Spain 2011 Pension Reform

J. Ignacio Conde-Ruiz*

(Universidad Complutense de Madrid and FEDEA)

Clara I. Gonzalez†

(FEDEA)

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Abstract

The aim of this paper is to evaluate the impact of the Spanish pension reform enacted in 2011. We use an accounting model with heterogeneous agents and overlapping generations in order to project revenues and expenditures of the pension system for the next four decades. Specifically, we analyze the impact of changes in the replacement rate, in the period of calculation and the delay of the retirement age. We obtain results under two alternative migration scenarios: (i) a combination of the latest figures released by the INE, which forecast a reduced annual immigration net flow of some 70,000 persons; and (ii) a revised scenario featuring a more generous hypothesis concerning this net flow. We demonstrate that the results show that these three changes instigated by the reform could imply a savings of about 3 percentage points of GDP in 2051. However, we couldn't include in the evaluation the sustainability factor (that transform the Spanish system in a defined contribution scheme) that will start in 2027 due to the lack of details in the text of the Reform. Finally, we analyze the changes in average pensions by gender, skill, and nationality.

Key words: aging, Spanish pension system, reform, accounting projection model, heterogeneous agents, overlapping generations.

JEL Codes: H55, J11, J26

*J. Ignacio Conde-Ruiz. UCM and FEDEA – Fundación de Estudios de Economía Aplicada, c/ Jorge Juan, 46; 28001 Madrid (Spain). e-mail: nacho.conderuiz@gmail.com

†Clara I. Gonzalez (corresponding author). FEDEA. e-mail: gonzalez.claraisabel@gmail.com

1 Introduction

The Spanish Social Security system is a Defined Benefit Pay-as-you-Go System in which pensions received by retirees are financed by same-period contributions paid by active workers. It is a defined benefit system because the pension level depends only on the retiree's work history (wages, number of years of contribution, and age of retirement). Hence the basis for calculating benefit levels is fixed as soon as the future pensioner begins contributing to the system and is independent of the economic and demographic conditions at the time of retirement. This is true as long as the law does not change. The fact that pensions paid in the future are committed in advance implies that its pension system's financial sustainability can be compromised by relevant macroeconomic and social changes (demographics, productivity, life expectancy, etc.). Yet reports from official institutions (e.g., the Spanish Ministry of Labor, the European Commission) and from academic research have shown that, absent reforms, Spanish pension expenditures as a percentage of Gross Domestic Product (GDP) would nearly double within four decades.

The aging of the population, with declines in fertility rates and increases in life expectancy, renders it imperative that the Spanish pension system be reformed so that it can adapt to this new demographic reality. In fact, this is why the Spanish government was prompted to take such action. The reform involves changes in the key system elements: the retirement age, replacement rate, and period of calculation. This paper offers a preliminary evaluation of the pension reform recently enacted.

The methodology that we employ is the one developed in González (2011) (and used in González, Conde-Ruiz and Boldrin, 2009), which comprises three phases. The first phase is demographic projection via the so-called Cohort Component Population Projection Method. The second phase is projection of labor histories through the transitions between different situations of employment, unemployment or inactivity conditioned by their heterogeneity. The third phase consists of the calculation of the contributions to the system in order to finally calculate their expected pensions. This approach enables us to estimate the total revenues and expenditures of the Social Security System, including expenditures on retirement, widowhood, and disability pensions.

The population projection for the period 2006–2051 is based on the long-term scenario described by Spain's National Statistics Institute (Instituto Nacional de Estadística, INE) and incorporates its general hypotheses regarding survival, fertility, and migration. The model developed in this paper distinguishes in terms of age, gender, education level, and nationality; the latter two aspects are especially important factors in the projection. The evolution of educational levels, which are directly related to participation in the labor market, is key to our assumption that any skill improvement will enhance the worker's employability and working conditions (i.e., wage). Moreover, differences by nationality allow us to isolate the impact on Spanish Social Security of the migration phenomena in Spain.

The employment scenario we posit for the next several decades incorporates the official macroeconomic forecasts of labor force participation and employment. As our starting point we use the INE's Labor Force Survey (LFS) as well as 2006 data from the Continuous Sample of Working Lives of Social Security (Muestra Continua de Vidas Laborales, MCVL). To the work histories derived from the MCVL we apply the transition probabilities derived (via Markov chains) from the LFS set of micro data on labor market flows. In this way we obtain the complete work histories for each cohort, which allows a further distinction between what Spain refers to as the *general scheme* and the *self-employed scheme*. So after accounting for the sources of heterogeneity mentioned previously (age, gender, education level, and nationality), we obtain for each cohort their complete work histories and contributions to the system.

As a population cohort ages and enters retirement, the model calculates its pensions based on key elements of its "virtual" work history (reference wage, years of contribution, and retirement age). We thus obtain total pension expenditures as the aggregate of retirement, widowhood, and disability pensions.

The balance of the paper is organized as follows. Section 2 presents the demographic scenario that is essential for assessing the system's financial sustainability. In Section 3, we describe in more detail the methodology used and also obtain the expected level of expenditures (as a fraction of GDP), over the next four decades, in the absence of pension reform. Section 4 evaluates the reform legislation approved in 2011, including assessment of the reform's effect on average pensions in Section 5. Section 6 is devoted to obtain these expenditure projections under two different migration scenarios. Finally, Section 7 concludes with a brief discussion and summary of the main limitations of our analysis.

2 Projection Model and Sociodemographic Scenario

The model that we have developed to evaluate the 2011 reform is an *accounting projection model, with heterogeneous agents and overlapping generations*, in which individuals live a total of 17 periods (see González (2011) for details of the methodology). Each period corresponds to five years of calendar time. Individuals enter the economy at age 15 and live at most until age 100. An individual's maximum working life is therefore 10 periods—that is, from age 15 through age 64—because the retirement age is established by law at 65. Finally, the maximum life span in retirement (for those who retire at age 65) is 7 periods.

Individuals differ not only by age but also by gender, educational attainment, and nationality. More precisely, individual heterogeneity is characterized as follows:

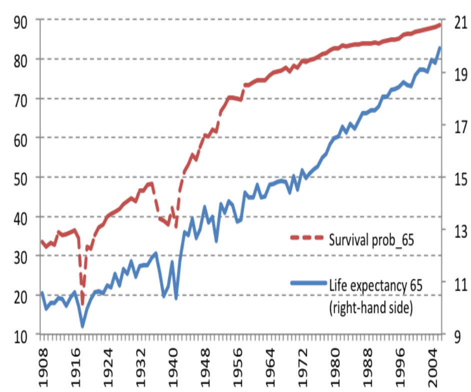
- Age $j \in \{1, 17\}$: $j = 1$ for individuals between 15 and 19 years of age, and so on until $j = 17$ for individuals between 95 and 99 years of age.
- Gender $g \in \{m, f\}$: m for males and f for females.
- Nationality $c \in \{n, m\}$: n for natives and m for immigrants.
- Education $e \in \{c, h, d\}$: d for high school dropout (primary education), h for high school (secondary education), and c for college graduate (tertiary education).

Thus we have $2 \times 2 \times 3 = 12$ different groups of individuals, and each group comprises 17 subgroups defined by age.

2.1 Demographic Scenario and Projections

The overall aging of the human population is one of the greatest challenges facing society today. Twentieth-century advances in health and socioeconomic conditions have led to increased life expectancy; when combined with the concurrent decline in fertility rates, the result is a transformation of the population pyramid. In Spain as in other developed countries, a gradual process of aging is forecast (United Nations, 2009a,b; INE, 2010) and cannot be reversed despite recent migration phenomena[1]. In particular, citizens of Spain have one of the highest life expectancies at birth, a value that has increased by 11 years since 1960. What is more important is that, as shown in Figure 1, the percentage of each generation reaching age 65 has increased significantly: the likelihood of reaching that age was less than 35% in the 20th century but now approaches 90%. The implication is that we are gaining years of life at the older ages; at age 65, for instance, the life expectancy has improved dramatically from less than 10 years in the early 20th century to nearly 20 years in the early 21st century (i.e., 21.1 years for women and 17.7 years for men). Furthermore, life expectancy at age 65 increases by one year for every eight more years lived, and most people who retire at age 65 still have a quarter of their life to live.

Figure 1: Survival Probability at Age 65 (Spain, 1908–2006)



Source: Own elaboration (Data: The Human Mortality Database – www.mortality.org).

