other authors or in official estimations. Figure 5.9 shows the ratio of pension expenditure to GDP for several recent studies. Besides initial scale differences —due to the type of pension considered—, some divergences on the projections remain, which might be explained by the set of assumptions or by the modelling strategy. In this subsection we compare results of recent studies. The focus will be on total retirement pensions because the rest of studies say little about the modelling strategy for the rest of categories or about the gender differences. In any case, the evolution of retirement expenditure is the main force governing the behaviour of total pension expenditure.

In fact, results may be sensitive to the assumptions underlying the demographic, macroeconomic and labour market scenarios. The following decomposition of the ratio of retirement pensions expenditure to GDP —the main expenditure category— may illustrate the sources of variation:

$$\frac{TE_t}{GDP_t} = D_t \cdot C_t \cdot R_t \cdot \frac{1}{PR_T \cdot ER_T} \qquad [5.1]$$

where D_t stands for the dependency rate, C_t for coverage ratio (defined as the number of pensions to population aged 65+), R_t is the replacement rate (defined as the average pension benefit divided by average labour productivity). The last term is the inverse of the product between employment rate (ER_t) and participation rate (PR_t). This decomposition allows iso-

Figure 5.9. Results of recent studies for the Spanish pensions system



Source: Own elaboration.
Note: Initial year 2005 and final year 2050, except for Jimeno (2003) —2001 and 2040— and Balmaseda *et al.* (2006) —2005 and 2045. Differences on the initial size of expenditure obey to pensions considered: only retirement pensions (Jimeno, 2006); the whole social security contributory system (MTAS, 2005; Balmaseda *et al.*, 2006 and this model); or also contributory pensions given by other public administrations (Alonso and Herce, 2003).

lating the pure ageing effect —the increase in the dependency ratio— from the other factors, in order to investigate different possibilities of reducing the strength of the increase in pension expenditure.

The full decomposition is not available for all the above mentioned studies but we can extract some tendencies. Our model captures movements in all those components. Besides the usual doubling of *D* (from 25 to 67%), there is an increase in *C* (from 64,1 to 68,9%) due to the rise in female participation rate.[23] With respect to employment and participation rates, as seen in Section 4, our scenario starts from a value of 61.2% and 68.6% to reach 68.6% and 76.8% at the end, respectively. Finally, the factors driving the change in R are a key issue. The mere projection of average entry pension using the legal formula coupled with the adjustment of the rest of pensions according to the inflation rate, imply a limited growth of the average pension benefit and hence a decline in *R*. Nevertheless, some other legal features of the system, like the possibility of an evolution of maximum and minimum pensions below or above inflation, should be taken into account. On the one hand, a constant ceiling on the maximum pension —a simple updating with inflation— entails an implicit decrease in average pensions in so far as there is an increase in the share of individuals reaching it. This seems to be the tendency in the Spanish system, as the maximum pension has decreased in real terms in the last two decades. On the other hand, given that the adjustment of non-entry pensions according to inflation implies a worsening of the relative position of those individuals receiving them, there have been discretional increases of minimum pensions above inflation. Overall, the combination of these observed tendencies implies in our calculations a slight decrease in the replacement rate from 20.5% to 19.2%.

Jimeno (2003) and Balmaseda *et al.* (2006) show a similar decomposition and derive scenarios based on different assumptions on the evolution of the four factors. In the former, the increase from 5.6% to 10.6% in the ratio of retirement pension expenditure to GDP is mainly explained by a pure ageing effect (i.e., associated with the change in *D*) to the extent that both *C* and *R* are kept constant while there is a slight increase in *ER*. In our case a similar total increase is obtained but with an increase in *C* and a decrease in *R* which offset each other. On the later the ratio of contributory pensions expenditure to GDP increases from 7.7% to 18%[24]. The higher value of total expenditure in retirement pensions is mainly due to an increase in *R* from 18% to 22%[25].

MTAS's (2005) results are similar to those reported in this paper, in spite of keeping *R* almost constant and increasing *C* by a 4%. Finally, if we abstract from the different scale, Alonso and Herce (2003), obtain a similar increase in pension expenditure, though the decomposition in the four factors is not apparent[26].

