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The Impact of Spanish Pension Reform on Expenditure: a Quick Estimate

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The impact of Spanish pension reform on expenditure: A quick estimate*

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Abstract

In this paper we present a preliminary estimate of the impact of the recent agreement between the Spanish government and the social partners to reform the public contributive pension system. After updating the projections of pension expenditure constructed in de la Fuente and Doménech (2010) for the period 2008-60, we analyze the impact on this variable of raising the retirement age from 65 to 67 years, extending from 15 to 25 years the period over which wages are averaged to calculate the starting pension and increasing from 35 to 37 the number of contribution years required to obtain a "full pension." Conditional on a series of assumptions about the evolution of employment, productivity and demographics, our estimates suggest that these measures will reduce pension expenditure by up to two percentage points of GDP once the reforms have been fully implemented in 2027. On the other hand, the existing uncertainty about the future evolution of the relevant variables suggests that it would be desirable to bring forward in time the introduction of the periodic evaluation of the system (the so-called *sustainability factor*) so as to have in place a mechanism that can be used to modulate the rhythm and scope of the reform if the system's financial situation requires it before the end of the transitional period.

Keywords: pension reform, Spain, retirement age
JEL Classification: H55, J11

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1. Introduction

This paper presents a preliminary estimate of the impact of the pension reform agreement signed in January 2011 by the Spanish Government and the social partners. Our starting point is the estimate of expenditure in the absence of reforms presented in de la Fuente and Doménech (2010) for the 2008-2060 period, which in turn relies on Eurostat's recent population projections for Spain. After making some adjustments to these projections in light of the recent experience, we analyze the impact on expected pension expenditure of the three main measures included in the agreement: raising the retirement age from 65 to 67 years, extending from 15 to 25 years the period over which wages are averaged to calculate the starting pension (the "pension calculation period") and increasing from 35 to 37 the number of years of social contributions that are required to be entitled to a "full pension" (i.e. to 100% of the so-called regulatory base of the pension).

The rest of the paper is divided into four sections and an appendix. Section 2 outlines the methodology that will be used to project pension expenditure in coming decades. Section 3 presents the baseline scenario – in which the present system remains unchanged – and section 4 quantifies the effects of the proposed reforms. Section 5 concludes with a brief summary of the implications of the analysis and some recommendations derived from them. Finally, the appendix reviews the evolution of the pension system's revenues and expenditures over the last three decades.

2. Methodology

Our projections of spending on contributory pensions are constructed by combining two instruments. The first one is a decomposition of this variable into a series of factors that reflect, respectively, how pension expenditure is influenced by demographic factors, the evolution of employment and the *generosity* of the system, as measured by the ratio between the average pension and average output per employed worker. Modelling the evolution of the first two factors is, in principle, a simple exercise. If we take as a given the population projections elaborated by the INE or Eurostat, we only need to make a reasonable assumption on the evolution of employment to project the trend of the ratio between employed and retired persons, which is about half the story we want to tell.

The other half is related to the evolution of the "generosity" ratio of the public pension system and poses more difficult problems, partly because the evolution of this indicator is not independent from that of employment (through the average number of contribution years of the stock of pensioners) and partly because its value depends in a complex manner on a series of parameters that summarise the procedure used to calculate each individual's pension on the basis of his contribution record (including, for instance, the number of years over which wages are averaged to calculate the pension's *regulatory base*). The second of these instruments will help us tackle this issue. It is a highly simplified model of aggregate pension expenditure that can be used to calculate the steady-state value towards which the generosity ratio of the system can be expected to converge in the long term, in the absence of any policy changes and under the assumption of constant rates of growth of productivity and employment. The short- and medium-term dynamics of the generosity ratio will be modelled as a process of gradual convergence towards the steady state described by the model.

2.1. The components of pension expenditure

To analyze the dynamics of pension expenditure as a fraction of GDP, it is useful to start by writing this indicator as the product of three factors that reflect, respectively, the influence of demography and employment and the unit cost or generosity of the pension system.[1]

Let *PEXP* be total expenditure on pensions. The quotient between this magnitude and GDP can be expressed as follows

$$(1)\ \frac{PEXP}{GDP} = \frac{NPENS}{L}\frac{\frac{PEXP}{NPENS}}{\frac{GDP}{L}} = \frac{NPENS}{L}\frac{AVPENS}{Q} = NPENSPW * GENQ$$

where *NPENS* is the number of pensions currently payable and *L* is total employment. Hence, the fraction of GDP that is spent on pensions is equal to the number of pensions per employed worker *(NPENSPW)* multiplied by an indicator *(GENQ)* of the generosity of the average pension as measured by the ratio between this variable *(AVPENS)* and average labor productivity *(Q)*. It is useful to rewrite the first term of the decomposition as follows:

$$(2)\ NPENSPW = \frac{NPENS}{L} = \frac{NPENS}{NRET}\frac{NRET}{NWA}\frac{NWA}{L} = COV * DEP * EMP$$

where *NRET* and *NWA* denote, respectively, the population that has reached the age of retirement – currently 65 years – and the working-age population, which we will identify for now as that between the ages of 18 and 64. Hence, the number of pensioners per employed worker can be expressed as the product of three factors: the rate of pension coverage (*COV* = number of pensions per person of retirement age), the old-age dependency rate (*DEP* = number of potential pensioners per working age person) and the inverse of the employment rate of the working-age population *(EMP)*. Combining (1) and (2), we end up with:

$$(3)\ \frac{PEXP}{GDP} = DEP * EMP * COV * GENQ$$

[1] This type of breakdown has been used frequently in the literature. See, among others, Jimeno, Rojas and Puente (2008) and Doménech and Melguizo (2008).

2.2. A simple model of pension expenditure

De la Fuente (2011) develops a simple accounting model of aggregate pension expenditure in an economy with exogenous wages and employment. The model uses highly simplified assumptions, including non-stochastic lifespans and constant rates of growth of employment and productivity, ignores the heterogeneity of agents and the endogeneity of decisions to enter or exit the labor market and does not take into account some important features of the Spanish system, including the existence of caps and floors on contributory bases and pension amounts. Hence, the model is highly simplified and excludes significant aspects of the complex Spanish system, but it can nevertheless be used to approximate the effects of the main determinants of pension expenditure. This makes it a rather useful complement of the decomposition described in the previous section, among other things because it imposes a certain discipline on projections of the evolution of the generosity of the system (the ratio between the average pension and average productivity), which is the component of pension spending that is hardest to model directly.

The model assumes that the pension calculation period *(N)*, the average number of contribution years of the representative pensioner *(C)* and the period during which retirement and survivors' benefits are collected (X and $X2$) are equal for all agents in each cohort and remain constant over time.[2] It also assumes constant rates of growth for employment *(n)* and average wages *(g)*, an experience premium that grows exponentially with time (also at a constant rate v) and a constant rate of social contribution (τ). For given values for these parameters and applying current Spanish regulations, the model can be used to compute the ratio between the average pension and the average salary, the internal rate of return (IRR) of the contributory pension system, the system's total revenues and expenditure and, hence, its financial balance, the average inicial replacement rate (defined as the ratio between the initial pension and the wage at retirement) and the sustainable value of this ratio.

