Projecting Pension Expenditures in Spain: On Uncertainty, Communication and Transparency *

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Abstract

In this paper we suggest a set of indicators about the future performance of the Spanish public pension system and a suitable method of representing their uncertainty, in order to improve the communication to the public opinion about its main future challenges. Spain seems a particularly interesting case in Europe to illustrate our proposals, since the social security system has been in surplus for nine consecutive years, in sharp contrast to the projections made just a decade ago, but, at the same time, most projections foresee for Spain one of the highest increases in public expenditure among EU countries due to ageing. We argue that simple, transparent, credible, public and periodic indicators, which take explicitly into account the uncertainty about future demographic, economic and institutional developments, may contribute to improve the debate on the policies needed to strengthen the pension system.

Keywords: pensions, projections, communication, uncertainty.
JEL Classification: E17, H55.

1. Introduction

Most countries, industrialized and emerging ones, make projections of their main public revenue and expenditures. In some cases, these projections respond to institutional commitments with supranational institutions (for example, in the case of the EU countries, with the European Commission). However, in most of them public finances projections

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are the natural outcome of responsible governments who try to anticipate their future challenges in terms of sustainability faced by their budgets, as well as to evaluate the impact of potential reforms.

During the last decades, there has been an outstanding progress in forecasting methods, thanks to new theoretical and empirical models, to the diffusion of databases and to the availability of more powerful and efficient computation techniques. A particularly rich area of research has been related to ageing projections and its impact on budgetary balance and agents' behaviour. The consensus reached within the academic community on the need of social security reforms has not sufficiently fostered a public debate on their alternatives. This imbalance can be explained by, at least, two factors. First, it may reflect a significant lack of knowledge among non-specialists about the progresses in the literature on these topics, probably due to an overly technical presentation of the results. Most of the surveys confirm this assumption. Secondly, many policy makers and citizens share a high degree of scepticism about long-term projections of the public pension system.

The empirical evidence shows clearly that the lack of knowledge about very relevant features of the welfare state is a serious problem in many advanced economies. For example, Boeri, Börsch-Supan and Tabellini (2001) surveyed population from France, Germany, Italy and Spain on their welfare states (mainly on unemployment benefits and pension systems) and on various reform options, and showed that the overall degree of misinformation about the pension system was undoubtedly high. Between 21.0 per cent (Germany) and 50.8 (Spain) per cent of respondents did not know how much of their wage was devoted to pay for public pensions (see Figure 1). The Spanish case is particularly troublesome. The percentage of non respondents is the highest among the four countries. And, among those who answered, the proportion who knew the number approximately right is the lowest (28 per cent vs. 64 per cent in Italy). In sum, less than 14 per cent of Spaniards knew the social security contribution rate, which represents half of the figure in France, and one third of the Italian one. Overall, results show that people tend to ignore or underestimate the costs of public pension system. Additionally, Boeri, Börsch-Supan and Tabellini (2002) asked Germans and Italians about how their pension systems worked. Only 40.5 per cent realized that, as the pay-as-you-go principle states, all their contributions finance current pension expenditures, not their future benefits (59.5 per cent thought that part of their contributions went into a pension fund). Similar figures were obtained for Italy by Boeri and Tabellini (2005). And, given the track record, in the best scenario French and Spanish figures would have been probably not lower. In spite of it, when asked, population expresses a strong desire to be informed on economic matters, as

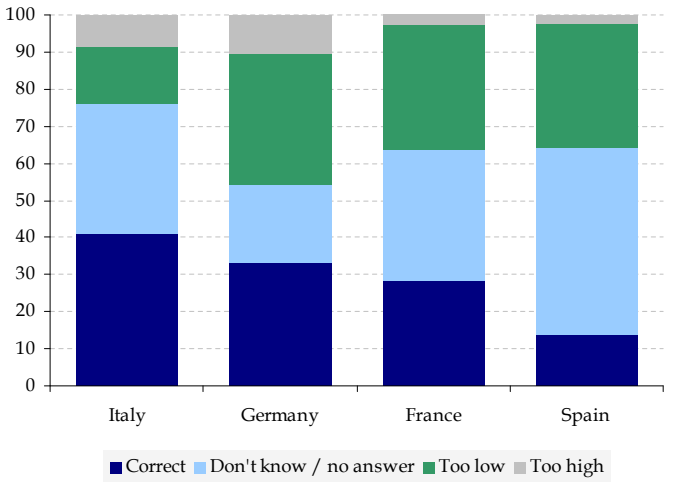

Figure 1: *Knowledge about the pension contribution rate. Data source: Boeri, Börsch-Supan and Tabellini (2001).*

Herce and Pérez-Díaz (1995) showed for Spain. This case seems particularly important. In 1995, after agreeing on the challenges of the public pension system, and on the basic lines of reform, all the political parties in Spain also agreed not to debate on pension issues during the political campaigns before elections, in order to avoid populist approaches. Since then, the public debate is limited to social dialogue and to a parliament permanent commission. Survey shows that 58 per cent of respondents considered that this agreement was negative. In a similar line, Blinder and Krueger (2004) show, based on a survey in the US, that only 3 per cent of people consider that being well informed about major economic policy issues is not important.