In the next Section alternative scenarios are presented. In order to evaluate the change in sustainability with respect to the baseline case, we employ a synthetic indicator commonly used in generational accounting. This indicator (which we will call *sustainability indicator SI*) which summarizes in a single figure the sustainability of the system, measures the present value of the expenditure as a fraction of the present value of GDP for the whole projection period (see Abío et al. 2005). The value of this indicator can be interpreted as the percentage of GDP that, on average and during the period of projection, has to be allocated to the payment of contributory pensions on an annual basis. If we denote the discount rate *d*, the *SI* may be defined as follows:

$$SI = \frac{\sum_{t=1}^{n} \frac{TE_t}{(1+d)^t}}{\sum_{t=1}^{n} \frac{GDP_t}{(1+d)^t}} \qquad [5.2]$$

where *TE* is total expenditure, *n* is the final projection period (2050), and *t* represents the year ($t = 1,\ldots,N$). The comparison of the *SI* with the ratio of expected Social Security revenues to GDP allows studying how sustainable is the pay-as-you-go system. In Table 5.4, the value of *the SI* of the base scenario projection for two different discount rates (3% and 5%) is provided.

Table 5.4
BASELINE RESULTS FOR THE *SI* PARAMETER

	Retirement	Disability	Widow	Other Survivors	TOTAL
d = 3%	7.896	1.133	1.430	0.178	10.638
d = 5%	7.284	1.114	1.434	0.174	10.005

Source: Own elaboration.

Insofar as the discount rate reflects the decline of the value of flows throughout time, the higher this is the lower the weight given to future flows. This entails that a scenario for which the projection of future expenditure is characterized by sharp increments will have a value of *the SI* that decreases as the discount rate increases. This applies to all pension categories but widowhood benefits. The reason is the low projected growth for this specific category, which is substantially less than that for the other categories.

As can be observed, the expenditure in retirement pensions would require, according to the simulations, an annual average collection for its complete funding of 7.9% of GDP (for *d* = 3%) or of 7.3% of GDP (for *d* = 5%), while in fact the effort currently exerted is significantly less, some 5.1% of GDP. If we add the remaining expenditure categories, the need for funding of the contributory pension system would on average be more than 10% of GDP during the projection period (while it is currently 7.7% of GDP). Additionally, this indicator also proves to be very useful when comparing the results of the different sensitivity analyses proposed.

6. Sensitivity analysis

With the purpose of studying how sensitive are the results of the base projection scenario to changes in some of the key demographic and macroeconomic variables, five scenarios of sensitivity analysis are provided. Firstly, a projection using two alternative hypotheses on productivity growth (higher and lower than that in the base scenario) is implemented. Secondly, in order to test the migration effects on the evolution of total expenditure, projections under two alternative demographic scenarios are carried out. The first of them is associated with a zero migration hypothesis. In the second one, the alternative hypothesis of migration flows proposed by the INE is considered. Finally, we propose the projection under a scenario of greater labour market participation and employment of individuals older than 55 years.

6.1. Productivity growth

The hypothesis on productivity used in the base scenario (see Figure 4.3) assumed a steadily increasing evolution until 2012 where it would reach annual growth values superior to 2% to later stabilize around 1.7%. In this exercise the sensitivity of the projection results to two alternative productivity growth hypotheses is analysed. Under the high productivity hypothesis, the maximum value would reach a 2.4% rate to stabilize around 2%. Under the low productivity hypothesis, the maximum value would be below 2% and remain stable below 1.5%.

Changing the productivity hypothesis affects the evolution of expenditure just for the average pension benefit. More specifically, it affects the evolution of the average pension benefit of the new registrations but leaves invariable the number of pensions. Figure 6.1 presents the evolution of the ratio of total expenditure to GDP under the two alternative hypotheses. The effects of a higher or a lower evolution of productivity cannot be judged until after 2020, which is the necessary delay for the productivity changes to be reflected in the regulating bases for the new pensioners entering the system. As can be observed from the synthetic indicator *SI* in Table 6.2, the effects of the changes in productivity are mirrored particularly in the retirement pension expenditure, whereas these effects are a lot less significant for disability and survivors' benefits.

6.2. Migration hypothesis

The effects of the migration hypothesis are firstly analysed by projecting the model under the alternative scenario of zero migration. The effects of migration on pension expenditure would be produced both on the number of pensioners and the average pension benefit alike. But, as can be observed in Figure 6.1 and Table 6.1, which give the evolution of the expenditure and the results for the *SI* respectively, these effects are quite limited, probably due to the low number of immigrants assumed.