For the purposes of the exercise in this paper, the result of greatest interest is the one that describes the relation between the system's generosity and its parameters. In particular, the ratio between the average pension (considering both retirement and survivors benefits) and the aggregate average salary is given by

$$(4)\ GENW \equiv \frac{\overline{P}}{\overline{W}} = \phi(C)b(N)e^{vC}\frac{n-v}{g+n}\frac{1-e^{-nC}}{1-e^{-(n-v)C}}\frac{1-(1-\pi\phi_v)e^{-(g+n)X}-\pi\phi_v e^{-(g+n)(X+X2)}}{1-(1-\pi)e^{-nX}-\pi e^{-n(X+X2)}}$$

where

$$(5)\ b(N) = \frac{1-e^{-(g+v)N}}{(g+v)N}$$

is the regulatory base (expressed as a fraction of the wage at the time of retirement) and $\phi(C)$, the percentage of the regulatory base that will be paid as pension to a retiree who has contributed to the system during C years. In what follows, we will assume that the share of

[2] This condition will be met if life expectancy and the ages of retirement and entry into the labor market remain constant over time or rise at the same pace.

labor in GDP (α_L) remains constant. This implies that the steady-state value $\overline{GENQ}$ of the generosity indicator that appears in the decompostion given in the previous section (the average pension as a fraction of average output per worker) will be a constant fraction of the ratio given in (4), that is:

$$(6)\ \overline{GENQ} = \frac{\overline{P}}{Q} = \frac{\overline{P}}{\frac{\alpha_L Q}{\alpha_L}} = \alpha_L \frac{\overline{P}}{\overline{W}} = \alpha_L \overline{GENW}$$

Parameterising the model

When using the model in combination with our demographic and employment scenarios, we must bear in mind that this is essentially a steady state model that cannot reflect the transitional dynamics induced by changes in parameter values and can only capture their long-term effects. Consequently, we will set the values of the model's parameters taking as a reference the average values of the relevant variables that have been observed during (or are foreseen for) each period of interest. In particular, we will work with two different periods: the years between 1981 and 2007, which we will use as a reference to set certain parameter values, and the period between 2010 and 2060, for which we will construct spending projections with and without taking into account the reforms contemplated in the recent agreement.

Table 1: Parameterization of the model in different scenarios

	[1]	*[2]*	*[3]*
	1980-2007	*2010-60 no changes*	*2010-60 with reform*
Growth of labor productivity (g)	1.13%	1.13%	1.13%
Total employment growth (n)	1.90%	0.24%	0.28%
Experience premium (v)	1.28%	1.28%	1.28%
Average employment rate (working-age pop.)	56.03%	68.23%	66.49%
Average years of contribution (C)	26.34	32.07	32.58
Life expectancy			
For the entire population	76.66	85.9	85.9
Male	73.37	83.5	83.5
Female	79.93	88.3	88.3
X = collection period of retirement pension	11.66	20.90	18.90
X2 = additional years of survivors' benefit	6.02	5.15	5.15
Retirement age	65	65	67

Table 1 summarizes the relevant data. For 1980-2007, g and n are set equal to the average rates of growth of output per (full-time equivalent) employed worker and of total employment according to the National Accounts (INE, 2011a). The two rates are calculated by regressing the logarithm of the corresponding variable on a linear trend. Regarding labor productivity, our assumption for 2010-2060 is that the average growth rate observed in 1980-2007 will remain constant in the future. In the case of employment, the value of n for the period 2010-2060 under each scenario s – with or without reform – is set equal to the expected growth rate of employment during the period according to the employment projections discussed later on. This variable is calculated directly, rather than estimated econometrically, using observed current employment and the expected value of the same variable in 2060

$$n^s = \frac{\ln L^s_{2060} - \ln L^s_{2010}}{50}$$

where L^s_t is expected employment in period *t* under scenario *s.*

The average years of contribution by the representative retiree are estimated as the product of the average employment rate of the working-age population in the relevant scenario, (calculated as the average of its annual values) and the maximum theoretical duration of the working life of an individual, 65 - 18 = 47 years.[3] The average duration of a retirement pension is approximated as the difference between the average life expectancy of the population as a whole (using, once again, the average during the relevant period) and the retirement age, which we set equal to the legal age (which is currently 65 years and will beome 67 once the reform has been fully implemented). The collection period of a survivors' pension is taken to be the difference between the life expectancy of women and that of the population as a whole, plus 2.75 years, which is the average age difference between men and women at the time of marriage according to INE's marriage statistics (2011c). For 1980-2007, we use the average of life expectancy at birth in 1975 and in 2005. For 2010-2060, we use the average of the 2005 and 2060 values of this variable. The second figure is estimated by adding to life expectancy in 2005 the increase in the same variable forecasted by Eurostat in its population scenario (which is used as the basis for our projections). The probability *(π)* that a retiree will be survived by a spouse entitled to a survivor's pension is set to ½.

The value of the experience premium (*v*) is chosen so that the model reproduces the average initial replacement rate (that is, the ratio between the initial pension and the salary at the time of retirement) observed among new retirees who entered the system in 2008, as estimated by Devesa (2009, p. 64) using the panel of work histories put together by the Spanish Ministry of Labor (the so called "muestra continua de vidas laborales"). Finally, the social security contribution rate is assumed to be equal to 95% of the contribution rate for common contingencies under the so called General Regime, calculated as the sum of the rates applicable to companies (23.6%) and to workers (4.7%).

2.2. Approximating the system's dynamics

If the growth rates of productivity and employment and the parameters used in the pension calculation remain constant for a sufficiently long period, the generosity indicator of the system will gradually approach the value predicted by the model outlined in the preceding section. As we have seen, the model cannot be used directly to project the evolution of *GENQ*

[3] In scenarios [1] and [2], the working age population is identified with the population between the ages of 18 and 64, while in scenario [3] the population aged 18 to 66 is used. In the latter case, the average years of contribution are approximated by multiplying the employment rate of the relevant age group by 67 – 18 = 49 years of potential working life.

on a yearly basis, but it can be used to calculate its long-term value (conditional on constant growth rates of certain aggregates). This, in turn, will allow us to approximate the system's dynamics in a way that should be sufficient for our purposes.

For short, let y be the logarithm of *GENQ* and let us assume that the parameters of the pension system and the rates of growth of productivity and employment remain constant for a long period of time. Since we know that y tends to converge to the long-term value given in (6),

$$\bar{y} = \ln \overline{GENQ} \,,$$

it seems reasonable to assume that the trajectory of this variable can be approximated by an expression of the form

$$(7)\ \Delta y_t = -b(y_t - \bar{y})$$

where $b > 0$ is the rate at which the system converges towards its long-term equilibrium.

What would a reasonable value for b be? If we take the model literally – and accept, in particular, the assumption that all agents in a cohort have lives of the same non-stochastic duration – the transition to a new steady state after any parametric change should be nearly complete after X years (where X is the difference between life expectancy and the retirement age) given that, after this period, all individuals whose pensions had been set prior to the reform of the system would be dead. While some widows from the "old regime" would remain in the system for a few years, their weight in total expenditure would be small, because not all pensioners leave a widower behind and because widower pensions are much smaller than retirement pensions. The weight of widowers will be particularly small when the number of retirees is growing over time and when productivity, and hence the average pension, is also growing.

In practice, of course, the transition will be a bit slower than in the case we have just described because some of the pensions granted under the old regime will be collected for more than X years, but it is still true that the bulk of the transition should have been completed in that time. Therefore, a reasonable assumption that can be used to set the value of b may be that after X year 75% of the initial distance of y from its steady state value will have disappeared.

The solution to the difference equation given in (7) can be written

$$(8)\ y_t - \bar{y} = (y_o - \bar{y}) * (1-b)^t$$

where y_o is the initial value of the (log of) the generosity indicator at the time of the system's reform and t the time elapsed since then. Our assumption on the speed of adjustment is that after X years, only 25% of the initial distance from the steady state will remain, that is, that

$$(9)\ y_X - \bar{y} = 0.25 * (y_o - \bar{y})$$

Substituting (9) into (8) evaluated at t=X¸ we have

$$(10)\quad y_X - \bar{y} = (y_o - \bar{y}) * (1-b)^X = 0.25 * (y_o - \bar{y})$$

Operating in this expression, we have

$$(1-b)^X = 0.25 \Rightarrow \ln(1-b) = \frac{1}{X}\ln 0.25 \Rightarrow b = 1 - Exp\left(\frac{\ln 0.25}{X}\right)$$

With the value of X we have chosen for 2010-2060 (20.9 years), this expression yields a value of 6.42% for b.