This lack of information about the pension system is one of the reasons behind the scarce debate and support for a reform agenda in many countries, even in those facing significant future challenges due to ageing. In fact, recent evidence shows that the political support for reforms increases (or, at least, their opposition decreases), as long as the projections and the reforms are well explained to and understood by citizens, irrespectively of their age (and, therefore, overcoming the consequences of the ageing of the median worker). An illustrative case is the 2007 Europe-wide Deliberative Poll.[2] In October 2007, more then 350 people from the 27 countries of the EU debated on economic, social and

[2] See www.tomorrowseurope.eu

foreign policy issues at the European Parliament during three days. One of the topics referred to the public pension system, its prospects and reform scenarios. Initially, two thirds of participants opposed to raise the retirement age (vs. 26 per cent who favoured this reform, and 8 per cent who neither favoured nor opposed). After three days of discussions and seminars with independent experts on the issue, the opposition to raising the retirement age (the most effective alternative according to all the empirical studies and the most unpopular one according to several surveys) was reduced 24 points (of which, 21 points thanks to a reduction of people who opposed strongly), down to 42 per cent (Figure 2). Therefore, after gathering information about the situation and the prospects of the pension systems in Europe, there were almost as many favourers (40 per cent) as opponents.[3] Boeri and Tabellini (2005) found similar results in the case of Italian citizens. The willingness to accept reforms that reduce its generosity (such as raising the retirement age and cutting pension benefits), was significantly higher among individuals who were more informed about the costs, sustainability and basic functioning of the Italian pension system (precisely, about its financial current position, the pay-as-you-go functioning and the social security tax rate)[4]. Besides, Chan and Stevens (2008) highlighted that the retirement behaviour is directly related to individual's level of knowledge (in particular, to financial incentives). Moreover, Boeri and Tabellini (2005) pointed out that governments should make an effort to spread this information, since media coverage by itself may not be enough. Individuals who had read newspaper articles or watched TV debates on the Italian pension reform were not significantly better informed.

Summarizing the preceding literature, the empirical evidence shows that, first, there is a significant lack of knowledge on key features of the pension system and, second, that the support for reforms is higher among more informed citizens. For all these reasons, economists should be encouraged to improve their communication strategies in order to increase the society's understanding of the implications of ageing on government budgets. A first starting point would be to agree on a common set of indicators on the social security outlook, based on some general requirements, such as transparency and simplic-

[3] In Spain, according to Pérez-Diaz and Rodríguez (2007), opposition to this measure among the population 50-70 years old reaches 55 per cent (vs. 32 per cent of favourers and 13 per cent who do not answer). In 1996, this proportion reached 71 per cent in 1996 (vs. 22 per cent who agreed and 8 per cent of non respondents). However, it may be optimistic to attribute these results to a better knowledge, since the percentage of people who do not answer if pension levels would be sustainable in the next 15 years remain very high (37 per cent in 2006, vs. 34 per cent in 1996).

[4] Results about the knowledge on pension issues were also discouraging. Only half of the respondents knew how a pay-as-you-go scheme basically worked, and just 10 per cent were close to the legal social security tax rate (poorer records than in Boeri, Börsch-Supan and Tabellini, 2001).

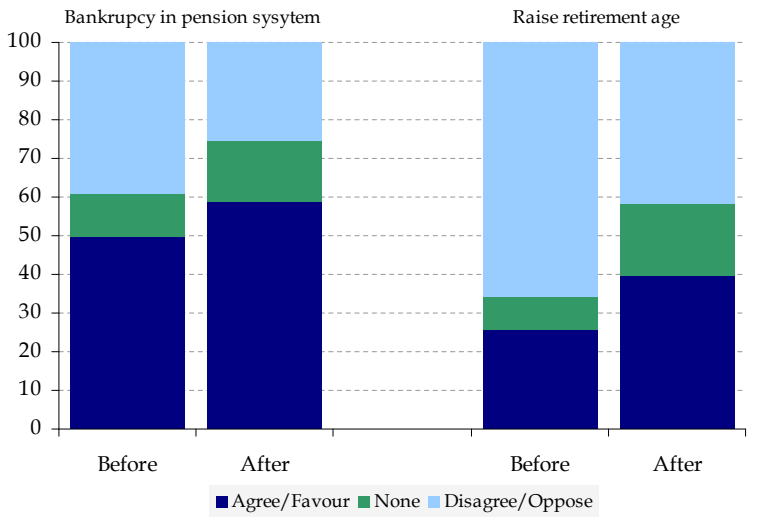

Figure 2: *Opinions on pension reform before and after deliberations.*

ity. Secondly, confidence intervals of projections should be made explicit in order to avoid that any future deviation from the baseline scenario justifies inaction.

The basic aim of this paper is to suggest a set of appropriate indicators and a suitable method of representing their uncertainty to improve the communication strategies to the public opinion, taking the Spanish public pension system as workhorse. This choice is particularly interesting for several reasons. First, the social security system has been in surplus for nine consecutive years, in sharp contrast to the projections made just a decade ago. These projection errors are a frequent line of reasoning to avoid the discussion about the future of the system and the convenience of possible improvements. Secondly, the Spanish economy has benefit from an unpredicted and outstanding supply shock, due to immigration flows and to higher female labour participation, with unambiguous effects on the current social security surplus (see, among others, Economic Bureau of the Prime Minister, 2006). However, despite the favourable current situation, most projections predict that Spain will face one of the highest increases in public expenditure among EU countries due to ageing. Therefore, it may be a right time to foster a debate on the reform agenda, given that in the last decade the discussion about the challenges of the Spanish system has been less far-reaching than in other European economies, notably Germany, Italy or Sweden (see Economic Bureau of the Prime Minister, 2007 and OECD, 2007).

The paper is organized as follows. In the second section, we briefly present the aggregate accounting methodology, the data and the assumptions for an updated projection of the public pension system in Spain, up to 2060. In the third section we report the main results for plausible alternative scenarios and compare them with recent studies, highlighting the main sources of uncertainty that involves this projection (demography, socio-economy and institutions). Also in light of these sources of uncertainty, this section ends with an analysis of the observed deviations from the projections made in the mid nineties. In the fourth section we describe and present a set of indicators of the medium and long-term outlook of the pension system, both for the baseline and the alternative scenarios used to asses the uncertainty in the baseline. These indicators may be used to improve the communication strategy on the challenges of the pension system. Finally, we present the main conclusions.

2. The projection methodology

2.1 Methodology description: Aggregate accounting

In the paper we use the aggregate or growth accounting approach to obtain the projections of the Spanish pension expenditure. This methodology has a long tradition in the literature and, with some variations on the aggregation of the different variables used (mainly due to various pension categories, and sex and age of workers and pensioners), is followed by most social security administrations. Additionally, the CBO's Long-Term Actuarial Model and the Ageing in charge of the public expenditure projections in the European Commission, follow this approach.