Secondly, the effects of migration levels higher than those considered by EUROSTAT are evaluated using the alternative demographic scenario elaborated by the INE. As discussed in Section 4, the INE assumes a net migration flow above 250.000 per year, while the baseline scenario posits a level of 100.000 per year at the end of this decade. In this case, deviation of expenditure from baseline is much more important, as shown in Table 6.1. Overall, this suggests that simulation results can be very sensitive to the migration hypothesis as it usually happens in a defined benefit pensions system like the Spanish one.

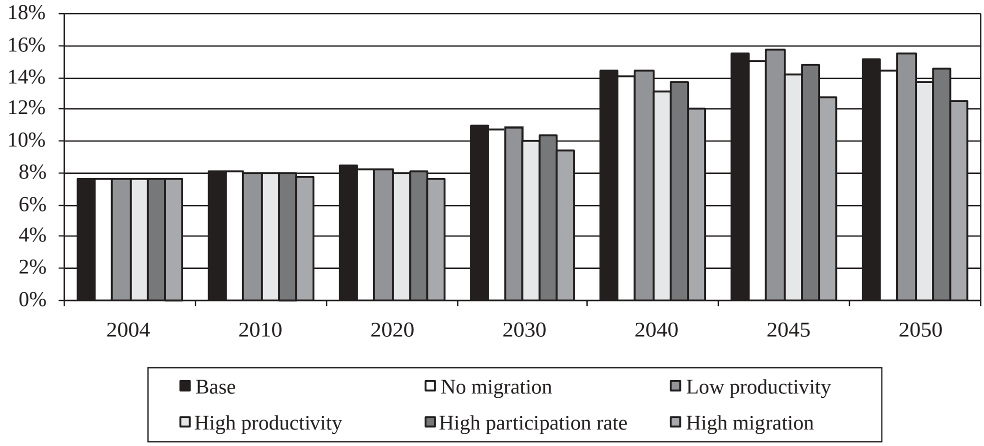
Nevertheless, note that we are only capturing the positive effects of migration. Those occur in the short and medium term, as it increases workers and hence GDP. In the long term it will also increase the pension needs though the time period considered in this study can hardly capture this effect. Although some of the current immigrants might retire before the

Table 6.1
SENSITIVITY ANALYSIS (*SI* VALUES)

	Retirement	Disability	Widow	Other Survivors	TOTAL
Base	7.896	1.133	1.430	0.178	10.638
Low productivity	8.110	1.153	1.475	0.181	10.920
High productivity	7.677	1.113	1.385	0.175	10.350
No migration	7.925	1.114	1.430	0.178	10.647
High migration	7.321	1.079	1.314	0.174	9.888
High participation (over 55 years)	7.843	1.125	1.434	0.177	10.578

Note: The results are obtained assuming a 3% discount rate.
Source: Own elaboration.

Figure 6.1. Pension spending as a percentage of GDP under alternative scenarios



Source: Own elaboration.

end of the projection period —2050— the positive effect on GDP of the 250.000 annual immigrants still pushes the ratio expenditure to GDP far below the baseline scenario as shown in Figure 6.1. Furthermore, due to a discounting effect, the *SI* strengths the weight of the positive effect in the near future while it reduces the long term negative effect.

6.3. Greater labour market participation and higher employment of workers older than 55 years

An experiment considering a possible increase in the labour market participation and higher employment of the workers older than 55 years is proposed. In particular, the baseline scenario assumes an increase to 63.9% at 2050 from initial 44.4% in the participation rate of older workers, while in this sensitivity test we will suppose a higher growth reaching 69.0% at the end of period. This way we try to mirror one of the possible effects of increasing working life due to a higher life expectancy along with the impact of a greater quality of life, which would make the expansion of the effective working time viable. Although the retirement age in Spain is 65 years, it is in this respect important to mention that the effective retirement age is on average 62. As shown in Figure 6.1 however, the effect of this hypothesis on expenditure is also quite limited since it hardly alters the course of the events described in the base scenario.

To some extent, this scenario gives account of the positive effects of delayed retirement as long as the model links the path of entry pensions to the evolution of the participation rate. The increase in participation increases employment and hence GDP, while it decreases expenditure by delaying some entry pensions. Nevertheless, the fact that the simulated change is only noticeable from 2030 on —and hence further reduced by discounting— explains the surprisingly limited effect. In any case, a thorough account of this event requires taking into account the behavioural responses of agents and the negative effect on sustainability of the legal incentives that should be enacted in order to achieve a delayed retirement age.