3. Baseline scenario: expenditure projections in the absence of reforms

This section describes the construction of the baseline or no-policy-change scenario. We have projected the evolution of pension expenditures in the absence of reforms by making some minor adjustments to the baseline scenario set forth in de la Fuente and Doménech (2009). Our point of departure is the demographic scenario recently constructed for Spain by Eurostat (Europop 2008). Eurostat's baseline scenario for Spain assumes a gradual decline of net immigration from more than 600,000 people in 2008 to a bit over 150,000 a year starting in 2040, a mild recovery in the birth rate from 1.39 children per woman in 2008 to 1.56 in 2060 and a rapid increase in life expectancy of 7.5 years for men and 5.7 years for women over the same period. With these assumptions, the aging process will be quite rapid: the old-age dependency rate (defined as the quotient between the 65+ population and the population aged 18-64) will rise sharply over the next five decades, rising from 0.25 in 2008 to 0.62 in 2060.[4]

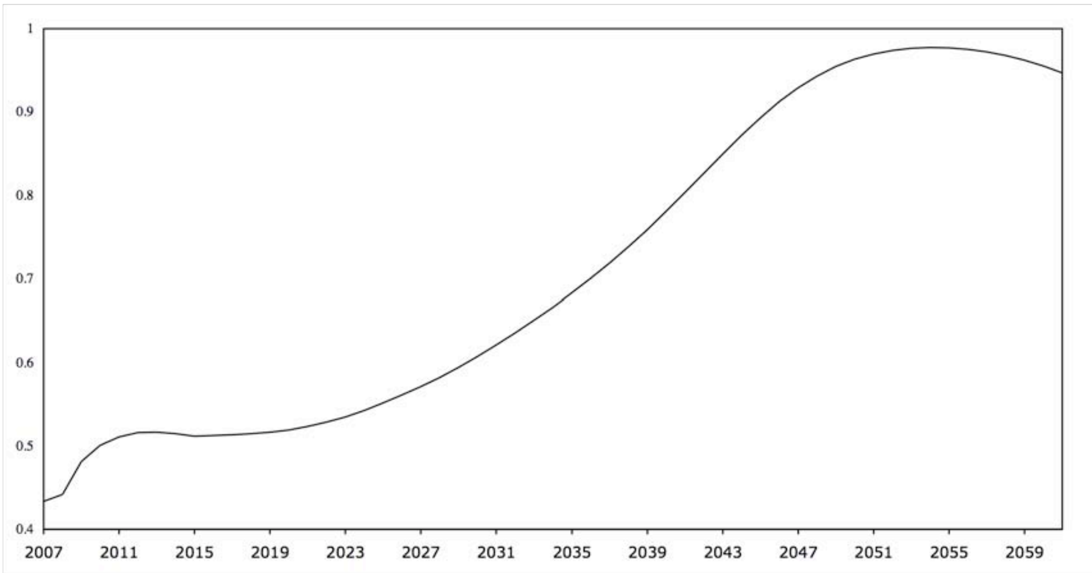
According to the National Statistical Institute's current population projections (INE, 2011b), the growth of the Spanish population between January 2008 and the same month of 2011 was below Eurostat's projections, probable due to the effects of the current crisis on fertility and on inmigration. In order to base our population series on the latest observed values of this variable, we have modified Eurostat's population scenario in the simplest possible way: for each age segment of interest, we take as a given the population estimate as of January 1st 2011 provided by INE and we extend the series forwards to 2060 using the growth rate of the same population segment in Eurostat's original baseline scenario.

We have also introduced minor chanages in the employment projections reported in our earlier paper while maintaining the (optimistic) long-term assumptions on which our baseline scenario was based. The change has to do with the evolution of employment until 2015, which has been adjusted in two respects. First, we have used the observed values of this variable between 2008 and 2010 (taken from the Nacional Accounts and measured by full

[4] In general, Eurostat's scenario is more optimistic than INE's most recent long-term projections (INE, 2010), although not in every respect. INE estimates a net migratory inflow of roughly 50,000 people per year for 2009-2018 and roughly 70,000 for 2019-2048, which is far below Eurostat's projection. On the other hand, INE is somewhat more optimistic than Eurostat regarding the recovery of the birth rate (in 2048, the Institute expects a birth rate of 1.71 children per woman, compared with the 1.52 estimated by Eurostat for the same year). Finally, the anticipated increase in life expectancy is greater in the INE scenario. Thus, life expectancy at birth in 2048 would be 84.31 years for men and 89.89 years for women, according to the Institute, compared with 83.4 and 88.4 years according to Eurostat.

time equivalent employment).[5] Second, we extend the series until 2015 by using the macroeconomic baseline scenario of BBVA Research. From 2015 onward, the assumption of the previous paper is maintained, namely, that the increase in the employment rate of the population aged 18 to 64 will converge, at an annual rate of 4%, to the employment rate of Spanish men aged between 16 and 64 in 2007 (77.4%), which is quite close to the employment rates (considering the entire population) of Japan, the Nordic countries, Canada or the US.

Figure 1: Projection of the number of pensions per employed worker in the absence of reforms



By adding to these premises the assumption that the coverage rate (defined as the number of pensions per person of retirement age) remains constant at its observed level in 2010 (which was 1.12), we can project the evolution of the number of pensions per employed worker (*NPENSPW*), which is the first component of the ratio of pension expenditure to GDP. Figure 1 shows the evolution of this ratio under the assumptions listed above and in the absence of reforms to the pension system. The high rate of growth of this indicator observed in 2007-2010 is largely due to cyclical reasons, and particularly to the rapid job destruction we have experienced during the current crisis. The growth of this ratio can be expected to decline somewhat in the near future before rising again sharply in the next decade, this time due to structural causes having to do with the retirement of the baby boom generation.

Minor changes from the previous paper have also been made in the modeling of the evolution of the system's generosity ratio. In particular, while we maintain the procedure used to estimate the long-term value of this variable, our assumptions regarding the system's transitional dynamics have changed. In our previous paper we assumed a linear transition between the last observed value of *GENQ* and the model's steady-state prediction which would be completed in 2060. In this paper, the transition is modelled using the methodology described in the preceding section and the steady state is attained only asymptotically.

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[5] For 2010, the figures are taken from the Quarterly National Accounts.

Table 2 Estimated steady-state values for the $\bar{P}/\bar{W}$ ratio

	Estimated value	*index*
1980-2007	0.704	100.0
2010-2060, no reform	0.809	115.0
2010-2060, with reform	0.700	99.5

The method used to estimate the steady state has not changed. Using equation (4) and the parameter values given in Table 1, we have calculated the steady-state values of the $\bar{P}/\bar{W}$ ratio predicted by the model (see Table 2). The observed value of this ratio in 2007 (using data on retirement pensions of the general regime) is 0.51, which is substantially lower than the model's prediction. If the model were correct, this would indicate that we are still far from the steady state and that the upward trend of $\bar{P}/\bar{W}$ we observe in recent decades would persist in the future even if all system parameters remained constant indefinitely at the values we observed during 1980-2007. Further, the model's prediction for the $\bar{P}/\bar{W}$ ratio in the absence of reforms is higher for 2010-2060 than for 1980-2007, mainly due to the increase in average years of contribution implied by our optimistic employment scenario. Striving to be conservative, we will not directly use the model's prediction for the steady-state value of the $\bar{P}/\bar{W}$ ratio. Instead, we will assume that the system was in a steady state in 2007 with the parameters of the 1980-2007 period and that the steady-state value for the P/W ratio will increase in the same proportion as the model's prediction for 2010-2060 in relation to the prediction for 1980-2007. That is, for each scenario, the steady-state value of $\bar{P}/\bar{W}$ for 2010-2060 is estimated by multiplying the observed value of this ratio in 2007 by the index in the second column of Table 2. Finally, we will assume that the share of wages in national income remains constant over time. This implies that the long-term generosity ratio, measured in terms of the average productivity of labour, *GENQ*, will also increase in the same proportion.