The first step in implementing our model is to develop the population projection up to the year 2051. We take as starting point the 2006 demographic situation[2] and we forecast its evolution over the next four decades. The demographic scenario established as the basis of these forecasts is calibrated to match the INE "long-term scenario Number 1 (2002–2060)", which is based on the 2001 Spanish Census (the scenario incorporating greater net immigration) and remains consistent with the mortality tables. That scenario, which was released in 2005, will be referred to as INE-2005. Because this scenario is the one most widely used in research on Spain's Social Security System, adopting it for our baseline scenario allows a broad comparison of the final results obtained.

[1]See González (2011) and González, Conde-Ruiz and Boldrin (2009) for an analysis of the impact of Spanish immigration on demographic variables.

[2]We establish year 2006 for consistency with the wave of MCVL data for the same year.

We have incorporated the basic assumptions made by the INE with respect to life expectancy (and its corresponding survival probability), fertility, and net migration flow by year for the period 2006–2051. These assumptions and the INE's own long-term projections can be seen in Table 1; it involves a three-year increase in life expectancy (for both men and women) and a net inflow of about 270,000 immigrants annually in its most optimistic scenario in this variable (see INE (2005) for more details).

Table 1: INE Hypothesis (Long-Term Scenario Number 1)

	Life expectancy at birth		**Births**	**Number of**	**Net migration**
	Males	Females		**kids by women**	**flow**
2015	79.2	85.5	466,868	1.49	282,284
2020	79.8	86.0	426,724	1.51	279,695
2025	80.4	86.5	408,045	1.52	277,106
2030	80.9	86.9	415,253	1.53	274,517
2035	81.0	87.0	436,768	1.53	271,927
2040	81.0	87.0	451,989	1.53	269,338
2045	81.0	87.0	450,272	1.53	266,749
2050	81.0	87.0	435,767	1.53	264,159

Source: INE (2005).

The methodology we use is the *Cohort Component Population Projection Method*, a technique that uses the components of demographic change to project population growth. This methodology takes each age cohort in the population and project it forward using hypothesized estimates of mortality, fertility, and migration. To project the total population as well as the number of males and females by age group, we use the following identity:

$$Pop_{t+n} = surviving\ population + births + net\ migrants. \tag{1}$$

The total population in Spain in period t is decomposed as follows:

$$Pop_t = \sum_{j=1}^{17} \sum_{g \in \{m,f\}} \sum_{e \in \{c,h,d\}} \sum_{c \in \{n,m\}} Pop_t(j,g,e,c) \tag{2}$$

where $Pop_t(j,g,e,c)$ is the number of individuals of age j, gender g, educational level e, and nationality c living in Spain during period t.

We have thus established the following assumptions.

- The probability at age j of surviving to age $j+1$ is $\psi_t(j,g)$ (i.e., 1 minus the mortality rate). In this respect, males and females differ but natives and immigrants do not.
- The likelihood that a female will reproduce is $k_t(j,e,c)$; this value depends on age and nationality (i.e., $k_t(j,e,c) = k_t(j,e',c)\ \forall\ e \neq e'$).
- Net migration flow is $M_t = \sum_{j=1}^{17} \sum_{g\in\{m,f\}} \sum_{e\in\{c,h,d\}} m_t(j,g,e)$; where $m_t(j,g,e)$ is the net inflow of immigrants of age j, gender g, and education e during period t.

For the population we consider, the law of motion is

$$Pop_{t+1} = M_{t+1} + \sum_{j=1}^{17} \sum_{g\in\{m,f\}} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} \psi_t(j,g) Pop_t(j,g,e,c)$$
$$+ \sum_{j=1}^{17} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} Pop_t(j,f,e,c) k_t(j,e,c). \tag{3}$$

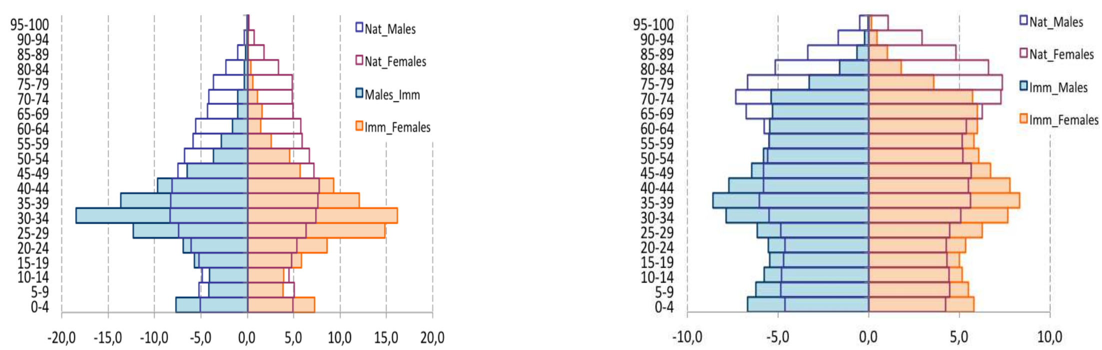
The benchmark demographic scenario is calibrated to match INE-2005, and we adopt its hypotheses regarding fertility rates and net migration flows. In addition, we make the following assumptions in order to identify by age, gender, and nationality.

- *Births.* Our estimate of the number of births each year is based on the INE hypothesis that the number of children by women will increase from 1.40 to 1.53 while taking into account the proportion of women of fertile age (more specifically between 25 and 40). Note that the population's births are distributed by gender as 51% males and 49% females. Finally, we treat the children of immigrant female mothers as immigrants even though they were born in Spain; this allows us to measure the total impact of immigration on the demography in Spain. On the one hand, it is likely that many of these children will attain Spanish nationality; on the other hand, it is certain that they would not be in Spain at all if their mothers had not emigrated.
- *Net migration flows.* The total annual figure from INE's forecast is allocated along the following lines: (i) by gender (males 51%, females 49%); and (ii) by age (between 0 and 40, based on the proportions observed for the period 2005–2007).

It follows from our assumptions that, over the long term, the working-age population (i.e., those of age 16–64), group that will condition future employment and activity rates, will decline as a portion of the total population from 67.7% to 56.4%. The dependency ratio (i.e., the population aged more than 65 divided by the population aged 16–64) would double from 24.3% to 48.7% and at the same time the average age would increase (by five years) and also the median age (by six years), so that the age of the median voter would increase from 38 to 44 years. However, as discussed in González, Conde-Ruiz and Boldrin (2009), absent migration the dependency ratio would increase by 35% and the average age by three years. Figure 2 clearly shows not only that the population is aging but also that the cohorts of immigrants who entered within the last decade will retire at about the same time as the largest cohorts of natives.

Figure 2: Population Pyramids as Percentage of Gender Totals (Spain, 2008 and 2050)

(a) 2008 (b) 2050



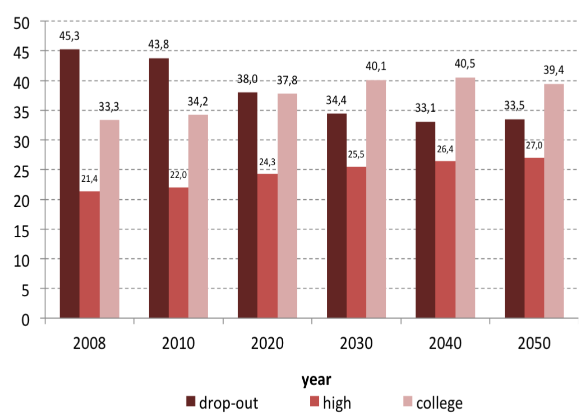
Source: Authors' calculation.

2.2 Projecting Education Levels (2006-2051)

The cohorts that are now entering the labor market for the first time have higher levels of education that those who are retiring, and this is especially relevant in the case of women. Because educational attainment is closely linked to labor participation, the projection of educational attainment levels is fundamental for estimating future pension liabilities. The scenario predicted for the period 2006–2051 is that of new cohorts reaching the same educational levels of the most educated cohort so far, which is the one born in 1975 (i.e., the total 32-year-old population in 2007).

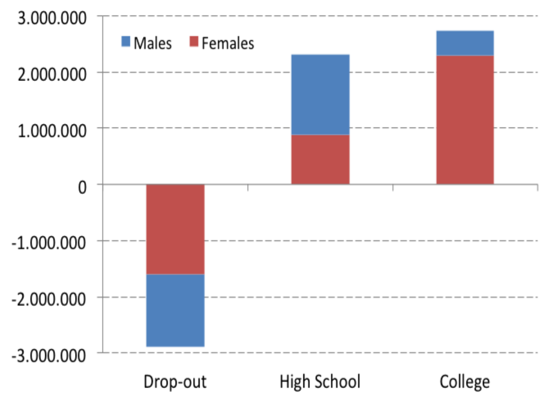
This would signify a major generational change, with the proportion of the labor force that is college educated rising from 33.3% in 2008 to 39.4% in 2050. At the same time, the proportion of those who achieve only a primary education would decline from 45.3% in 2006 to 33.5% in 2050 (see Figure 3).