The aggregate or growth accounting approach relies on different assumptions at the economy as a whole about future trends in demography (fertility rates, migration flows and life expectancy), in economic conditions (participation and employment rates, productivity, wages and interest rates) and in institutional factors (coverage and pension levels).

The main advantage of this method is that, based on the projections of a relatively small number of variables, it is simple to obtain reasonable projections of the pension expenditure as a share of output. Projections based on individual life-cycle profiles produce a richer amount of information for different generations, making possible to obtain individual accounts and the analysis of the distributional effects of alternative policies, but at the cost of more complexity. As an alternative to these two methods, general equilibrium models have the advantage of accounting for the endogeneity of some of variables

as, for example, the labour supply, which is assumed to be exogenous in the aggregate accounting approach or in the individual life-cycle profiles.[5] The main drawback of general equilibrium models is that the results are sensitive to many more assumptions and hypothesis, since there are more exogenous parameters that need to be calibrated. Given that these alternative methods produce similar conclusions about the challenges of the pension system, we have opted for the simplicity of the aggregate accounting approach.

The first step in the aggregate accounting method is to decompose the share of GDP devoted to expenditures in the public pension system using the following expression:

$$\frac{G_t^{pens}}{P_t GDP_t} \equiv \frac{L_t^{pens}}{L_t} \frac{\left(\frac{G_t^{pens}}{P_t L_t^{pens}}\right)}{\left(\frac{GDP_t}{L_t}\right)} \tag{1}$$

where L_t^{pens} stands for the number of pensions, L_t is the number of workers (a proxy of the contributors to the social security system), $\frac{G_t^{pens}}{P_t L_t^{pens}}$ is the real average pension (since $G_t^{pens}$is the nominal expenditure and $P_t$the price level), and GDP_t/L_t the average real labour productivity. The second term in the right-hand side of equation (1) is usually named the benefit ratio, since it relates the average pension to labour productivity.

Equation (1) implies that the share of GDP devoted to pensions is explained by demographic, institutional and macroeconomics factors, since L_t^{pens}/L_t depends on demographic and labour market conditions, $\frac{G_t^{pens}}{P_t L_t^{pens}}$on institutional features (mainly, the pension formula), and $\frac{GDP_t}{L_t}$on the macroeconomic performance (labour productivity).

Additionally, the number of pensions per worker is usually decomposed in four ratios:

$$\frac{L_t^{pens}}{L_t} \equiv \frac{L_t^{pens}}{L_t^{+65}} \frac{L_t^{+65}}{L_t^{16-64}} \frac{L_t^{16-64}}{L_t^{s}} \frac{1}{1-u_t} \tag{2}$$

Therefore, the number of pensions per worker is the product of the take-up ratio (L_t^{pens}/L_t^{+65}, that is, the coverage of the pension system), the old-age dependency ratio (L_t^{+65}/L_t^{16-64}), the inverse of the participation rate (L_t^{16-64}/L_t^{s}) and the inverse of 1 minus the unemployment rate.

Combining equations (1) and (2) we can obtain a convenient decomposition of pen-

[5] Jimeno, Rojas and Puente (2008) offer an excellent survey of the features of these alternative methods and perform a quantitative analysis for the Spanish pension system.

sion expenditures in terms of GDP:

$$\frac{G_t^{pens}}{P_t GDP_t} \equiv \frac{L_t^{pens}}{L_t^{+65}} \frac{L_t^{+65}}{L_t^{16-64}} \frac{L_t^{16-64}}{L_t^{s}} \frac{1}{1-u_t} \frac{\left(\frac{G_t^{pens}}{P_t L_t^{pens}}\right)}{\left(\frac{GDP_t}{L_t}\right)} \tag{3}$$

To sum up, in order to make the aggregate accounting method operational we only need projections of the different terms in the right-hand side of equation (3).

2.2 Data description

Demographics

In the long run, results are mainly driven by the demography. In order to deal with the uncertainty that surrounds it (mostly due to immigration flows, as well as fertility rates and life expectancy), we use three demographic scenarios. As shown in Table 1, the central scenario (named Demo 2) corresponds to the new demographic projection recently published by Eurostat, Europop2008[6] for further details (Eurostat, 2008). We also used the companion Eurostat's demographic projection that assumes zero net immigration, as scenario Demo 1. Finally, we constructed a more favourable scenario (Demo 3) based on the previous round of demographic projections published by INE in 2005 (in particular, we chose INE's scenario 1). Since immigration stocks and immigration flows were largely underestimated, series can not be taken directly. The figures for 2006 are taken from the population statistics of the Spanish Labour Force Survey (EPA), and, from 2007, we apply, disaggregated by sex and age (16-24 years, 25-54 years, 55-64 years, and over 64), the annual changes projected from 2003. In some sense, this exercise assumes that population developments from 2007 will be in line with those projected from 2003, but corrected by the errors stemming from the unexpected population shock between 2003 and 2007.

The different old-age dependency ratio projections (L_t^{+65}/L_t^{16-64}) are represented in Figure 3. The ratio will significantly increase from 0.24 in 2006 to 0.53-0.70 in 2060. The results show that even considering high immigration flows (4.4 million people between 2007 and 2014 in the central scenario, Demo2, and between 100 and 200 thousand per year

[6] These series are in line with the latest official projections by the Spanish National Institute of Statistics (INE, 2008), available up to 2015, and will be used for the on-going round of public expenditure projections of the Ageing Working Group. See population projections in epp.eurostat.ex.europa.eu for further details (Eurostat, 2008).