Figure 2: Projection of the generosity ratio (average pension/GDP per employed worker)

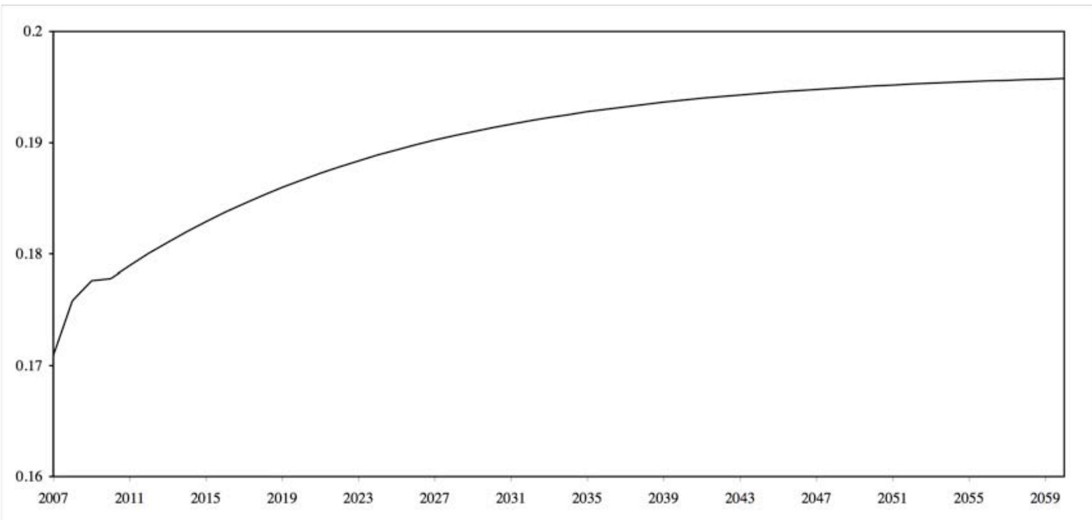


Figure 3: Projection of pension expenditure as a percentage of GDP

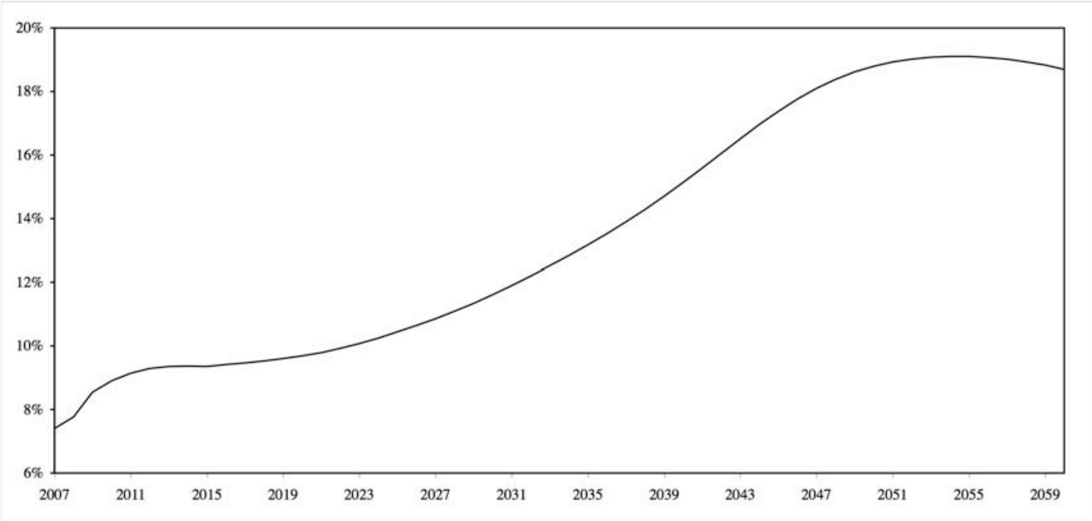


Figure 2 shows the expected path of the generosity indicator in the absence of reforms. Combining this variable with the *NPENSPW* projection described above yields the projection of total expenditure shown in Figure 3.

4. The impact of the reform

The reform proposal signed by the Spanish Government and the social partners (ASE, 2011) contains three key measures which will be implemented gradually between 2013 and 2027: raising the retirement age from 65 to 67 years, extending the pension calculation period from 15 to 25 years and increasing from 35 to 37 of the number of contribution years required to reach 100% of the regulatory base.[6] To this, we must add what is known in the Agreement as the *sustainability factor*, namely, the introduction of a quinquennial evaluation of the system which will result in whatever parametric adjustments are necessary to ensure its sustainability. Finally, the proposal envisages exceptions to some of these rules, including the possibility of maintaining retirement at the age of 65 for long contribution careers (understood as those of at least 38.5 years) and for workers engaged in especially risky or arduous activities, and includes additional measures that affect the minimum retirement age and the incentives to postpone retirement among other things. Although the model we are using cannot quantify the impact of these exceptions and additional measures, their expected effect would be that of reducing to some extent our estimates of the savings generated by the reform.

[6] The proposal also modifies the scale that relates the number of contribution years with the percentage of the regulatory base to be collected as a pension. The minimum requirement of 15 years of contributions (to be entitled to 50% of the regulatory base) remains unchanged. However, the text of the document states that, in contrast with the current system, each year after the first fifteen will have the same impact on the amount of the pension once the reform has been fully implemented. In view of the scale given in table 5 of the document (see AES 2011, pp. 10 and 17), this will not be exactly the case.

Figure 4: Timetable for the implementation of the main reforms

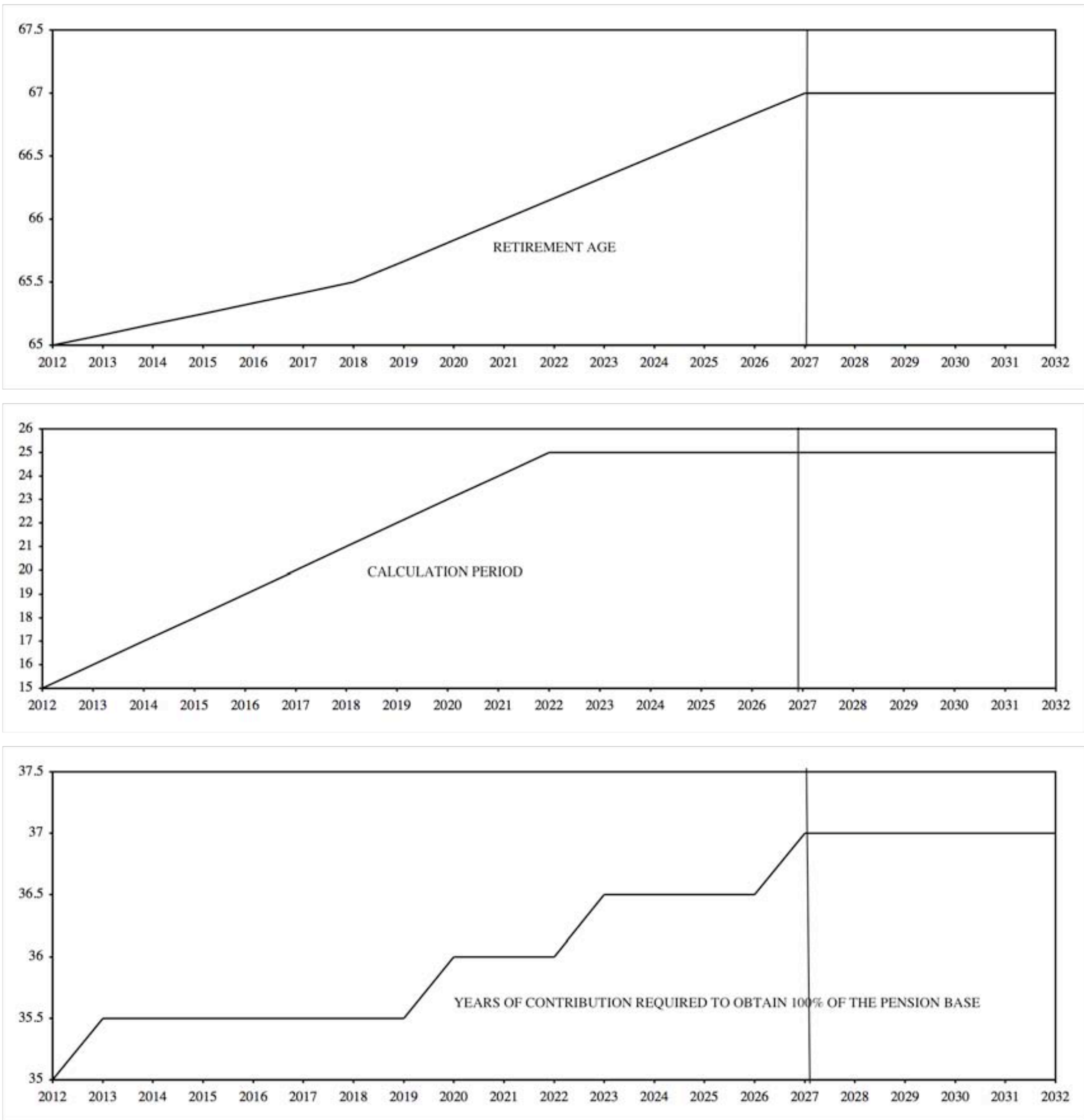


Table 4 summarises the expected timetable for the application of the reform. The retirement age will rise gradually, at a rate of one month per year between 2013 and 2018 and two months per year between 2019 and 2027. The calculation period will be increased from 15 to 25 years at a uniform pace between 2013 and 2022. Finally, the contribution period required to receive 100% of the regulatory base will be increased in six-month steps in 2013, 2020, 2023 and 2027, with simultaneous adjustments of the scale relating the number of years of contribution with the amount of the pension, as set forth in a scale attached as an Annex to the Agreement.