Figure 3: Projected Evolution of the Distribution of Education Levels of Working-age Individuals (Spain, 2008–2050)



The result of this improvement in education could result in an increase, from 2008 to 2050, of 5 million people in the working-age population with a secondary or tertiary education; the number of those with only a primary education would decline by nearly 3 million people (see Figure 4). Much of this improvement would reflect a population of more highly educated women, whose numbers would increase by 28.2% (secondary education) and 43.2% (tertiary education). One can reasonably suppose that a large fraction of these 2.3 million better educated women will join the labor market.

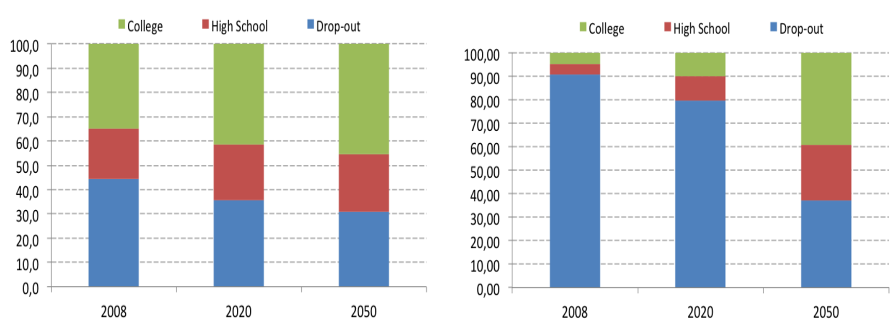
Figure 4: Projected Change in Working-age Population by Gender and Education (Spain, 2008–2050)



Additional evidence of the generational change that the Spanish population will experience in the coming decades is the percentage of working-age women with a tertiary education, which will rise from 34.9% in 2008 to 45.3% in 2050. The increase for those older than 64 is even more significant: from 4.9% to 39.3% (see Figure 5). If these projections are accurate then they bear important implications for labor markets and the pension system. In particular, as females become more qualified they should be entitled to higher pensions at retirement than were previous cohorts.

Figure 5: Projected Education Levels of Females (Spain, 2008–2050; percentage distribution)

(a) 16-64 (b) older than 65



3 Projecting Labor Market Factors (2006-2051)

In order to estimate future revenues and expenditures of the Spanish Social Security System, we must first establish the evolution of key macroeconomic variables up to the year 2051. This requires that we make assumptions about labor force participation, employment, labor productivity and wages growth rate, all depending on the heterogeneity of the agents. Our underlying assumption is that the ruling legislation will not undergo appreciable changes and so the contribution base will grow in parallel with wages, which in turn will increase to keep pace with the growth of labor productivity. In this sense we have adopted the same macroeconomic scenario used by the Spanish Ministry of Economy and Finance (see Table 2) in their joint work with the European Commission (EC) for the projection of long-term pension expenditures (European Commission, 2009c).

Table 2: Projected Macroeconomic Scenario (Spain, 2021–2051)

	2021	2031	2041	2051
GDP Real (growth rate)	3.1	1.7	0.9	1.1
Labor productivity (growth rate)	2.7	1.9	1.7	1.7
Participation rate (15-64)	75.7	76.5	77.2	77.6
Employment rate (15-64)	71.0	71.8	72.4	72.8
Unemployment rate (15-64)	6.2	6.2	6.2	6.2

The individual's level of education is a key element in relation with employability and labor market participation. Furthermore, education combines with previous work history to determine access to higher wages. For this reason, we assume that the Spanish population will undergo an increase of the proportion of high level education.

An individual in the working stage of life may be in one of five situations. As a starting point we use the microdata from the LFS to obtain individual heterogeneity differences. Individuals who are working can be either employees (denoted o_{ca}) or self-employed (o_{cp}); those out of the labor force either are students (denoted e), receive a disability pension (d), or are inactive (i). Unemployed individuals are simply unemployed (u). Individuals between 66 and 99 years old are assumed to be out of the labor force and either receiving or not receiving a pension (according to the rules determined by law).

We use $o_{ca,t}(j, g, e, c)$ to denote the percentage of employees at time t with characteristics (j, g, e, c). Similarly, $o_{cp,t}(j, g, e, c)$ denotes the percentage of self-employed, $u_t(j, g, e, c)$ the percentage of unemployed, $d_t(j, g, e, c)$ the percentage of those with a permanent disability pension, and $i_t(j, g, e, c)$

the residual percentage of inactive people. The data indicate that for natives the inactivity level is higher among women, although the difference is reduced within younger cohorts and inactivity decreases with education level. For all relevant age groups, activity rates are higher for immigrants than for natives.

It is expected that there will be a full integration of regimes in the future, as recommended the Toledo Pact Commission and it initiated by Spain's 2011 reform[3] into two main groups: the General Regime (Régimen General, RG) for employed people and the Special Scheme for Self-Employment (Régimen Especial de Trabajadores Autónomos, RETA) for the self-employed.

Also, for employed individuals the model incorporates the contract type (full- or part-time, permanent or temporary; by age, gender, education, and nationality) into the system's revenue forecast. This is necessary because (i) part-time contracts are more common among women and (ii) immigrant workers register a greater proportion of temporary contracts.

3.1 Labor Transitions

Having defined the situations in which individuals are found during their working-age years, we can use the labor market flows reported in the LFS microdata to obtain the transition probabilities among the five labor situations (o_{ca}, o_{cp}, d, u and i)—by age, gender, skill, and nationality—in each time period of their life cycle. Monte Carlo simulation is used to estimate the probability that an individual is in one of the five situations conditional on his situation in the *previous* period. The estimation process follows a finite-state Markov chain that for a set of individual characteristics (j, g, e, c) is homogeneous across workers and whose conditional transition probability matrix[4] is:

$$p_{ss'} = \Pr(s_{t+1} = s' s_t = s \mid j, g, e, c) \quad \text{for all } \; s, s' \in \{o_{ca}, o_{cp}, u, d, i\} \tag{4}$$

The transition probabilities so obtained are consistent with the observed snapshot for the year 2006. The estimated transition probabilities also incorporate aggregate evolution of the average employment rate from 65.6% in 2006 to 72.8% in 2051. Finally, we emphasize that the absence

[3]So far, employees of the Special Agricultural Scheme and the Domestic Employees Scheme have been integrated into the General Scheme.

[4]See González (2011) for further details.

of reliable data about immigrants has forced us to make the following choice when estimating the transition probabilities: immigrants are assigned the same transition probability matrix as the one estimated for natives.

3.2 Reconstruction of Work Histories

Our goal is to simulate contributions and pensions under well-defined scenarios, using the situation in 2006 as our starting point and taking into account the substantial individual heterogeneity captured by our model. Because we distinguish by age, gender, education, and nationality, there are 120 different groups (i.e., 12 groups × 10 periods) for which we must simulate their contributions to the system and their pensions upon retirement. Moreover, group members during their working life may be in any of five possible situations: employed, self-employed, unemployed, disabled, or inactive.

Thus there are 120 groups of individuals for whom we have a "real" work history in the past up until 2006 (as derived from the MCVL) and for which we can simulate a "virtual" work history in the future via Monte Carlo simulation using the transition matrices described previously. Joining these two work histories we obtain the full work histories of Spanish workers (both natives and immigrants) through 2051. We then apply the specific rules of the RG and RETA schemes to these labor histories (e.g., early retirement is not an option for the self-employed), and based on these completed histories we can forecast the revenues and expenditures of the Spanish Social Security System in future decades.

Given our macroeconomic assumptions along with the transition probabilities and working histories, we can calibrate the model to obtain the activity rate, employment rate, and unemployment rate for each group of individuals. The average employment rate[5] has been calibrated to make it compatible with the INE's demographic scenario and the macroeconomic scenario summarized in Table 2. Everything else is based on the assumption that Spaniards of the future will be, as far as the labor market is concerned, identical to Spaniards of the past—in other words, only their composition (in terms of age, gender, education, gender, and nationality) will change. Finally, we assume that future retirement patterns as well as the contribution bases of the different groups will be the same as those currently observed in the MCVL data.