7. Conclusions

The need for long-term fiscal projections is self-evident. Of these projections, pension expenditures are one of the most important because firstly they represent a large share of total expenditure, and secondly because of the close relationship between this variable and demographic change. In this paper, after a state of the arts exposé, we develop a model to project contributory pensions expenditures if the Spain Social Security System until 2050. For that purpose we used the last demographic and macroeconomic scenarios developed by Eurostat (2005). The model starts with a decomposition of total expenditure as a product of the number of pensions and the average pension benefit. Later, we undertake a disaggregation by pension category, contribution regime to Social Security, gender, and age cohort.

Among the results obtained, one is of central importance: a substantial increase in total expenditure for contributory pensions is to be expected. This would reach some 15% of GDP around 2050 compared to a barely 8% in 2004. However, three stages are to be differentiated in change. Thus, from 2004 until 2018-2020 approximately, total expenditure as a percentage of GDP would remain basically unchanged, but afterwards we would observe a steady increase until it reaches maximum values around 2045. From that year a gradual downward tendency would set in. Taking into account the fact that important changes in the ratio of average pension benefit to GDP per worker are not foreseen during the projection period, the increase in expenditure would mainly be attributed to the growth of the number of beneficiaries. In fact, the results show clearly that by 2050 the number of pensions would be more than 14 million, compared to barely 8 million in 2004. This important increase is due principally to the expected demographic evolution by age cohorts (in 2050 more than 35% of the population would be 65 years old or more, compared to 16.8% in 2004).

By pension categories, as the projection results show, the evolution of total expenditure is driven by the evolution of retirement pensions. For instance, the coverage rate of retirement pensions (the ratio of the number of pensions to the population 65 years old or more) would increase by more than five percentage points during the projection period and would be around 70% in 2050. Although an increase in the number of beneficiaries for the rest of the pension categories is also expected, this increase, in each and every case, is not important enough so as to make them gain more importance with respect to total expenditure. Retirement pensions in turn gain weight since they would represent almost 72% of total number of pension benefits in 2050, against 58.6% in 2004. Consequently, the expenditure in retirement pensions would be almost 81% of total contributory pensions in 2050, against 66% originally. Meanwhile, total expenditure in all the other categories of pensions would lose weight.

Interesting conclusions are also reached from the analysis of the results by gender. We are referring to both the number of pensions and the average pension benefit. For instance, concerning the total number of pensions (including all categories), contrary to what one would expect, the projection shows a greater increase of the men pensions. Being basically equal at the beginning (with 4 million pensions for both male and female), the number of benefits allocated to male pensions would be 8 million against 6 million for women in 2050. If we look at each pension type we can see that the initial female retirement pensions, which represented only one third of the total, would grow more than male pensions, yielding an average annual growth rate of 1.86% versus 1.71%, due to the increase in female participation. Nevertheless as an indirect effect of this trend, it is expected that widower's pensions grow relatively more (an average annual growth rate of 2.5% is estimated for the number of men pensions, compared to a barely 0.3% for widow's pensions). Consequently, the absolute increases that are observed in the number of female beneficiaries in all the pension categories would not suffice to inhibit a relative increase of the male pensions. The future entitlement conditions of widowhood benefits will probably change this result as a consequence of one of the purposes of the DSD —i.e., those benefits stay as a subsidiary income— but the projection model needs to stick to constant legislation assumption.

As far as the size of pension benefits is concerned, the model projects important changes in the original differences that exist in the various pension categories by gender. For the widowhood benefits and the rest of pensions to survivors, the gender gap (the difference between the average widow's pension and the average widower's pension) is initially favourable to female, whose average pension starts at a level that is 10% superior to that of men. Nonetheless, that gap would disappear before 2012. From that moment average pension benefits by gender would remain very similar, and even the men pensions would be slightly above. This is mainly attributable to the greater proportion of new registrations of men with respect to total number of pensions. This brings the size of the pension benefit closer to the growth of the contributory bases. For retirement pensions however, the average benefit allocated to men starts by being 60% more than that allocated to women, but at the end of the projection the excess is only 30%. The greater labour market participation of women along with the tendency to wage equality would not be sufficient to bring the size of the benefits by gender closer. The proportion of new registrations to total retirement pension beneficiaries is superior for men (due basically to higher life expectancy of women which keeps them longer time in the system), which, despite a hypothetical equality in the contributory bases, provokes a greater increase of the size of average benefits to men.

The ratio of the present value of the flows of total pension expenditure to the present value of GDP is frequently used as an indicator to assess the sustainability of public finances. This index is very useful as a synthetic indicator of sustainability (*SI*) as well as to capture variations among the different sensitivity scenarios. In our base scenario (and for discount rates between 3% and 5%), the model forecasts a value for *SI* superior to 10%.