The impact of these measures on the number of pensions per employed worker is easily calculated with a few additional assumptions. Increasing the retirement age will reduce the number of pensioners and increase the number of employed persons. To quantify the effects of this measure, we have ignored the possibility of early retirement and assumed that those affected by the increase in the retirement age have an employment rate that is similar to that of the population aged between 60 and 64 years in the year 2007 (which was 33%).

Figure 5: Projection of employment and the retirement-age population, with and without reform (2007=100)

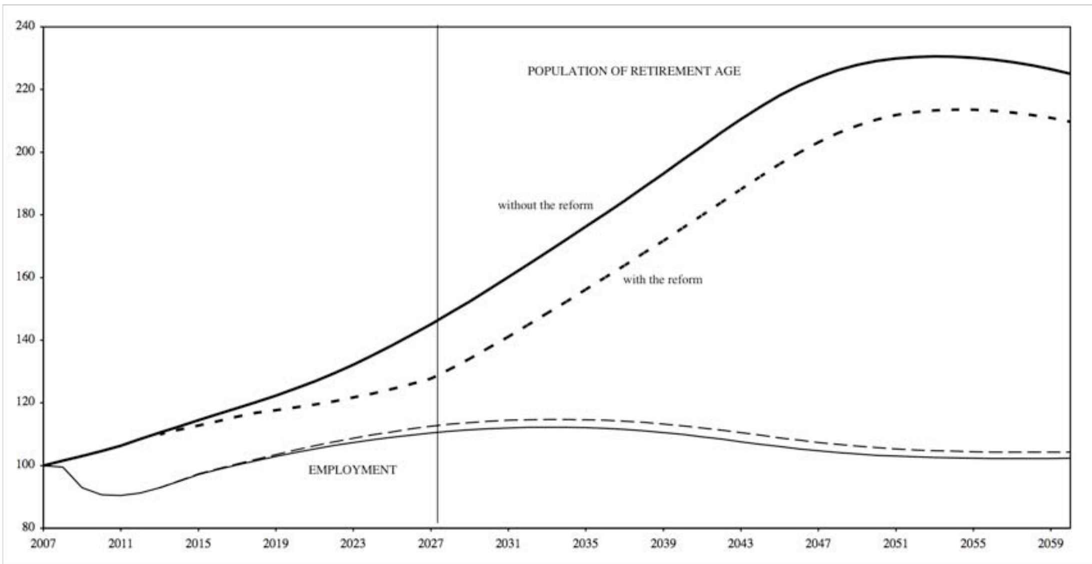


Figure 6: Projection of number of pensions per employed worker

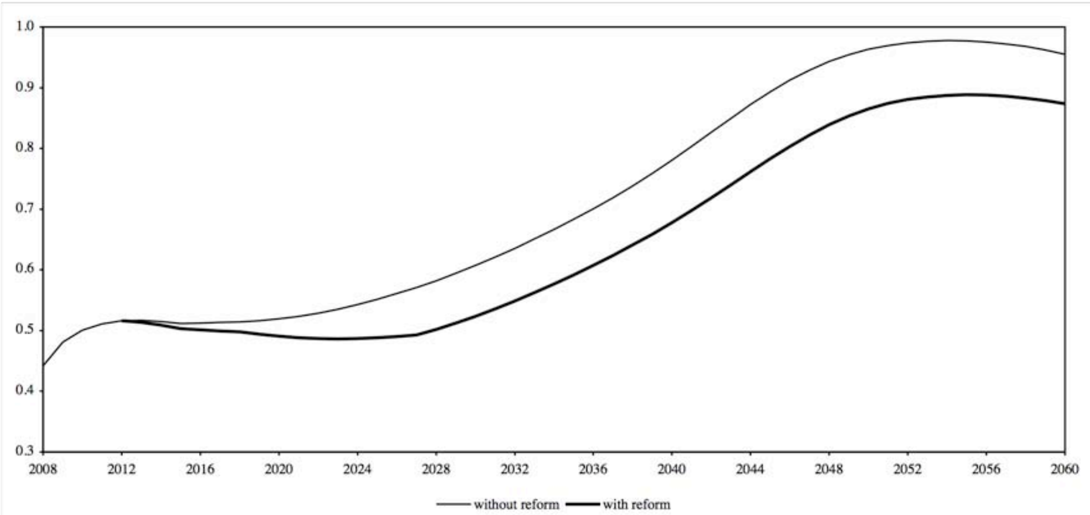
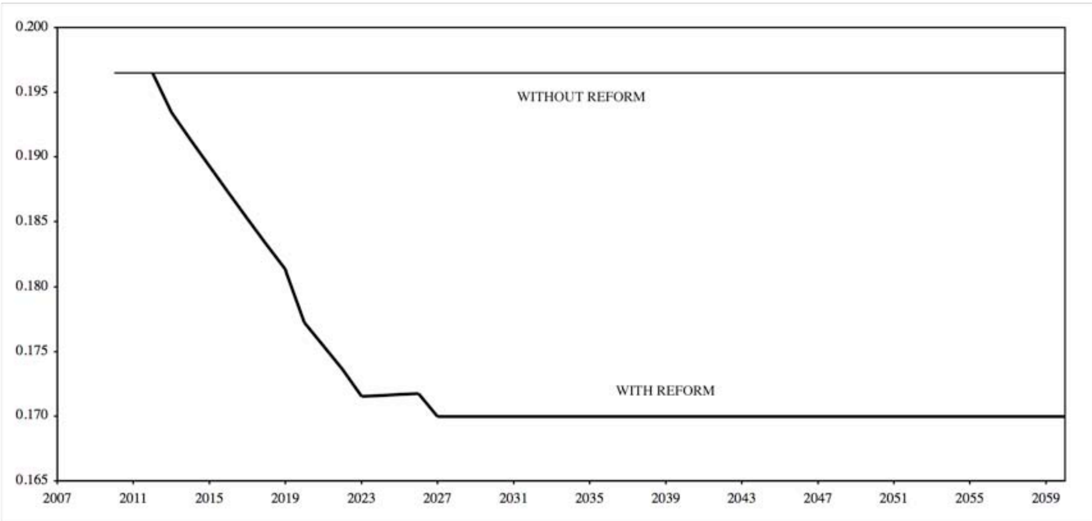


Figure 5 shows the implications of the reform for the evolution of employment and the retirement-age population and Figure 6 summarizes the estimated impact on the number of pensions per employed worker. Under our hypothesis, the gradual rise in the retirement age will temporarily stabilize the ratio between pensioners and employed persons. Starting in the second half of the next decade, however, growth in the first variable surges, with dramatic effects on the first major component of pension expenditure.

Projecting the evolution of the generosity ratio is somewhat more complicated than in the previous scenario because of the gradual nature of the reform. For each transition year t (between 2013 and 2027), we have used the model outlined above to calculate the long-term generosity ratio $\bar{y}_t$ that would correspond to the current values for the parameters of the system, which would vary from year to year during the transition period. Figure 7 shows the time path of $\bar{y}_t$, which would fall by 13.5%, from 0.196 to 0.170, between 2012 and 2027 with the implementation of the reforms.