[5]The total employment rate at time t is defined as

$$TE_t = \frac{\sum_{j=1}^{17} \sum_{g\in\{m,f\}} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} (o_{cp}(j,g,e,c) + o_{ca}(j,g,e,c)) Pop_t(j,g,e,c)}{Pop_t}.$$

3.3 Projecting System Revenues and Expenditures for the Period 2006–2051

The projection of employment histories by age, gender, education, and nationality allows us to forecast contributions to the system and hence its total revenues. In computing revenues we use the MCVL data to estimate, period by period, the growth rate of the average contribution base according to age, gender, education, and nationality; this estimate incorporates the assumed growth rate of wages, which corresponds to the productivity growth rate under the macroeconomic scenario. We assume that, within each of our 12 groups, contributions are uniform and equal to the estimated group average. We make two exceptions for those contributing to the RG scheme, one each for high school dropouts and for individuals with a college degree: we assume that dropouts contribute according to either the minimum or the average contribution; and we assume that college graduates contribute either the maximum or the average.

Using these assumptions, we obtain the mean contribution bases for each group in each period according to their age and education level: $\bar{b}_t^{ca}(j,e,g,c)$ and $\bar{b}_t^{cp}(j,e,g,c)$, where the indices *ca* and *cp* correspond (respectively) to the General Regime (RG) and the Self-Employed Regime (RETA). For unemployed workers we take into account the relevant rule which stipulate that contributions be based on the wages earned in the most recent employment spell after applying the appropriate "replacement" rate (70% for the first six months and 60% thereafter).

Total revenues then equal the sum of contributions from employed (ICS_t) and unemployed (IPD_t) individuals:

$$
\begin{aligned}
ICS_t = &\sum_{j=1}^{17} \sum_{g\in\{m,f\}} \sum_{e \int\{c,h,d\}} \sum_{c\in\{n,m\}} \bar{b}_t^{cp}(j,e,g,c) o_{cp}(j,g,e,c) Pop_t(j,g,e,c)\tau \\
&+ \sum_{j=1}^{17} \sum_{g\in\{m,f\}} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} \bar{b}_t^{ca}(j,e,g,c) o_{ca}(j,g,e,c) Pop_t(j,g,e,c)\tau; \qquad (5) \\
IPD_t = &\sum_{j=1}^{17} \sum_{g\in\{m,f\}} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} \left[(0,65)\bar{b}_t^{cp}(j,e,g,c) o_{cp}(j,g,e,c)\right] Pop_t(j,g,e,c)\tau. \qquad (6)
\end{aligned}
$$

Here τ denotes the contribution rate. As a benchmark we use the actual revenues in the baseline year (2006); we match these exactly by using LFS information to adjust the fraction of workers that are employed full- or part-time according to age, gender, education, and nationality.

Total system expenditures consist of the sum of retirement, widowhood, and disability pensions. In order to compute these expenditures, for each individual we need (i) the number of years of contribution, (ii) the wage earned (i.e., the contribution base), and (iii) the retirement age (65 or earlier).

Once we have estimated the entire employment histories of each of the 12 groups (taking into account differences in education levels), we know the contribution base and total years of contributions to the system. We then apply the current law to calculate the average pension for each group in each time period, $\bar{p}_t(j, c, g, e)$. Toward this end, we make the following additional assumptions.

- $\bar{p}_t(j, c, g, e) = \bar{p}_{t+1}(j + 1, c, g, e)$; this implies that mortality rates do not change as a function of pension level.
- For all j, e, g, c, let $\phi_t(j, c, g, e)$ be the percentage of individuals in that group who at that time has the right to receive a contributive pension. We assume $\phi_t(j, c, g, e) = \phi_{t+1}(j + 1, c, g, e)$, which implies that the mortality rate is the same for all retired individuals regardless of their matured right to receive a contributive pension.

Total expenditures due to contributive retirement pensions can now be written as follows:

$$PJ_t = \sum_{j=11}^{17} \sum_{g \in \{m,f\}} \sum_{e \in \{c,h,d\}} \sum_{c \in \{n,m\}} \bar{p}_t(j, c, g, e)\phi_t(j, g, e, c)Pop_t(j, g, e, c). \tag{7}$$

The total pension expenditure is expected to increase because future pensions are expected to be higher. This is because wages are higher (as they grow with productivity) and also because employment histories are expected to be longer, especially for women with higher education levels than their previous cohorts.

We now compute the expenditures due to survivors' pensions. Every period there is a number of new widowhood pensions, which coincides with the number of retirement pensions that disappear because of the spouse's death. So the expenditures due to the new widowhood pensions in period t is equal to:

$$PVa_t = \sum_{j=11}^{17} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} pva_t^m(j,e,c) + \sum_{j=11}^{17} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} pva_t^f(j,e,c); \tag{8}$$

here $pva_t^m(j,e,c)$ (resp. $pva_t^f(j,e,c)$) is the expenditure due to new survivor's pensions in period t originated by men (resp. women) with characteristics (j,e,c). That is:

$$\begin{aligned} pva_t^m(j,e,c) &= \beta\overline{p}_t\,(j,e,m,c)\,\phi_{t-1}\,(j,e,m,c)\,\chi_t\,(j,e,m,c)\,(1-\psi_{t-1}\,(j,m))\,Pop_{t-1}\,(j,e,m,c) \\ pva_t^f(j,e,c) &= \beta\overline{p}_t\,(j,e,f,c)\,\phi_{t-1}\,(j,e,f,c)\,\chi_t\,(j,e,f,c)\,(1-\psi_{t-1}\,(j,f))\,Pop_{t-1}\,(j,e,f,c) \end{aligned} \tag{9}$$

The parameter $\beta = 0.52$ is the ratio of the survivor's pension to the original contributive pension, and $\chi_t(j,e,g,c)$ is the percentage in each group that is either married or has a legally recognized partner. The latter values are obtained from Ahn and Felgueroso (2007).

When calculating expenditures due to widowhood pensions in a certain period T, we must also take into account the pensions generated in previous periods ($t < T$) whose recipients have survived until T. To simplify matters we assume that all couples are formed by individuals of the same age (and of opposite genders). Thus, the death of a married retiree results in a widowhood pension with survival period equivalent to the life expectancy of the surviving spouse.

The total expenditure on survivors' pensions is then:

$$\begin{aligned} PV_t = PVa_t + \sum_{T=1}^{17} \Bigg[&\sum_{j=11}^{17} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} pva_{t-T}^m(j,e,c)\psi_t(j+T,f) \\ &+ \sum_{j=11}^{17} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} pva_{t-T}^f(j,e,c)\psi_t(j+T,m) \Bigg]. \end{aligned} \tag{10}$$

Next, we assume that a pension for permanent disability cannot be obtained before age 50. Given the current legislation, this assumption allows us to compute that segment of total expenditures as follows

$$PI_t = \sum_{j=1}^{10} \sum_{g\in\{m,f\}} \sum_{e\in\{c,h,d\}} \sum_{c\in\{n,m\}} \overline{pd}_t(j,e,g,c) d_t(j,g,e,c) Pop_t(j,g,e,c), \qquad (11)$$

where $\overline{pd}_t(j,e,g,c)$ is the average disability pension for this group. Recall that disability pensions become retirement pensions at age 65, so in equation (11) we replace the disability pension with the retirement pension after the third period.

Now that we have estimated the expenditures attributable to each of the different pensions considered, total system expenditures can be written as

$$GT_t = PJ_t + PV_t + PI_t. \qquad (12)$$

The results indicate that, if current legislation and behavior continue unchanged, then total pension expenditures will increase over time and accelerate between 2026 and 2046, reaching nearly 19% of GDP in 2051 (see Table 3). The two principal causes of this trend are (i) the reaching of retirement age by the larger cohorts born during the Spanish baby boom and (ii) much of the immigrant population reaching retirement age at about the same time (their portion of the total increases throughout the projection period, and pensions expenditure paid to immigrants are estimated to be 4. 3% of GDP in 2051). The impact of aging is also evident; for example, the cohort that retires in 2040 will live longer than previous cohorts, thereby increasing the amount of future pension expenditures. At the same time, revenues could fall to 8.18% of GDP at the end of this period—precisely when the greater cohorts will be retiring.