Regarding the sensitivity analysis, in this paper we have considered how the simulation results vary under changes in: (1) productivity growth, (2) migration, and (3) the labour market participation of individuals of age 55 and older. With respect to (1), a greater or lower productivity growth rate hardly has any influence on the results until after 2020. This is due to the fact that the increases in the contributory bases require some time before they have any effect on the new registrations pensions. Assuming a 3% discount rate, a greater (lesser) productivity growth rate reduces (increases) the value of the *SI* from 10.6 to 10.3% (10.9). Regarding (2), consideration of high migration flows reduces the baseline results in a sizeable way. In fact, migration flow is the variable that has the greatest impact on the projection results given the current design of the benefit formula on a defined benefit bases. Finally, an alternative scenario considering a greater participation for older workers (over age 55) has been carried out to evaluate the effects of prolonging working life.

The availability of long-term fiscal projections is a necessary condition for the introduction of reforms in the areas of public action. On the contrary, the lack of these projections can allow necessary reforms to be avoided or deferred. This paper tries to palliate the need to have long-term projections specifically for contributory pension expenditure, which is in absolute term one of the most important rubric of public expenditure in welfare.

Notes

1. See EPC (2006) for the last report.

2. As Baekgaard (2002) points out, without interactions with some sort of macro model, most non behavioural microsimulation models can simply be regarded as huge and very complicated accounting models.

3. For instance, Rojas (2005) includes income inequality as a source of heterogeneity while Jimeno (2003) considers heterogeneity through the simulation of working careers.

4. There is also a residual scheme under extinction, called SOVI, consisting of old-age and disability pension benefits.

5. It is worth noting first that contributory bases for the 24 months immediately prior to the date of retirement are taken by their nominal value, while the rest are updated according to the evolution of the CPI; second worker's contributory bases are bounded every year by virtue of the General Budget Act. For instance, in the General Regime these bases are subject to a minimum and maximum limit depending on the professional category of the worker. However, there is just one upper and lower limit in the Special Self-Employed Regime and Agrarian Regime (for self-employed workers). In case of the Domestic Employees and the Agrarian (salaried workers) Regimes contributory bases are fixed. Second that the 15 years correspond to 4.700 effective days instead of 5.475 because extraordinary payment days are computed (This is one of the changes introduced by the DSD as seen later)

6. The requirements are: i) retirement from age 61; ii) a minimum effective contribution period of 30 years (at least 2 years must be within the last 15 years of the working career); iii) to be registered as a job seeker and iv) a job termination not been caused by reasons of the worker's free will.

7. The following three requirements, must be simultaneously met: b.1) if the widow has dependent relatives and simultaneously the annual family income per capita does not exceed 75% of the minimum wage; b.2) this pension is the sole or primary source of income for the beneficiary; b.3) the pensioner's annual income from all sources can not exceed a certain limit.

8. If the deceased was under partial retirement, the RB corresponding to the period of part-time work will be taken into account, increased up to 100% of the amount that would have applied if the worker had been employed full-time during that period.

9. In particular: a) remarriage, b) having been found guilty, in a final sentence, of originator's death, c) when it is proven that the worker who disappeared in an accident did not die and d) conviction with a final sentence, of committing a felony of aggravated homicide in any of its forms, or injuries, when the victim was the spouse or ex-spouse, except when, where appropriate, they had been reconciled.

10. Following Blanco, A., Montes, J., and Antón, V. (2001a and 2001b).

11. For that we have to assume that no withdrawal occurs among the new registrations, since data for a precise measurement are not available. Any error margin in the estimates can be construed as negligible, for the percentage of withdrawals from the new registrations of the same period is less than 1%. Moreover, we confine this assumption to computing the number of common pensions each year. So, its use is not extended to the whole projection model.

12. As noted in Section 2, the past contributory bases are updated from the third year on.

13. Notice that, contrary to the computation of the common pensions, it is not necessary to assume that there exist no withdrawals among the new registrations.

14. In practice, as noted in Section 2, total permanent disability can be of two types depending on the percentage to be applied to RB to obtain the pension benefit. So, the three initial degrees are transformed in four in the projection exercise.

15. Disaggregated information is not available, so we had to have recourse to an imputation procedure. For instance, to disaggregate according to the cause of the disability we used the INE 'Encuesta Sobre Discapacidades, Deficiencias y Estados de Salud' (1999) to obtain a proportion by gender and age cohort of the disabilities caused by common disease and non-workplace accident.