Figure 7: Evolution of the long-term generosity ratio with and without reform



To approximate the system's evolution, we will proceed as above while allowing the steady state to vary over time. That is, we will assume that in year *t* the value of the logarithm of the generosity ratio converges to its steady-state value for the same year and does so at the same rate we used in the previous section, in accordance with the following expression

$$(7') \quad \Delta y_t = -b(y_t - \bar{y}_t)$$

which is identical to equation (7) except that $\bar{y}_t$ now has a time sub-index that tells us that the system is approaching a moving target during the transition period.

Figure 8: Projection of the generosity ratio of the pension system (average pension/GDP per employed worker) with and without reform

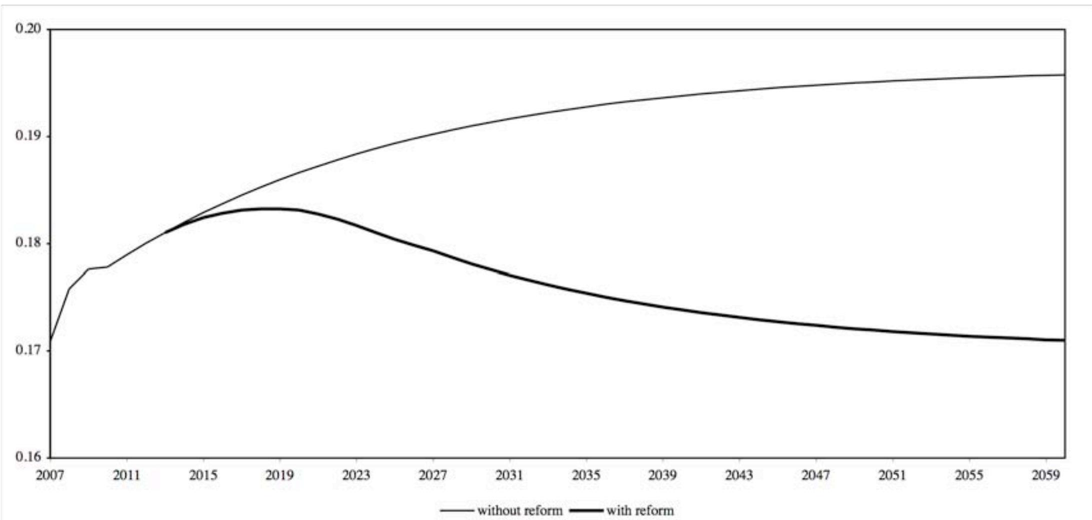


Figure 8 shows the estimated trajectory of the generosity ratio after the reform. Combining this projection with our prior estimate of the number of pensions per employed worker yields the spending projection summarised in Figure 9 and the estimate of savings arising from the reform that is shown in Figure 10.

Figure 9: Projection of pension expenditure as a percentage of GDP, with and without reform

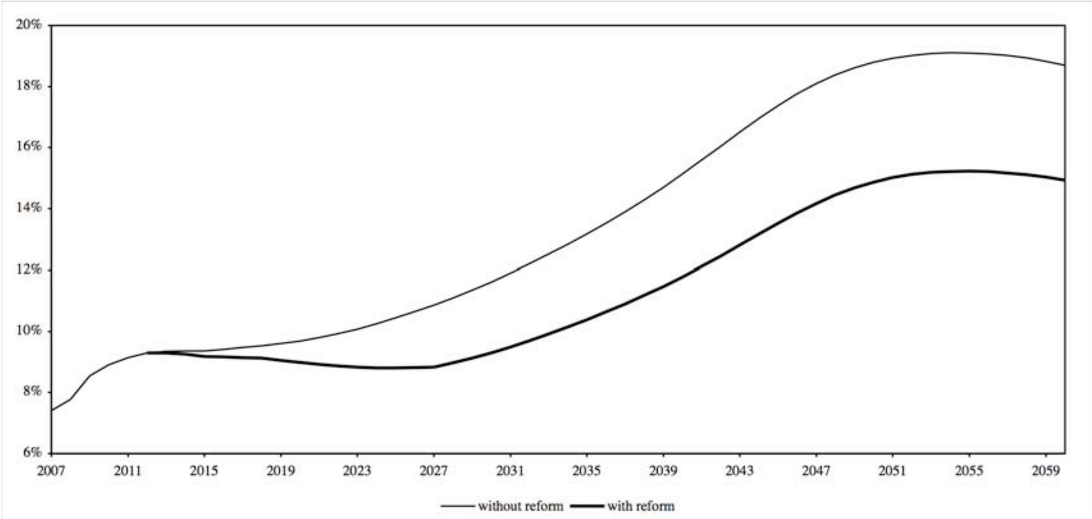
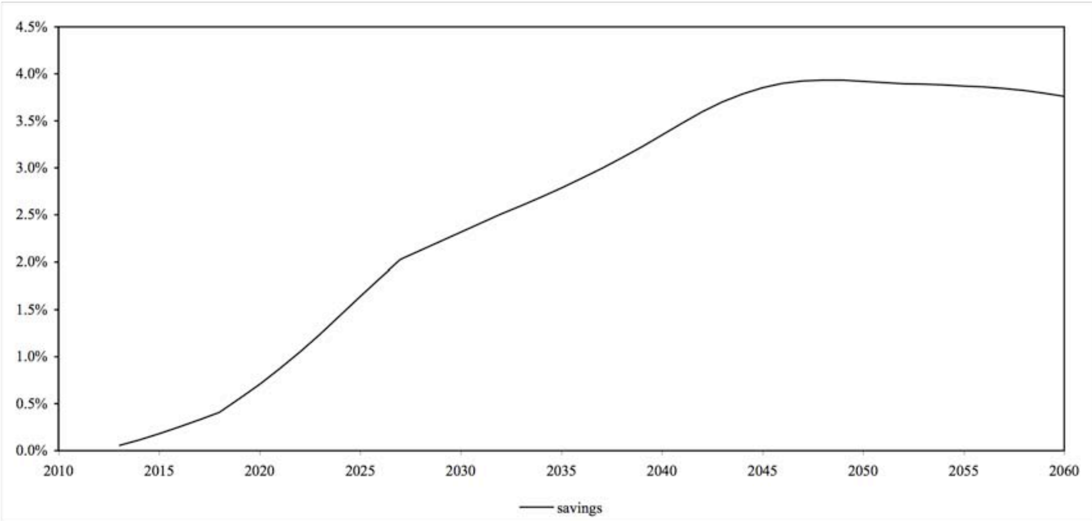


Figure 10: Savings resulting from the reform, in percentage points of GDP



On the basis of our assumptions regarding the evolution of employment, productivity and demographics, the results of the analysis suggest that the proposed reforms would reduce pension expenditure by around two points of GDP at the end of the transition period in 2027 and by up to four points by mid-century.[7] In this scenario, the reform would suffice to stabilize pension expenditure as a percentage of GDP during the transition period. In the absence of further reforms, however, spending is projected to increase quickly starting in 2030 and to reach 15% of GDP by 2050, thereby generating deficit levels that would be very difficult to sustain.

[7] As noted, these figures should be interpreted as an upper bound on the reform's impact, as they do not take into account certain exceptions to the new rules that would tend to reduce their effect on expenditure.

5. Conclusions

This paper presents a preliminary estimate of the impact of the proposal for the reform of the Spanish pension system signed in January 2011 by the central Government, the main trade unions and the employer confederations. After updating our earlier projections of spending on contributory pensiones during the period 2008-60 in the absence of reforms (de la Fuente and Doménech, 2010), we have estimated the impact on this variable of the three main measures included in the agreement: increasing the retirement age to 67, extending the pension calculation period to 25 years and increasing to 37 the number of contribution years required to be entitled to 100% of the regulatory base.

These reforms are in line with those adopted in recent years by other European countries.[8] Although reasonable doubts remain as to whether or not they will be sufficient to ensure by themselves the financial sustainability of the system, they do constitute a significant step in the right direction for three reasons. First, because they have triggered an important public debate about the sustainability of the public pension system that has not been restricted to the political parties. Second, because the agreement to raise the retirement age has broken a real taboo. Now that that barrier has been crossed, it will be much easier to deal with the further changes that may be required in the future to ensure the sustainability of the system. Lastly, and in line with the previous point, because the introduction of the *sustainability factor* entails a qualitative change in the nature of the system by introducing a quasi-automatic mechanism for making reforms that had previously required long gestation periods and laborious agreements.