Table 3: Projected Evolution of Social Security System's Revenues and Expenditures (Spain, 2016–2051; percentage of GDP)

	REVENUES					EXPENDITURES			
	TOTAL	RG	RETA	UNEMP		TOTAL	RET	WIDOW	DISAB
2016	9.21	7.85	1.03	0.33	2016	7.81	5.53	1.28	1.00
2021	9.15	7.82	1.04	0.29	2021	8.57	6.39	1.15	1.03
2026	9.04	7.72	1.03	0.29	2026	9.97	7.80	1.12	1.05
2031	8.86	7.56	1.01	0.29	2031	11.56	9.37	1.13	1.06
2036	8.65	7.37	0.99	0.29	2036	13.64	11.32	1.28	1.04
2041	8.45	7.20	0.96	0.29	2041	16.13	13.61	1.50	1.02
2046	8.30	7.08	0.93	0.29	2046	18.31	15.63	1.72	0.95
2051	8.18	6.98	0.91	0.29	2051	18.95	16.13	1.93	0.89

Total expenditures could reach 19% of GDP in 2051, a figure in line with other papers that have made projections for the Spanish Pension System. For the year 2050, these expenditure projections range from 14.6% to 19.6% of GDP with a mean value of 17.2% (see Table 4).

Table 4: Projected Expenditures of Social Security System (Spain, 2050 and 2060; percentage of GDP)

	2050	2060
European Commission (2009a)	15.5	15.1
MTIN (2008b)	15.3	14.1
Jimeno (2000) (revised in Jimeno et al. (2008))	19.6	
Rojas (2005)	19.4	
Díaz-Saavedra (2005)	19.0	
Jimeno et al. (2008)	18.1	
de la Fuente and Doménech (2009)	18.1	18.6
Balmaseda et al. (2006)		17.9
Sánchez-Martín and Sánchez-Marcos (2009)	17.8	
Jimeno (2002)	17.6	
Alonso and Herce (2003)	17.2	
Herce and Fernández (Dir.) (2009)	15.9	15.2
Moral-Arce et al. (2008)	15.5	
Gil et al. (2008)	14.6	

The official projections of expenditure that are available for Spain are those from the European Commission in 2009 and the Spanish Ministry of Labor (Ministerio de Trabajo e Inmigración, MTIN) in 2008. According to the EC, Spain would see an increase in pension expenditures of 6.7 percentage points of GDP between 2007 and 2060, which means that they would reach 15.5% of GDP in 2050 (15.1% of GDP in 2060) (European Commission, 2009a). In 2008, MTIN published the National Pensions Strategy (Estrategia Nacional de Pensiones), which includes estimates of revenues and expenditures. These estimates show pensions reaching 15.3% of GDP in 2050 (14.1% of GDP in 2060) (MTIN, 2008a,b). Absent reform, it is expected that the first system deficit would occur in 2023, after which it would be necessary to use de Reserve Fund.

4 The 2011 Spanish Pension Reform

Spanish Pension System reform was approved in July 2011. Changes beginning in 2013 will enable full phase-in of the new system by 2027. The minimum contribution period for pension eligibility remains 15 years and the main changes affecting retirement pension are as follows:

- *Replacement rate.* Number of years required to reach 100% of the reference wage increased from 35 to 37 years of contributions.
- *Reference wage.* Extension of the number of contribution years for calculation of the reference wage increased from 15 to 25 years.
- *Retirement age.* Statutory retirement age raised from 65 to 67 years (although workers who have contributed for at least 38.5 years are entitled to a full pension at age 65). The early retirement is delayed from 61 to 63 years, however eligibility is limited to workers with at least 33 years of contributions and it its applied a penalization coefficient. Special retirement at age 64 is eliminated, and voluntary extension of working life is encouraged via annual bonuses of between 2% and 4% (depending on the total number of contribution years).
- *Sustainability factor.* This factor was introduced by the reform in order to ensure the pension system's long-term viability. Beginning in 2027, the basic parameters of the system will be revised every five years to reflect the difference between the life expectancy at age 67 in 2027 and in the year of revision.

4.1 Changes in the Replacement Rate

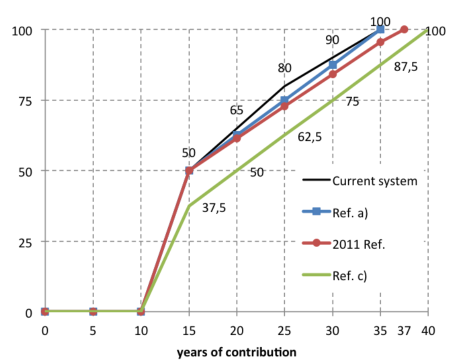
The pension amount is determined by the reference wage and the percentage applied to it (the percentage varies as a function of the worker's number of contribution years). Before the 2011 Reform, the minimum contribution (15 years) entitled the pensioner to 50% of the contribution base; that amount increased by 3% for each additional year of contribution to reach the 80% with 25 years of contribution. From this point increases are 2% per contribution year up to reach the 100% with 35 or more years. This scale originated in 1997 with the Law 24/97 of Consolidation and Rationalization of Social Security; before that time, the rate was 60% for 15 years of contributions and increased 2% each additional year up to a total of 35.

The reform of 2011 increases the number of contribution years required to receive 100% of the contribution base (from 35 to 37 years) and employs a proportional scale that begins at 50% (with 15 years of contributions). A novel aspect of the reform is to count contributions by months (instead of rounding off to completed years). Thus, after 15 years of contributions the new scale adds 0.19% for each additional month (up to 35 years and 8 months); after that it adds 0.18% per month until 37 years, when the scale reaches 100%.

To evaluate the impact of this measure, we have evaluated three possible changes in the replacement rate, including the new scale enacted by the 2011 Reform. Results for the following values are plotted in Figure 6.

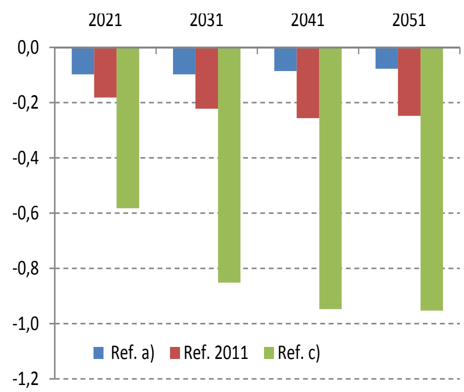
1. *Reform (a).* Linear scale between 50% for 15 contribution years and 100% for 35 years, where 2.5 percentage points are added per contribution year.
2. *Reform (b).* Linear scale, following the 2011 Reform, between 50% for 15 contribution years and 100% for 37 years.
3. *Reform (c).* Linear scale with 2.5 percentage points per contribution year between 37.5% for 15 contribution years and 100% for 40 years.

Figure 6: Replacement Rate Scenarios (%)



The results of these three possible changes in terms of pension expenditures are shown in Figure 7. Applying the linear scale over the same range, as in Reform (a), would yield a savings of 0.1 percentage points (p.p.) of GDP every year over the projected period. Applying the new scale approved in 2011, Reform (b), yields an average annual savings for the system of 0.2 p.p. of GDP. Had the reform been more demanding and required 40 contribution years for 100% of the reference wage, as in Reform (c), then the savings could amount to as much as a full percentage point of GDP in 2050.

Figure 7: Reduction in Pension Expenditures by Reform Scenario (p.p. of GDP)



Any of these three reform options would entail a reduction in system generosity (i.e., mean pension divided by mean productivity) and in the mean pension compared with the baseline scenario, see Table 5. Specifically, under the 2011 Reform the mean pension in 2051 will be 1.5% less than under current guidelines.

Table 5: Change in Generosity and Retirement Pension for Year 2051 by Reform Scenario

	Baseline scenario	Reform (a)	(b) (2011 Reform)	(c)
Generosity (retirement and widowhood)	0.236	0.235	0.232	0.223
Retirement pension (%)		−0.5	−1.5	−5.6

4.2 Changes in the Reference Wage (Period of Calculation)

Since 1997, the number of years considered when calculating Spanish pensions has been 15. Initially the system considered only two years, which in 1985 was extended to eight years. The 2011 Reform will incorporate 25 contribution years when calculating the pension's reference wage.