Table 1. Main projection assumptions

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Demographic scenarios	
Demo 1	Eurostat (2008): Europop2008 zero immigration
Demo 2	Eurostat (2008): Europop2008
Demo 3	Own elaboration, based on INE (2005)
Socio-economic scenarios	
Macro 1	Constant participation rates from 2010
	Constant unemployment rates from 2010
Macro 2	2006 Swedish participation rates in 2030
	2006 US unemployment rates in 2030
Macro 3	2006 Swedish participation rates in 2060
	2006 US unemployment rates in 2060
Institutional scenarios	
Institut 1	Pension increases over productivity (13%, as 1996-2006)
Institut 2	Constant benefit ratio from 2030
Institut 3	Pension decreases over productivity (-13%)
Common assumptions	
Short-term macroeconomic scenario 2007-2010: Stability programme	
Cyclical economic and other uncertainty (+/- 0,4 p.p. approx.)	
Productivity growth: 1,5 per cent from 2015	
Convergence to unitary take-up ratio in 2060	
Constant social contributions over GDP from 2006	

afterwards), Spain will experiment an intense ageing process (among the highest of industrialized economies). Ceteris paribus, based on equation (3), public pension expenditure over GDP in 2060 could be between 2.2 and 3.1 times higher than in 2006.

Socio-economics

Participation and unemployment rates are projected separately for women and men, and for the same four age groups (16-24 years, 25-54 years, 55-64 years, and over 64; the age for entering into the labour market is legally set at 16 years in Spain). From 2007 to 2010, we use the employment growth projections of the Ministry of Treasury (2007)[7]. From 2011, we define three alternative scenarios. In Macro 1 participation and unemployment rates by age and sex are kept constant. Therefore, all the variations are purely demographical.

[7] Employment growth is projected in terms of Labour Force Survey statistics. In recent years, there has been a significant deviation of these figures with respect to National Accounts employment data (employment growth in Spain has been, between 1996 and 2006, 0.9 p.p. per year higher according to Labour Force Survey than to National Accounts). We assume that the gap between the respective rates of change is null from 2015. This issue is relevant also to interpret recent productivity figures.

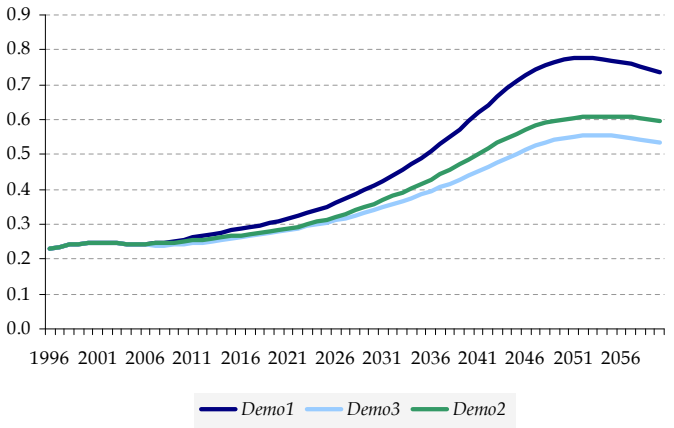

Figure 3: *Dependency ratio (L^{+65}/L^{16-64}), 1996-2060. Source: INE and Eurostat.*

By contrast, in the central scenario Macro 2, participation and unemployment rates are projected to converge linearly in 2060 to the participation rates (by age and sex) observed in Sweden in 2006 (approximately 80 per cent in the aggregate), and to the unemployment rates observed in the US in 2006 (close to 4 per cent). Finally, the Macro 3 scenario anticipates this real convergence process to 2030, keeping the rates of each sex and age group constant afterwards.

In addition, annual productivity growth (measured as GDP over National Accounts employment) is taken from the Stability Program up to 2010, and it is set exogenously at 1.5 per cent from 2011 for workers over 16 years (labour productivity of workers aged 16-64 will be higher, depending on the demographic projections).

Finally, we include a factor to control for the short-term economic uncertainly, common to the three scenarios. Its size is based on the observed volatility of output in Spain in the last decades, and implies a confidence interval around expenditure figures of around 0.3-0.4 percentage points (p.p.) over the whole projection period[8].

Institutional features

There is a significant degree of uncertainty on some institutional issues, even applying

[8] 95 per cent confidence interval, based on the standard error of Spanish output gap (0.0226), estimated with a model based on the Kalman filter as explained in Doménech and Gómez (2006), with quarterly data for 1970Q1-2008Q1. We would like to thank Glenn Follette, for suggesting this point.

the usual *no policy change rule*. The average pension depends not only on the evolution of productivity, but also on each affiliate's labour market history (for example, the length and temporal distribution of contribution and non-contribution periods, and the effective retirement age). As in the previous items, to deal with these variations we define three scenarios. From 2030, in our central scenario (Institut 2) real average pension grows at the same rate than labour productivity of workers aged 16-64, so that the benefit ratio is kept constant. However, during the period 1996-2006, the rate of growth of the average pension has been a 13 per cent higher than that of productivity (1.9 per cent vs. 1.7 per cent). Therefore, in Institut 1 scenario, the average pension growth rate from 2030 will be a 13 per cent higher than productivity growth, so the benefit ratio increases. In order to design a balanced exercise, in Institut 3 pension grows below productivity. The range is set so that the negative growth gap has the same size than the positive in the previous scenario (13 per cent). In the three of them, a transition period is set from 2007 to 2030, so that annual changes converge from the 1996-2006 average (1.9 per cent) to the corresponding rate in each case. In terms of the number of pensions, we assume a linear convergence to a unitary take-up ratio in 2060, common for the three institutional scenarios. In both cases, the central assumptions are also in line with the latest official exercises (Ministerio de Trabajo y Asuntos Sociales, 2005 and Economic Policy Committee, 2006).[9]

The projections are based on a quite rigorous institutional framework that compensates some of the drawbacks of aggregate accounting. The projection will be focused on the so-called *contributory public pension system*, that is, we exclude the solidarity pillar and the voluntary one. In the expenditure side, we will project aggregate public contributory pensions, which comprise permanent disability, old-age, early retirement and survivors benefits. Therefore, some contributory benefits are not considered, such as unemployment benefits (managed outside the social security system and financed by its specific contributions), and temporary disability and maternity (which are usually projected constant over GDP). Additionally, we take into account that in 2012, the separation of social security financing sources (social contributions and transfers from central government) should be completed. Therefore, non-contributory benefits will be fully financed by general revenues, and not by social security contributions (in 2006, two thirds of the complement of minimum pensions, which represent 0.5 per cent of GDP, were financed by social contributions). This fact impacts the pension fund, as it will be described later on. Revenue figures are compatible with this selective approach. We will just include social security

[9] The detailed assumptions of the Spanish projection, and some sensibility tests, can be found in Gil, López, Onrubia, Patxot and Souto (2007).

contributions that are devoted to finance specifically these contributory pensions[10]. From 2007, social contributions are set constant over GDP.