Contingent upon certain assumptions about the evolution of employment, productivity and demographics, the results of this paper suggest that the three main reforms contemplated in the recent agreement will have a significant impact on pension expenditure and may be expected to yield savings of around two points of GDP at the end of the transition period in 2027 and of up to four points by mid-century. In this scenario, the reform would stabilise pension expenditure at approximately 9% of GDP during the transition period, thereby preventing the emergence of a structural deficit in the system before the end of the next decade. In the absence of further reforms, however, we anticipate that expenditure will increase rapidly after 2030, reaching more than 15% of GDP by 2050. Hence, additional reforms will be required in the future to prevent the emergence of large deficits.

Given the uncertainty that surrounds the projections of many of the variables of interest, we cannot rule out the possibility that, even with the reform, the system may begin to experience a structural deficit before the end of the transition period. Under these conditions, the most sensible step would be to move up the introduction of the sustainability factor to the start of the reform, rather than waiting for the end of the transition period. This would activate a mechanism that could be used to modulate the pace and scope of the reforms, should the

[8] The system resulting from the reform closely resembles the German system, although with a much higher replacement rate (ratio between the first pension and the last salary) and a lower number of years required for early retirement or to be entitled to a "full pension." For a review of the reforms undertaken in other European countries in recent years, see Alonso and Conde (2007) and OECD (2009).

financial situation of the system so require before the end of the transition period. Further, the model clearly shows that the financial health of the system depends not only on the evolution of life expectancy but also on other variables like the employment and dependency rates that influence the number of pensions per employed person. One important implication of this observation is that the sustainability factor cannot be linked only to life expectancy, as the Government document appears to suggest (ASE, 2011, p.10), but must also take into account other variables that are relevant for the financial health of the system.

In addition to any further parametric changes that should prove necessary in the future to ensure the sustainability of the public pension system, it is very important to increase the transparency of the system by supplying additional information both to contributors and to pensioners. This would enable society to internalize the close relationship that exists between contributions and benefits and would help workers make timely and informed decisions on the best way to prepare for retirement. The experience of other European countries that have introduced models with notional accounts in their public pension systems, like Sweden, Italy, Poland or Latvia, should provide a useful reference in this regard.

Appendix: Evolution of the pension system's expnditure and revenues since 1980

This appendix examines the evolution of the revenues and expenditures of the Spanish public pension system during the last three decades. Our data refer to spending on contributory pensions by the Spanish Social Security system. We have obtained from the website of the Ministry of Labour data on the number of pensions paid every month between 1981 and 2010 broken down by type of pension (retirement, disability, survivors' benefits, and benefits for orphans and other family members) and the average amount of each type of pension.[9] For 1998-2010, the data come from the Gazette of Labor Statistics (*Boletín de Estadísticas Laborales*) (MITIN, 2011a), while for previous years, average pensions are taken from the 2000 and 2007 editions of the Statistical Report of the INSS (several years).

Total pension expenditure is estimated by multiplying the average number of pensions payable in each year by their average annual amount (which is calculated as fourteen times the monthly amount).[10] The calculation is done separately for each type of pension and the results are aggregated. We have checked that the total obtained in this way approximately matches the figure in the General State Budget for this item.

In Spain, contributions for common contingencies cover a series of contingencies in addition to retirement. As a result, it is not possible in principle, to isolate a specific contribution to the pension system. On the basis of an internal Spanish Government report cited by Doménech and Melguizo (2008), we estimate that 95% of such contributions can be imputed to the pension system.[11] To this, we must add a transfer from the State's General Administration to cover a growing fraction of the "minimum complements" that raise the lowest contributory pensions to the minimum set by law. Our data on the system's revenues are taken from the Economic and Financial Report of the General Social Security Budget for fiscal year 2011 and the Appendix to that document (MITIN, 2011b).[12]

Data on GDP, employment and population broken down by age groups are taken from the INE website (2011b and 2011d). This institution offers two different National Accounts series: one for 1995-2010 with base 2000 and another for 1980-1995 with base 1986.[13] We have linked the two series and extended the most recent one backwards by using the growth rate of each magnitude in the older series.

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[9] To calculate annual expenditure, we have taken into account the fact that pensions are paid out in fourteen installments per year, including extra payments in july and december.

[10] The total number of pensions payable is greater than the number of pensioners because one person may have more than one pension.

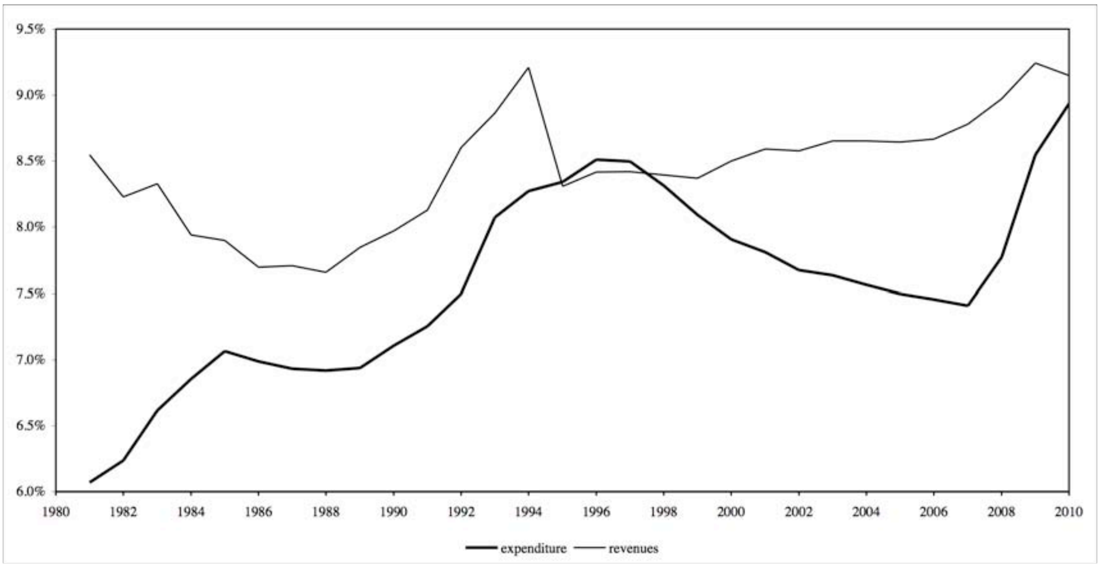
[11] According to the report cited by Doménech and Melguizo (2008), income from contributions imputable to the pension system totalled 8.6% of GDP. We have calculated the ratio between this figure and the total amount of contributions for common contingencies (including those corresponding to the unemployed) which was 8.98% of GDP in that year.

[12] The revenue series we have retrieved appears to include, as part of the contributions paid by the National Employment Institute (INEM) on behalf of the unemployed, certain incentives to employment creation that are paid by INEM and its successors. In principle, this item (which amounted to 2.72 billion euros in 2010) should be excluded, but the available series are not sufficiently detailed to allow for this.

[13] In the most recent series, employment is measured in full-time equivalent terms. In the case of the 1980-1995 series, only "gross employment" seems to be available.

Figure A.1 shows the evolution of expenditure on contributory pensions as a percentage of Spanish GDP together with the revenue of the Social Security System that can be imputed to pensions with the criteria indicated above (i.e. including 95% of contributions for common contingencies and State transfers to help finance minimum complements). The spending series shows an upward trend until 1996, when spending reaches 8.51% of GDP. Starting in that year, expenditure declines gradually to reach 7.41% of GDP in 2007 and then surges to an all-time high of 8.93% in 2010. The revenue series, on the other hand, shows considerable oscillations but does not display a clear trend.