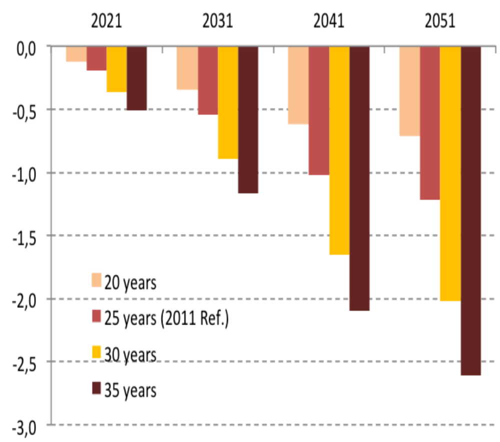
Extending this period of calculation will achieve greater proportionality, which will help rationalize the connection between an individual's system contributions and pension received. According to the extant literature, incorporating more years in the calculation should reduce pension expenditures. The consensus is that a change from 15 to 20 years would reduce system expenditures by 0.6 percentage points of GDP; including the individuals entire working life (i.e., 35 or more years) would yield a reduction of almost 3 p.p. See Table 6) for a more complete listing.

Table 6: Change in Pension Expenditures by Number of Contribution Years Included in the Calculation (p.p. of GDP)

Period of calculation	2050		2060	
20 years	−0.3	Alonso and Herce (2003)		
	−0.7	Da-Rocha and Lores (2005)		
	−0.9	Díaz-Gimenez and Díaz-Saavedra (2009)		
25 years	−0.8	Alonso and Herce (2003)		
	−1.6	Da-Rocha and Lores (2005)		
30 years	−1.7	Sánchez-Martín (2001)	−1, 4	Sánchez-Martín (2001)
	−1, 3	Alonso and Herce (2003)		
	−2.7	Da-Rocha and Lores (2005)		
	−0.9	Jimeno et al. (2008); Jimeno (2000)		
	−1.9	Jimeno et al. (2008); Jimeno (2003)		
35 years	−1.9	Alonso and Herce (2003)		
	−3.6	Da-Rocha and Lores (2005)		
Whole working history			−2.7	Balmaseda et al. (2006)
			−3.3	Díaz-Saavedra (2005)

With respect to the 2011 Reform our results show, in line with other studies, that system costs are decreasing in the number of years used to calculate pension benefits. In comparison with the base year, expenditures in 2051 would be lower: (i) by 0.7 percentage points of GDP if the calculation period were extended to 20 years; (ii) by 1.2 p.p. if extended to 25 years (as in the 2011 Reform); and (iii) by 2.6 p.p. if extended to 35 years (see Figure 8).

Figure 8: Effect of Changes in Period of Calculation on Pension Expenditures (p.p. of GDP)



The system's generosity is likewise decreasing in the number of years used to calculate benefits. In the baseline case this generosity (i.e., mean pension divided by mean productivity) in 2051 would be 0.236, versus only 0.220 for the 25-year calculation. Extending the calculation period from 15 to 25 years would also reduce the average pension in 2051 by 7.2% comparing with the baseline scenario (see Table 7).

Table 7: Change in Generosity and Retirement Pension for Year 2051 by by Calculation Period

	Period of calculation (years)				
	15	20	25 (2011 Reform)	30	35
Generosity (retirement and widowhood)	0.236	0.226	0.220	0.209	0.202
Retirement pensions (%)		−4.2	−7.2	−11.9	−15.4

4.3 Changes in the Retirement Age

In Spain, the retirement age was set at 65 by the 1919 Worker Retirement law and this parameter of Spanish pensions has not been modified since then. The rationale for increasing the retirement age is that a higher age more accurately reflects current life expectancy and modern life cycles. This change not only extends the labor period (increasing revenues, since then there are more contributions to the system) but also shortens the retirement stage (reducing expenditures on pensions).

The 2011 Reform, which becomes effective in 2013, postpones the retirement age from 65 to to 67 years (though it remains 65 for workers who have contributed for at least 38.5 years). The years 2013–2027 constitute the transitional period during which the retirement age increases by one month per year through 2018 and by two months per year from 2019 through 2027. The requirement of 38.5 years of contribution to be pensioned at age 65 will occur also in the transitional period between 2013 and 2027 by three months per year. The reform includes incentives to delay voluntary retirement. In particular, for each additional contribution year, the retiree's pension is increased: by 2% per year for fewer than 25 contribution years if the retiree is at least 67 years old; by 2.75% per year for 25–37 contribution years if the retiree is at least 67; and by 4% per year for workers with a complete career (38.5 years) and people older than 65 or 67 years old.

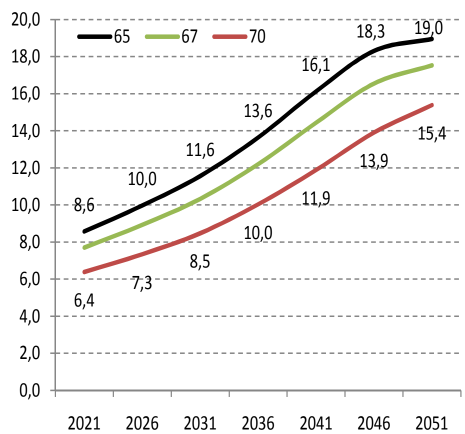
Academic papers that address delaying the retirement age in Spain indicate that doing so would reduce pension expenditures and also postpone the first system deficit. A retirement age of 70 could yield expenditure savings of 6.4 percentage points of GDP in 2050 (Da-Rocha and Lores, 2005) and of 4.2 p.p. in 2060 (Balmaseda et al., 2006). According to de la Fuente and Doménech (2009) it would suppose the reduction of the rate of return of the system in 52 basic points. Extending the retirement age to just 67 years would still generate savings of 3.4 percentage points of GDP in 2050 (Sánchez-Martín, 2001). According to Díaz-Gimenez and Díaz-Saavedra (2009), delaying normal retirement to age 68 (and "early age" retirement to 63) would delay the first system deficit by 14 years (from year 2016 to 2030).

We evaluate two possible reforms: (i) delaying normal and early retirement to age 70 and 66, respectively ("Reform 70"); and (ii) delaying normal and early retirement to age 67 and 63, respectively ("Reform 67"). The results for Reform 67 give us an upper bound on outcomes of the 2011 Reform. We remark that two special provisos of the enabling legislation will influence policy effectiveness: as mentioned previously, workers with at least 38.5 contribution years will still be able to retire age 65; also, workers whose retirement was caused by crisis or business closure may start receiving benefits at age 61. However, in this exercise we assume that all workers retire at age 67 (see Section 6 for what is implied by that assumption).

First we have made the assumption that the retirement age is delayed until age 70 assuming that the legislation concerning the calculation of the pension remain the same. The employment rates for those of age 65–69 are assumed equal to those now observed for those aged 60–64, and likewise for the contribution bases (always according to the model's heterogeneity). Similarly, we assume that the oldest workers in this scenario are no less productive than workers who are five years younger. These assumptions imply that, when we extend their labor histories they incorporate the same probabilities as before of being in each of the model's five different situations, in accordance with their gender and education level. Finally, early retirement is delayed by the same number of years, so now it occurs within the range of 66–69 years old (instead of age 61–64); with respect to the pension amount paid, the same penalties as before apply to taking early retirement. All these assumptions hold as well for our simulations of delaying retirement until age 67 except that the difference is only two years (not five).

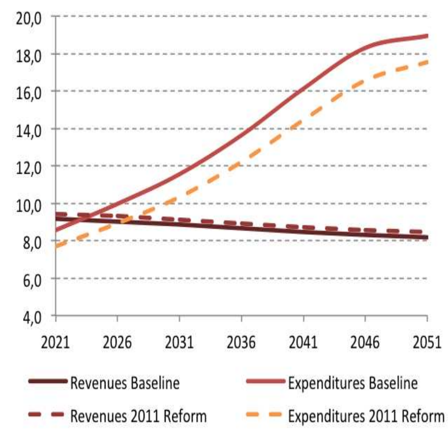
In short: raising the retirement age to 70 years would reduce pension expenditures by as much as 3.5 percentage points of GDP in 2051 when compared with the baseline scenario (see Figure 9); raising it to 67 would result in a reduction of 1.4 percentage points.

Figure 9: Projected Pension Expenditures by Year as a Function of Retirement Age (2021–2051, percentage of GDP)



Delaying the retirement age will naturally increase GDP because more individuals will be working, and we account for this fact when calculating the results presented here. This reform affects both expenditures and revenues. Absent any other changes, the Reform 67 scenario affects system expenditures and revenue both. Figure 10 shows that, by 2051, expenditures would be 1.4 percentage points of GDP less and revenues would be 0.3 p.p. more. Increasing the retirement age to 67 years would have the additional benefit of postponing the pension system's first deficit by four years.