We also include the pension reserve fund established in Spain in 2000. By law (General Act on Budgetary Stability), the major part of social security administration surplus has to be saved in this fund. In particular, the surplus is calculated excluding the part of minimum contributory pensions that is financed by general revenues (one third in 2006, 100 per cent from 2012). In each scenario, this rainy-days fund will be accumulated and capitalized at a common nominal 5.5 per cent rate (3.5 per cent in real terms). This rate of return is higher than the observed return from 2000 (4.2 per cent in nominal terms), but close to European Commission assumptions in its Ageing Reports (5 per cent in nominal terms, 3 per cent in real terms).

Finally, we should add two caveats. Firstly, although assumptions have been explained separately for exposition purposes, they are not independent. For instance, a more favourable demographic scenario may affect participation and employment rates (since high employment cohorts are more numerous). Secondly, we should stress that we do not consider explicitly the effects of the 2007 social security reform (*Ley de Medidas en Materia de Seguridad Social*, effective since January, 2008). Briefly, the reform makes the conditions for early retirement stricter (in particular, for partial retirement, it increases from 15 to 30 the required years of contribution and from 60 to 61 years the minimum age), and strengthens the financial incentives to work over 65 (extending the two per cent bonus in pensions for each year to all contributory affiliates, and setting a three per cent bonus if the affiliate has contributed for more than 40 years). Additionally, the minimum contribution period is increased across the board, due to the exclusion in the contribution history of extra payments. A transition period, up to 2012-2015 depending on the measure, is set. In net terms, we would expect an slight increase of social security taxes over GDP, and a decrease of expenditure, mostly thanks of a higher effective retirement age, so sustainability indicators might improve.

[10] In Spain, there is no legal imputation of social security contributions by expenditure categories. However, Spanish social security administration has elaborated an estimate for the year 2006 within the Task Force on the statistical measurement of the assets and liabilities of pension schemes in general government (see Committee on Monetary, Financial and Balance of Payments Statistics, 2008). According to it, 88 per cent of total social contributions revenues can be imputed to the pension system (8.6 per cent of GDP).

3. Results

3.1 Pension expenditure scenarios, Spain 2006-2060

Combining the three different sets of assumptions on demography (scenarios Demo 1, Demo 2 and Demo 3), on socio-economics (scenarios Macro 1, Macro 2 and Macro 3) and on institutional design (scenarios Institut 1, Institut 2 and Institut 3), as many as 27 projections can be made, covering almost all the reasonable future developments of the old-age dependency ratio, the participation and unemployment rates, and the benefit ratio.

In Figure 4, we have represented a sub-set of these scenarios. The central scenario is elaborated taken scenarios Demo 2, Macro 2 and Institut 2. The first interval shows how the central scenario is affected by a worse or better demographic scenario (Demo 1 and Demo 3) respectively. The confidence interval widens further when we take into account the uncertainty about future participation and unemployment rates (Macro 1 and Macro 3, respectively). The third interval is obtained after allowing for a more or less generous institutional design, in terms of the pension level over productivity (scenarios Institut 1 and Institut 3, respectively). Finally, the fourth interval adds the aforementioned short-term economic or cyclical uncertainty, completing the range.[11]

A first conclusion from Figure 4 is that demographic assumptions (particularly affected by immigration flows) are the most important source of uncertainty. The second conclusion is that, despite their relatively wide dispersion, results are quite robust: Spain will experiment a significant increase in public pension expenditure in the following five decades. And, within all the plausible described assumptions, the system will be in red at some point of the next three decades.

Uncertainty obviously increases over time, as the different areas from central scenario illustrate. In the central scenario, the system would be in red in 2024. Demographic uncertainty suggests that the first deficit could occur between 2021 and 2026. If we add the macroeconomic uncertainty, the interval should be augmented to 2020-2029. The impact of different pension rules would augment this interval to 2020-2031. Finally, short-term uncertainty suggest that the system could be in red between 2018 and 2035. It is interesting to note that, given the quantitative assumptions described in the previous section,

[11] Notice that, by construction, in Figure 4 we have added the uncertainty associated to each scenario. The advantage of this approach is that allows us to obtain a very clear and comprehensible image of the quantitative relevance of the different assumptions we have made. The transparency of results in Figure 4 is at the cost of statistical inference, which cannot be assessed. Nevertheless, to the extent that our intervals of the old-age dependency ratio, the participation and unemployment rates, and the benefit ratio are sufficiently wide to be consistent with the empirical evidence of the last decades, we are reasonably secured against future development of these variables.

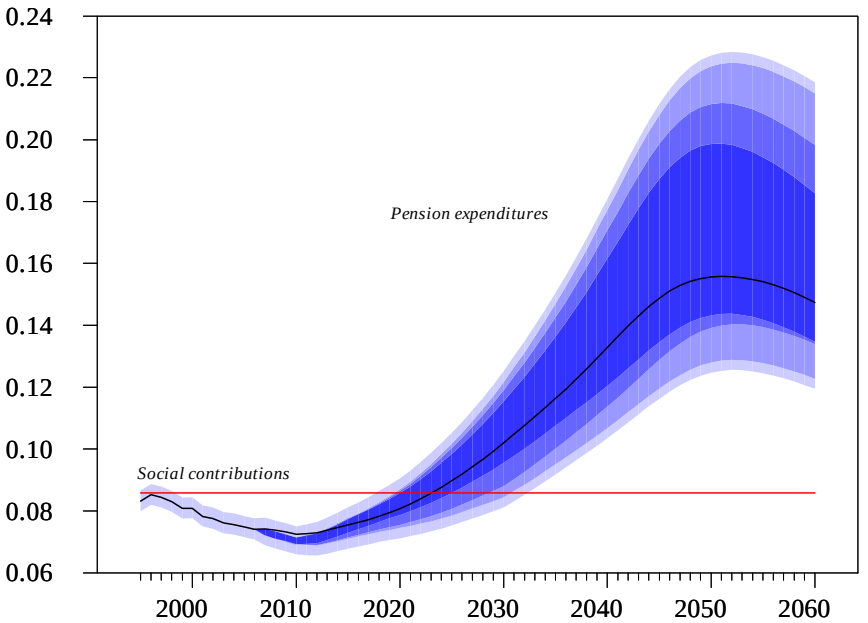

Figure 4: *Public pension expenditure projections, 1995-2060 (GDP share). The central scenario is surrounded by the intervals that reflect the uncertainty in the demography, the labour market, the benefit ratio and the business cycle.*