16. However, it is important to mention that substantial differences exist between contribution regimes to Social Security (Agrarian, Sea and Charcoal have the highest disability rates) and also by age cohorts (the rates are higher as the age comes close to retirement).

17. The computation is done for the period 1999-2003, using for each age cohort the mean value throughout the period.

18. Since the absolute permanent disability can give place to two different percentages to be applicable to the *RB* (55% on general basis, and 75% when the beneficiary accomplish 55 years and is not working), the three possible degrees of disability considered are converted into four when estimating the average pension benefit.

19. As explained in Section 2, this percentage goes up to 72% whenever some special requirements are met

20. *Proyecto de Ley de Medidas en Materia de Seguridad Social* approved by the government on the 13th of February 2007. This reform was pushed by the declaration for social dialogue (DSD) —*Declaración para el Diálogo Social* — subscribed first on July 2004 by the government, unions and employer's organizations.

21. The availability of micro data set in Spain is improving. In particular, the Social Security Administration has recently elaborated a micro database from its administrative records. This database can be very useful in the near future, once adapted to research needs. As an example, the number of contribution years, which becomes crucial in the evaluation of the main cutting expenditure proposals for reform, is not currently collected for disability pensions and has many missing values in the case of retirement pensions.

22. In particular in retirement pensions the minimum contribution period is increased to effective 15 years, 5,475 days, instead of the current 4,700 days. In the case of disability benefits, there are several measures: First, a new minimum period of contribution is established for those aged less than 31. Second, a modification is introduced in the calculation of pension benefit originated by common disease that reinforces the link between contributions and benefits. In this case, before applying to the RB the percentage associated with the disability degree, and additional percentage is introduced, which —analogously to the retirement pensions— depends on the number of contributed years. Finally, with regard to complete disability pensions, a change in the calculus of the complement to pay for the assistance is proposed. Instead of the present 50% additional to the 100% of the RB, this complement is the sum of two components: a) the 25% of the RB and b) the 50% of the

prevailing minimum contributory base. It is worth noting that the later can increase expenditure, in some contribution regimes.

23. Note that the increase in female participation has two opposite effects. On the one hand it increases *C*, worsening sustainability and, on the other hand, it increases employment improving it. Furthermore the closing of the gender pension gap modelled may push up female future pension benefits but not necessarily the replacement rate.

24. Recall that the reference year is 2045 in this case.

25. Jimeno (2003) also derives a similar alternative scenario. In fact the two studies take quite different approaches. Jimeno (2003) uses hypothetic heterogeneous working careers in order to investigate the effect of those differences in inequality, while Balmaseda *et al* (2006) make discretionary adjustments in the ratio average pension to average productivity, in order to investigate the effect of those changes in pension expenditure.

26. Studies based on previous years usually give a higher value of expenditure to GDP mostly due to the recent improvement in employment, the huge entry on immigrants and the recent change in GDP calculations. See also Abío et al. (2005), which estimate the sustainability of pensions system together with the whole Spanish budget using generational accounting.

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Resumen

La necesidad de realizar proyecciones fiscales a largo plazo es evidente y se acentúa en el caso del gasto en pensiones. En primer lugar porque éste representa una parte importante del gasto total, y en segundo lugar, debido a su fuerte dependencia del envejecimiento demográfico. En este artículo elaboramos un modelo para proyectar el gasto en pensiones contributivas del sistema de Seguridad Social español, desagregando los resultados por tipo de pensión, sexo y régimen de cotización.

Entre los resultados obtenidos el más destacable es el aumento esperado del gasto total en pensiones contributivas. Éste rondará el 15% del PIB hacia 2045, partiendo de un valor inicial cercano al 8%, a pesar de que el escenario de referencia incorpora una recuperación sustancial del empleo y de la participación laboral femenina. Por tipo de pensión, las pensiones de jubilación son las que determinan la pauta de evolución del gasto total. Del análisis por sexos se obtienen también conclusiones interesantes. Por ejemplo, incluso teniendo en cuenta el aumento en pensiones de jubilación de las mujeres con motivo de su mayor participación laboral, el aumento correspondiente de las pensiones de viudedad de los hombres acaba produciendo un aumento mayor del número total de pensiones recibidas por hombres.

Palabras clave: Sistema de pensiones, sostenibilidad, gasto público.

Clasificación JEL: E62, H55.

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