Figure 10: Projected Revenues and Expenditures by Year as a Function of Retirement Age: Baseline Scenario (age 65) versus 2011 Reform (age 67) (2021–2051, percentage of GDP)



4.4 Global Analysis of the 2011 Reform

The reform passed in 2011 will change three parametric elements simultaneously: the replacement rate, the calculation period, and the retirement age. In preceding sections we have described the estimated impact of each reform in light of the INE-2005 demographic scenario. The three reform elements in the legislation correspond to an overall savings of 2.87 percentage points of GDP in 2051. There are two reasons why this figure should be the upper bound. First, we do not account for all the allowed exceptions because we lack sufficient information about them. Second, we cannot apply the sustainability factor because details of its calculation are not yet known.

Had the reform been more demanding and the three parameters would be extended up to a maximum—that is, if it had required 40 years to reach 100% of the reference base, extended the calculation period to 35 years, and increased the retirement age to 70—then the total reduction in pension expenditures would amount to 7.07% percentage points of GDP. See Table 8, in which the proposal just described is referred to as the “Max” reform.

Table 8: Change in System Expenditures under Reform (2050, p.p. of GDP)

	Conde-Ruiz & González (2012)	MEH (2011)	BdE (2011)
REPLACEMENT RATE			
Linear up to 37 years (min 50% with 15 years, 2011 Reform)	−0.25	−0.3	−0.7
Linear up to 40 years (min 37.5% with 15 years, Max reform)	−0.95		
PERIOD OF CALCULATION			
25 years (2011 Reform)	−1.22	−1.0	−1.7
35 years (Max reform)	−2.61		
RETIREMENT AGE			
67 years (2011 Reform)	−1.40	−1.0	−0.9
70 years (Max reform)	−3.51		
TOTAL			
2011 Reform	−2.87	−2.3	−2.9
Max reform	−7.07	Adj. for GDP: −0.2	
		Sust. factor: −1.0	

These results are substantially similar to the assessment made by the Spanish Ministry of Economy and Finance (MEH) and the Bank of Spain (Banco de España, BdE). In particular, MEH (2011) projects savings of 2.5 percentage points of GDP—plus an additional point if the sustainability factor is applied (so that the total savings in 2050 would be 3.5 p.p.). The Banco de España (2011) obtains a total savings of 2.9 p.p. using a general equilibrium model with overlapping generations and the Eurostat demographic scenario EUROPOP2008. This estimate indicates that the three changes could reduce by 43% the total increase in pension expenditures for the period 2009–2050 projected by the EC (6.7 p.p. of GDP).

The impact of reform has also been explored by several academic authors. For example, de la Fuente and Doménech (2011) estimate expected savings amounting to 3.25 percentage points of GDP in 2050; that value rises to nearly 4.0 p.p. when the reform's retirement age exceptions are disregarded. Díaz-Gimenez and Díaz-Saavedra (2010) report that raising the retirement age by two years, when combined with extending the calculation period to 25 years, could yield savings of 2.8 p.p. of GDP in 2050.

4.5 Impact of the 2011 Reform on Average Pensions

The three modifications adopted in the 2011 Reform could reduce pension expenditures by nearly 3 percentage points of GDP, resulting in savings equivalent to a full third of the expected increases through 2051 (we assume that the system undergoes no adjustments on account of the sustainability factor).

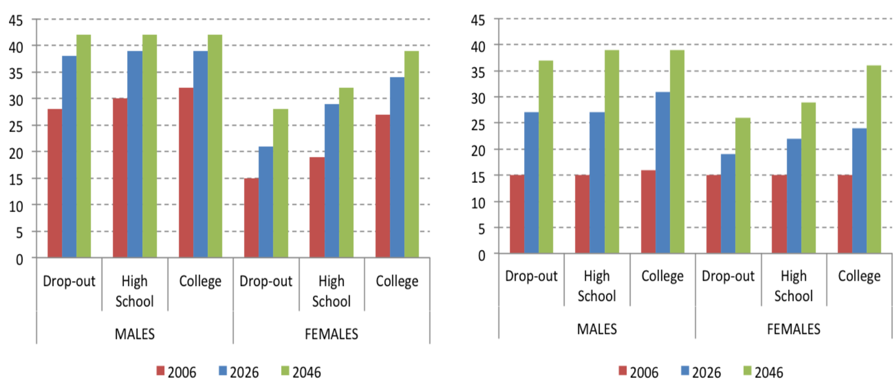
The model developed in this paper enables an aggregated analysis of the evolution of pension expenditures. In addition, it allows us to trace the reform's implications on an individual basis—in other words, to identify winners and losers in terms of the (heterogeneous) workers' characteristics codified in Section 2.

As regards the average pension in 2051, changes in the replacement rate would lead to declining values for both native and immigrant women—despite increases in their rate of labor market participation and length of employment history. The average number of contribution years exceeds 37 only for those women with tertiary levels of education, as shown in Figure 11. That explains why this group would have a smaller decrease compared with the absence of reforms (−0.8% and −2.1% for natives and immigrants, respectively); see Table 9. In contrast, men are not much affected by this modification, since their labor histories exceed 40 years in 2050 regardless of education level.

Figure 11: Total Years of Contribution by Year of Retirement, Gender, and Education Level

(a) Natives

(b) Immigrants



Regarding the period of calculation, the individuals most affected by reform are natives (both men and women), whose pensions might be reduced by 10% versus in the absence of reforms. This result is due to the different labor histories typical of natives and immigrants. Because the wage curve is flatter for immigrants, extending the calculation affects them less than it does native workers.

Table 9: Changes in Average 2051 Pension Amounts Due to Reform by Gender, Nationality, and Education Level

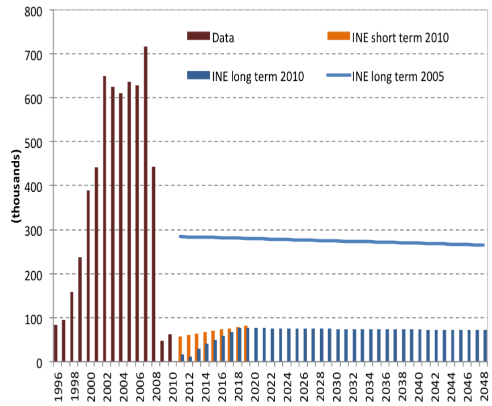
			Replacement rate	**Reference wage**
MALE	NATIVE	drop-out	0.0	-10.8
		high school	0.0	-10.3
		college	0.0	-7.7
	IMMIGRANT	drop-out	-0.9	-7.0
		high school	-0.4	-6.1
		college	-0.6	-8.1
FEMALE	NATIVE	drop-out	-3.4	-5.4
		high school	-4.9	-10.5
		college	-0.8	-8.1
	IMMIGRANT	drop-out	-4.0	-4.7
		high school	-5.7	-8.2
		college	-2.1	-8.4

5 Evaluating Different Migration Scenarios

Net migration flows in Spain have diminished significantly in recent years, a trend that leads us to describe the INE-2005 demographic scenario as "generous" with respect to the migration hypothesis. Since 2009, the inflow of immigrants arriving Spain has been reduced. As a result, Spain's net migration in 2009 and 2010 amounted to only 47,000 and 62,000 people, respectively, compared with 716,000 in 2007 and 443,000 people in 2008.

The INE has therefore published a new demographic projections considering a reduced migration flow in its latest long-term projection (INE, 2010). Under this new scenario, the increase in Spain's population due to immigration might total only 2.7 million people—far fewer than the 11.2 million of the previous scenario. In addition, the INE has begun to publish annual short-term (10-year) projections, of which the most recent covers the period 2010–2020. These recently published scenarios (both short- and long-term) reflect extremely conservative assumptions about net immigration as compared with the INE-2005 scenario (see Figure 12).

Figure 12: Observed and INE Projected Net Migration (Spain, 1996–2050)



This change in the migration hypothesis has important implications for demographic projection. According to projections derived from the new scenario, by 2050 the total foreign population in Spain should reach 11.7 million—little more than half of the 23 million previously projected. The difference between the two scenarios is that the working-age immigrant population would grow by just 2 million, compared with the 10.6 million originally predicted. One consequence of this decline is that the dependency ratio (see Section 2.1), which is less than 50% in 2050 when calculated based on the 2005 projections, could rise to more than 60% when calculated based on the revised demographic projections in (INE, 2010). A smaller working-age population affects the job market because it reduces the potential number of workers as a fraction of the population over 15 years. These findings highlight the importance of immigration in projections of total population. The baseline projection used here is based on the INE-2005 demographic scenario in order to obtain comparable results with the vast majority of existing research. However, that scenario is ones optimistic scenario. Given the significance of migration for both demographic and labor projections, we forecast system revenues and expenditures under two additional demographic scenarios as well as the previously used (INE-2005).