Figure A.1 Expenditure and revenue of the contributory pension system as a percentage of GDP

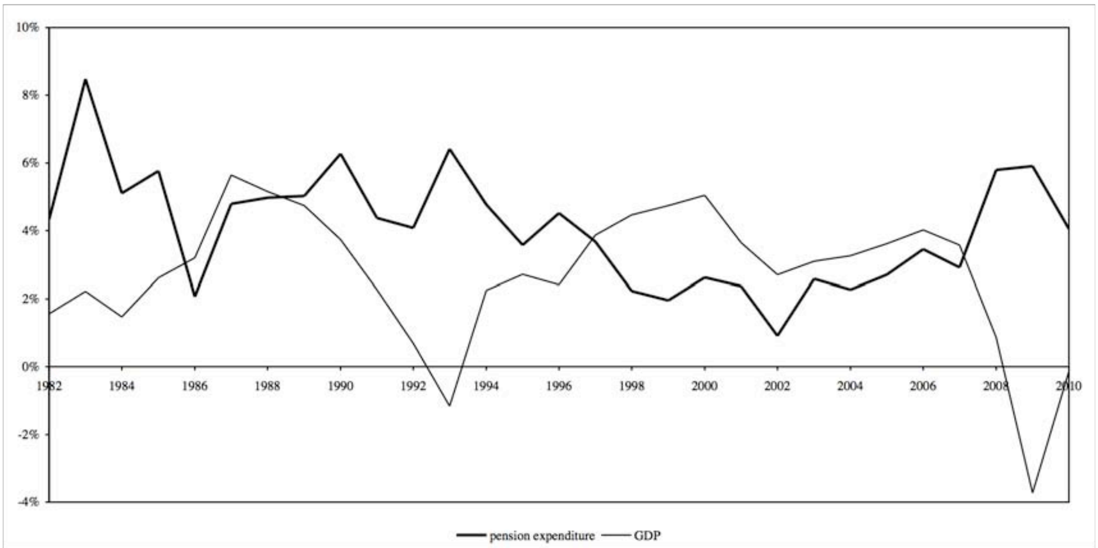


- *Note*: Revenues do not include interest from the Reserve Fund, which totalled 2.66 billion euros in 2010.

The Figure should be interpreted with caution because the State has been gradually assuming the financing of major benefits that in the past were at least partially financed with social contributions, including health care and non-contributory benefits. Strictly speaking, then, the vertical distance between the two series can only be interpreted as either the surplus or the deficit of the public pension system in very recent years, but it does give us an idea of the system's financial situation. In the mid-1990s, the system was roughly in equilibrium. In recent years, however, the generally favourable evolution of expenditure has allowed the system to accumulate over 64 billion euro in the Reserve Fund as of September 2010 (which represents 6.04% of GDP).

Figure A.2 shows the growth rates of the numerator and the denominator of the ratio of pension expenditure to GDP, with both aggregates measured at constant prices. The figure shows that, as would be expected, intervals of rapid growth in the spending ratio coincide with recessive periods. This phenomenon tends to be inverted during expansive periods but only partially, leaving us with an upward trend in the expenditure ratio.

Figure A.2: Annual rate of growth of pension expenditure and of GDP, at constant prices



- *Note:* Both series are deflated with the GDP deflator.

Figure A.3: Main components of pension expenditure as a fraction of GDP, 1981=100

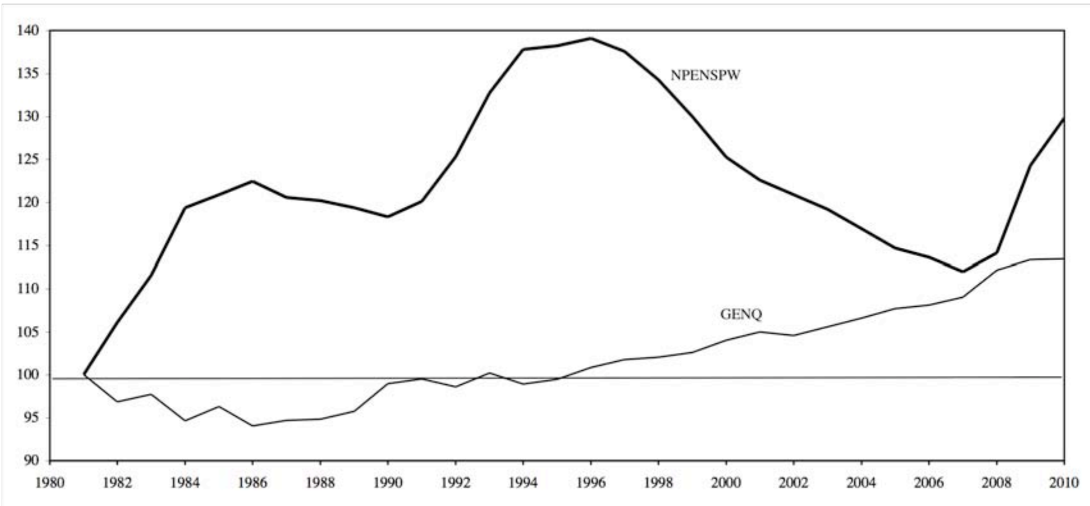


Figure A.4: Components of the number of pensions per employed worker, 1981=100

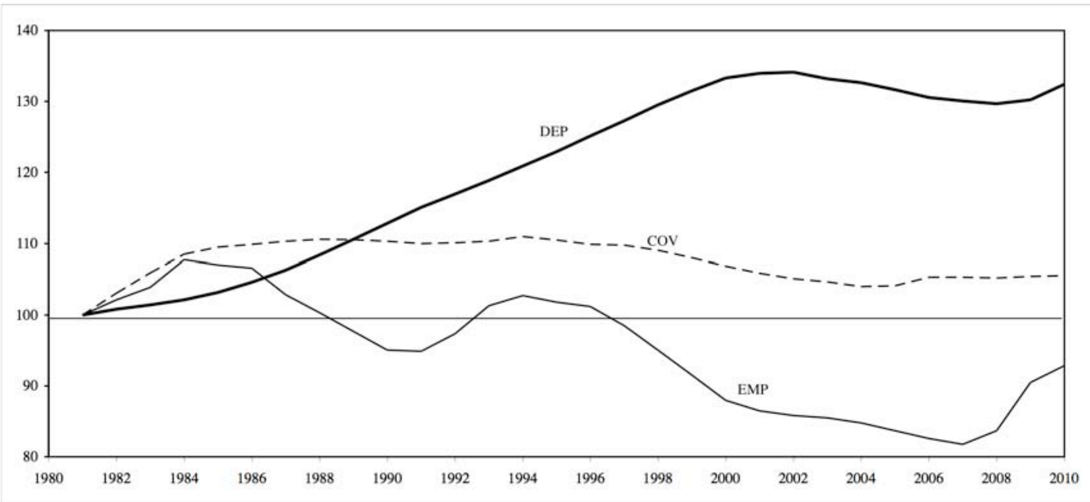


Figure A.3 breaks down the pension expenditure indicator *(PEXP/GDP)* into its two main components: the number of pensions per employed worker and the average pension as a fraction of output per worker, both standardised by their 1981 values. The first of these components is, in turn, broken down into several factors in Figure A.4.

The figures show that the evolution of pension expenditure has been dominated in recent decades by two fundamental factors: an adverse demography and a generally favourable performance of the labor market. The demographic effect, which is captured by the dependency rate *(DEP)*, has been negative except in the early years of this century, when the strong inflow of immigrants into Spain led to a small decline in the dependency rate, temporarily inverting the clear upward trend of this variable. On the other hand, the employment rate of the working-age population has shown an upward trend for most of the period of interest, thus generating a positive employment effect *(EMP* that has mitigated the negative impact of the demographic factor. In the last third of the sample period, rapid employment creation, combined with strong immigration, even allowed for an appreciable reduction of the expenditure to GDP ratio. However, all indications suggest that this is only a temporary respite within a continuing upward tend in spending that will become irreversible in the absence of drastic reforms in the design of the pension system. The experience of recent years shows the strong impact of the current crisis, which has temporarily stopped or even reversed the migration inflow and has brought with it a dramatic rate of job destruction. These two factors explain the sharp decline of *NPENSPW* that we observe since 2007.

With regard to the other components of pension expenditure, the generosity indicator *(GENQ)* has risen slightly, while the coverage rate *(COV)* has remained approximately constant without displaying either a clear trend or large oscillations.

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