uncertainty sources seem to have a similar quantitative impact on projections.

This graphical approach shares the spirit of *fan charts*, very popular for inflation forecasts (see, for example, Cogley, Morozov and Sargent, 2005). The main difference is that intervals are not based on probabilistic inference, but on different sets of economic and institutional assumptions. We will come back to this point in section four.

The range of the numerical results is shown in more detail in Table 2 and Figure 5. Although it is not the main contribution of this paper, nevertheless it could be useful to describe the results of the central scenario depicted in Figures 4 and 5[12]. Pension expenditure could increase up to 15.3 per cent of GDP in 2060, from 7.6 per cent in 2006, doubling its share on output (see Table 2). This evolution is mainly driven by the increase of the number of pensions over workers (0.45 to 0.86), due to the ageing of population (dependency ratio more than doubles, up to 0.60). The decrease of the take-up ratio and a higher employment rate (thanks to the increase of participation and the decrease of unemploy-

[12] For exposition reasons, Figure 5 does not include the short-term economic uncertainty factor. As usual, results for the different projections are available upon request.

Table 2. Public pension expenditure projection, 2006-2060.

	Expenditure	Pensions / Workers					Benefit ratio
	GDP share		Take-up ratio	Dependency ratio	Employment rate		
	Gpens/P*GDP	**Lpens / L**	Lpens / L+65	L+65/L16-64	L16-64/LS	1 / (1-u)	(Gpens/P*Lpens) / (GDP/L)
Central scenario							
2006	7,6%	0,45	1,14	0,24	1,50	1,09	0,17
2015	8,1%	0,46	1,11	0,27	1,46	1,08	0,17
2030	10,7%	0,61	1,08	0,36	1,47	1,07	0,18
2045	15,4%	0,87	1,04	0,56	1,42	1,06	0,18
2060	15,3%	0,86	1,00	0,60	1,39	1,04	0,18
High expenditure scenario							
2006	7,6%	0,45	1,14	0,24	1,50	1,09	0,17
2015	8,7%	0,48	1,11	0,28	1,41	1,09	0,17
2030	13,1%	0,71	1,08	0,41	1,48	1,09	0,18
2045	21,7%	1,16	1,04	0,71	1,45	1,09	0,18
2060	22,4%	1,16	1,00	0,74	1,45	1,09	0,19
Low expenditure scenario							
2006	7,6%	0,45	1,14	0,24	1,50	1,09	0,17
2015	7,3%	0,44	1,11	0,26	1,42	1,07	0,17
2030	8,7%	0,53	1,08	0,34	1,39	1,04	0,17
2045	12,2%	0,76	1,04	0,50	1,40	1,04	0,16
2060	12,5%	0,79	1,00	0,53	1,42	1,04	0,16

Notes: Expenditure figures include minimum pensions complement
High and low expenditure scenarios incorporate +/- 0.4 p.p., due to short-term economic uncertainty
Source: INE, Ministerio de Trabajo y Asuntos Sociales and own elaboration

ment rates) would moderate this impact. By construction, the benefit ratio does not affect the results from 2030.

Under the central scenario (which, we should remind that does not include the potential effects of the on-going social security reform), the contributory public pension system will register a deficit from 2024 onwards. As it is illustrated in Figure 5, the pension reserve fund will be capable to finance the deficit up to 2037. From that point, the system would not be self-financed, demanding reforms and/or transfers from the other government administrations. The extreme scenarios complete the picture.

3.2 Comparison with previous recent projections

As we can see in Figure 6, these results are in line with the latest official projections (Ministerio de Trabajo y Asuntos Sociales, 2005 and Economic Policy Committee, 2006), and somewhat lower for the central scenario than two recent independent ones (Balmaseda, Melguizo and Taguas, 2006 and Rojas, Jimeno and Puente, 2008).[13] However, these differences can be mostly explained by differences in the demographic, macroeconomic and

[13] Projections in Figure 6 differ in assumptions, pension categories and, sometimes, even in the period analyzed. Therefore, numbers should be interpreted with caution. Our high and low scenario do not incude short-term or cyclical uncertainty.

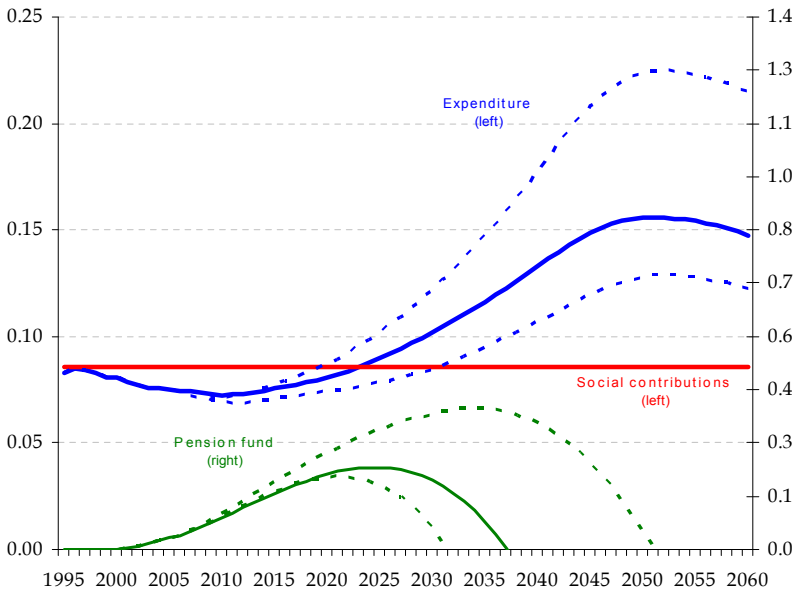

Figure 5: *Public pension expenditure and social contributions, 1995-2060 (central and high/low expenditure scenarios, GDP share).*