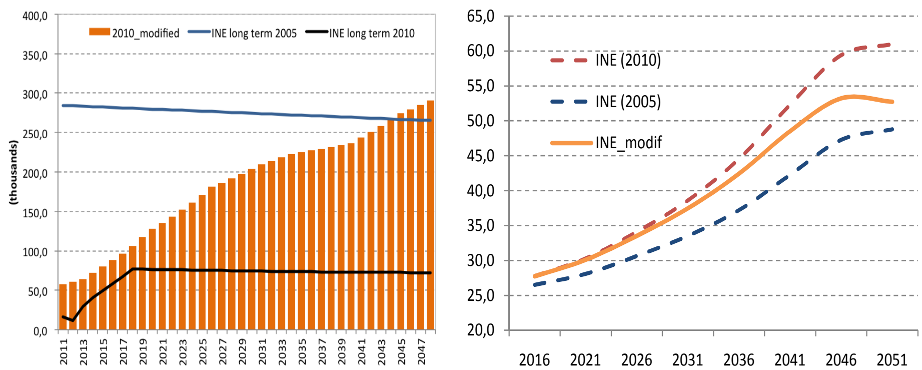
- *a pessimistic migration scenario* (INE-2010), which combines the most recent migration scenarios published by the INE for the short-term forecast for 2010–2020 and the long-term forecast for 2021–2051;
- *an intermediate migration scenario* (INE-2010_modified), that estimates a net flow linked to the need of the economy of employees in relation with the population over 15 years, in order that this ratio remains no less than the average of 48.1% observed over the past 10 years.

Figure 13 compares these three migration scenarios in terms of their implication in the dependency ratio. In the decades to come, if current patterns of fertility and mortality persist then the proportion of the elderly will increase in any case—but much more so under lower immigration. Compared with a 2051 dependency ratio of 48.7% in the optimistic scenario, the ratio in the intermediate and pessimistic scenarios is (respectively) 52.7% and 61%.

Figure 13: Alternative Migration Scenarios

(a) Net migration flows

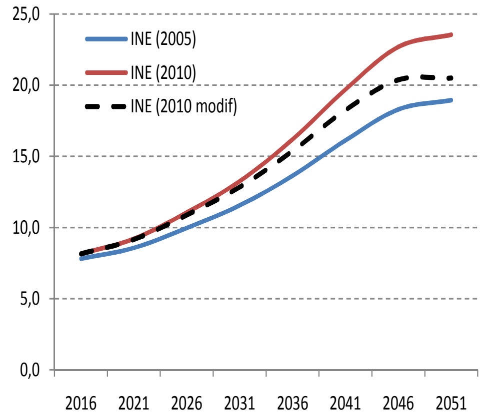
(b) Dependency ratio (%)



We also project pension expenditures under the INE-2010 and INE-2010_modified scenarios in order to assess the impact of migration flows. The effects of migration extend beyond demographics, since less net immigration reduces the number of potential employees and hence the GDP. Under the INE-2010 scenario, the ratio of number of employed persons relative to the population over 15 years would fall over time, so INE-2010_modified proposes that this ratio be constrained to exceed the average value (48.1%) observed in the last 10 years. In this intermediate case, then, there would be fewer workers than under INE-2005 but never fewer than 20 million.

Performing the projection exercise once again, we find in the pessimistic (INE-2010) scenario that 2051 pension expenditures are 4.6 percentage points of GDP higher than in the baseline (INE-2005) scenario. Thus, pension expenditures under these two INE scenarios range from 18.95% to 23.50% of GDP. Under the intermediate scenario (INE-2010_modified), these expenditures would be 20.48%—in other words, about 1.5 percentage points higher than under the baseline scenario; see Figure 14.

Figure 14: Projected Pension Expenditures as a Function of Immigration Scenario (2016–2051, percentage of GDP)



The European Commission ran simulations under the extreme assumption of zero migration flow and it reached the same conclusion: in the long run, lower migration flows result in spending a greater portion of GDP on pensions. Specifically, the EC finds that under zero migration the pension expenditures in Spain would be 3.6 percentage points higher in 2050 (European Commission, 2009b).

Finally, we analyze the 2011 Reform's impact under the intermediate migration scenario (INE-2010_modified). In this case the potential savings of the reform could be slightly higher. In particular, a savings of 2.98 percentage points of GDP would result from carrying out the 2011 Reform (and of 7.29 p.p. under the maximum reform described in Section 4.4).

6 Discussion and Conclusions

It was a demographic crisis, not the economic crisis, that made it absolutely necessary to reform the Spanish pension system. The 2011 Reform introduced important changes aimed at improving the system and its viability. This is the most substantial pension reform in Spain since "Law 26/2985" in 1985, and an especially positive aspect is that it was achieved through the Social Dialogue.

In this paper we estimate that the reform approved in 2011 could reduce pension expenditures by 3 percentage points of GDP in 2051. This result is in line with government projections, including the Stability Program for Spain (Programa de Estabilidad España), 2011–2014 (MEH, 2011) and the Bank of Spain's 2010 Annual Report (Banco de España, 2011).

We emphasize that the results obtained in this paper represent an upper bound on the impact of the reform's three main changes—in replacement rate, reference wage, and retirement age—because there are several exceptions to the shift in retirement age from 65 to 67. For example, we assume that all workers postpone their retirement age by two years even though that provision applies only to workers who have not yet contributed to the system for 38.5 years; according to MCVL data, more than the half of those retiring now have more than 38.5 years and thus are not affected by the reform. There are also exceptions to the increase in early retirement age (from 61 to 63 years). In addition, the new law provides for retirement at age 61 in "crisis" situations, but the exact criteria are unknown and so we could not estimate the proportion of workers retiring at that age. If these exceptions are all generalized to a large number of workers, then the impact of the reform measures would imply less impact than indicated by the results obtained in this paper.

That being said, we did not evaluate one element whose effect could be significant: the reform's introduction of a "sustainability factor" starting in 2027. We did not incorporate this adjustment because the law gives no details concerning its application. The enabling legislation states only that the system's basic parameters will be revised every five years as a function of the *difference* between official government forecasts of (a) life expectancy at age 67 in the year of revision and (b) life expectancy at age 67 in 2027.

Deploying this sustainability factor may be a first step toward transforming the system from a defined *benefit* system to a defined *contribution* pension system where pension amounts are not known in advance and are linked to life expectancy at 67 years. We view the introduction of this factor as a crucial measure for enabling the system to adapt "automatically" in response to future developments, but the details should be established as soon as possible in order to eliminate all uncertainty about how pensions will be affected. This is important not only for evaluating the system but also for enabling workers to plan their work lives and savings plans for the retirement period.

The demographic scenario published by the INE in 2005 is based on the "optimistic" assumption that average net migration will amount to 270,000 annually. More recently, the INE published revised demographic scenarios, for both the short and long term, that reduce the expected number of immigrants arriving in Spain to an average of only 73,000 annually. Pension expenditures in 2051 under these two demographic scenarios would be (respectively) 18.95% and 23.5% of GDP. Under an intermediate scenario (which we propose as INE-2010_modified), pension expenditures would be 20.5% of GDP and the system savings would be slightly greater with the 2011 Reform than without it (baseline scenario). With respect to average pension amounts, the 2011 Reform's changes to the replacement rate and the period of calculation should lead to lower amounts in 2051 than would the baseline case of no pension reform. More specifically, our model's incorporation of heterogeneous agents allows one to conclude that women are the group most negatively affected by changes in replacement rate and that native workers are the group most negatively affected by changes in the period of calculation (reference wage).

In sum: despite the acknowledged limitations of our analysis, we believe this paper indicates that the 2011 Reform of the Spanish Pension System has led it in the right direction establishing a viable transition to the system's eventual final reform. For this purpose is necessary not think of the pension system as a income replacement mechanism and start thinking of it as an insurance against the risk of longevity. We believe that with the 2011 Reform, it will be easier to move towards a Defined Contribution Model with Notional Accounts similar to the Swedish NDC system as experts advocate. In order to be possible this change: i) the pension must be proportional to the contributions actually made throughout working life; ii) the retirement age should be postponed but in a flexible way and pension should depend on life expectancy at the time of retirement, and iii) to face new demographic and socioeconomic changes, the pension system must contain elements of automatic adjustment.

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