institutional scenarios. Particularly, with respect to the 2006 European Commission projection, in spite of a more favourable demographic scenario[14], we project a slightly higher increase (8.5 p.p. vs 7.0 p.p.), due to the institutional framework (both in terms of pension level and coverage). More important, all the studies share the results about the significant challenge to welfare state financing posed by ageing in Spain.

3.3 Revising 1990s projections: What went right?

Our proposal of taking explicitly into account the uncertainty around the baseline can be tested backwards, examining the evolution of social security accounts since the mid nineties. In contrast with the projections published a decade ago, both from the government (Ministerio de Trabajo y Seguridad Social MTAS, 1995) or from private analysts (Herce and Pérez-Díaz, 1995 and Barea, González-Páramo and Velarde, 1997, or even more recently, Alonso and Herce, 2003), social security has been in surplus since 1999 and the

[14] Ceteris paribus, according to our estimations, *Europop*2008 would imply an increase in pension expenditure of 10.3 p.p., significantly lower than the 12.4 p.p. from *Europop*2004.

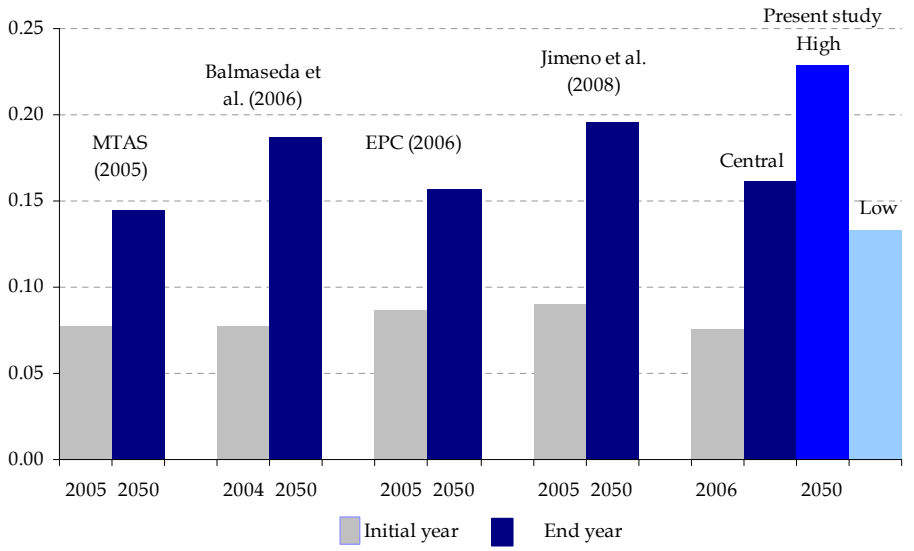

Figure 6: *Public pension expenditure projections (GDP share).*

Stability Programme extends this surplus, at least, until 2010. We find that the exercise of explaining the projections errors of previous studies, which to our knowledge had not been made elsewhere, is useful, since these deviations are very often used to discredit this kind of projection exercises, avoiding the necessary permanent dialogue on pension reform.

In the mid nineties, after the 1992-1993 recession, it was a time of intense public debate on economic issues, and specifically on pension reform in Spain. In view of this, all the political parties approved in 1995 the Toledo Pacts, which included a diagnostic of public pension structural problems and some recommendations for the system reform. Part of them were actually enacted in 1997 (Ley de consolidación y racionalización del sistema de Seguridad Social), such as the separation of financing sources and the increase in the actuarial fairness (based on an increase in the number of years in the pension base, and on a higher penalization for labour careers under 25 years). Afterwards, until the present 2007 reform, legal advances have been modest, even contributing to lower effective retirement age, as in the 2002 reform (Ley de medidas para el establecimiento de un sistema de jubilación gradual y flexible), which created partial retirement (a type of early retirement that allows to work part-time). Despite this limited reform agenda, social security has been in

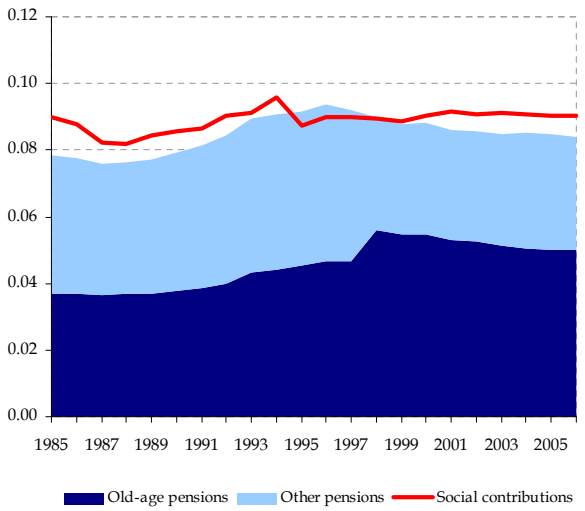

Figure 7: *Public pension expenditure and social contributions, 1985-2006 (GDP share).*

surplus. Figure 7 shows that, contrary to conventional wisdom, it is not due to a boom in social security contributions (actually, roughly constant over GDP), but due to a decrease in expenditure over GDP.

In addition, focusing on the expenditure side, based on the results of the aforementioned projections, this good performance is not due neither to the effects of the social security reform, but to an unexpectedly strong and long-lasting economic growth, driven by an improved labour market. Applying the aggregate accounting decomposition of pension expenditure over GDP, in Figure 8 we compare the observed evolution during the last decade, with the projections[15]. Expenditure as a percentage of GDP has decreased almost one point (from 8.5 to 7.6 per cent of GDP). This decrease is driven by a slight decrease in the take-up ratio (from 1.2 to 1.1) and, mostly, by an outstanding increase in the employment rate (from 49.8 to 61.2, in National Accounts terms). Population ageing and a higher benefit ratio contributed to elevate spending. In absence of these two last factors, expenditure would have decreased 2.1 percentage points (1.7 points due to the higher employment rate).

[15] Precise numbers should be taken with caution, since studies differ in the categories of pensions included and in the participation and unemployment rates definitions. Besides, since 1996 there have been various methodological changes, both in the Labour Force Survey and in National Accounts.

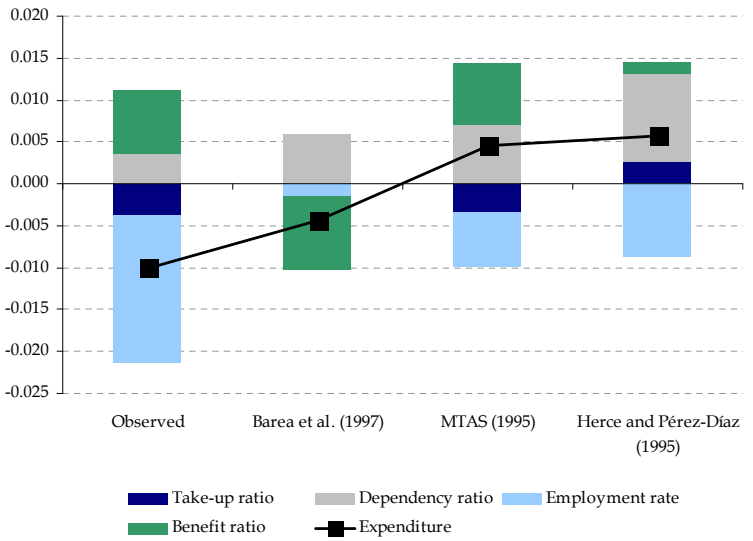

Figure 8: *Actual and projected pension expenditure, 1996-2006 (1996-2006 difference, GDP share).*

The main deviation of the three projections comes from the much higher contribution that expected increase of employment rate (approximately one point in the case of MTAS, 1995 and Herce and Pérez-Díaz, 1995, and 1.6 points in Barea, González-Páramo and Velarde, 1997). Additionally, there was a significant underestimation of the evolution of the benefit ratio in the two independent studies (Herce and Pérez-Díaz, 1995 set it almost constant, and Barea, González-Páramo and Velarde, 1997 even projected a decrease). However, when this factor is decomposed in its two components, all the deviation stems from a lower than expected productivity growth (0.4 per year vs. 1.2 in Herce and Pérez-Díaz, 1995, and 2.8 in Barea, González-Páramo and Velarde, 1997), and not from a higher average pension level. In both cases, results support the view that Spain has benefit from an outstanding supply shock, in terms of participation rate, due to immigration flows (that also contributed to the lower than expected dependency ratio) and to higher women labour participation. This has led to a labour intensive growth pattern, which explains the decrease of unemployment rates and the productivity slowdown.

In summary, contrary to the conventional wisdom, the current social security surplus in Spain does not seem to be explained neither by a extraordinary boom in revenues (which are almost constant over GDP), nor by lower pension levels due to the 1997 re-

form. On the contrary, it can be explained by a great supply shock, which affected both the demographic and, mostly, the macroeconomic variables (participation and unemployment). We believe that if some intervals for these variables had been set in the projections (in line with the procedure proposed in this section), the debate would have been more constructive.

4. Indicators and transparency: policy implications

As we have stated in the introduction, there is a substantial asymmetry between the academic debate on the challenges of the pension system and the knowledge of the median voter about this issue. In some occasions even, the attempts to extend the academic debate to the public opinion are not well understood, giving place to the allegation made by some politicians or by other economic agents that such attempts only provoke unnecessary worries in the society about the future solvency of the welfare state. For all these reasons, economists should be encouraged to improve their communication strategy in order to improve the society's understanding of the implications of ageing on government budgets. In fact, information and knowledge is a necessary but not a sufficient condition to increase the support of a reforming agenda. In a provocative paper, Sinn and Uebelmesser (2003) predicted that informed German voters would support the transition to a partially funded pension system only until 2014 since, after that year, gerontocracy would rule and the age of the median voter would impede any reform.[16]

The first element in a new communication strategy should be to make explicit and clear the objectives of an exercise addressing pension system projections. The society will be more receptive and sympathetic to those studies that make explicit from the beginning that their main aim is to contribute to the strengthening and the reinforcement of the welfare state, preventing some of the problems that may arise in the future. Taking as given that modern societies with well founded welfare states are particularly interested in satisfying their demand of social policies, the projection of possible futures imbalances in the pension system should not be understood as jeopardizing the system itself. On the contrary, they should be seen as an attempt to anticipate the correct policies aimed at making

[16] However, a branch in the political economy literature on social security has departed from this median voter hypothesis, suggesting the need to control also for the preferences of other population groups (see Galasso and Profeta, 2002 for a survey). In this generalized context, the effect of ageing on social expenditure would depend on the net impact of two opposite effects: on the one hand, the increasing demand of the elderly (the traditional positive political economy effect), and on the other, the attempts of the young and working-age population to avoid it, given the associated higher tax burden (a negative economic effect). Empirical evidence for the OECD suggests that the first effect dominates (Disney, 2007), although it is decreasing over time (Sanz and Velázquez, 2007).

the system less vulnerable to future developments. Besides, a proper anticipation of the challenges also reduces the burden of the needed measures since their implementation is spread over a longer period of years.

The second element in order to improve the communication strategy is to agree a common set of indicators about the pension system outlook. These indicators could be based on five basic requirements: simplicity, transparency, credibility, publicity and periodicity. Unsurprisingly, these characteristics are also required in the implementation of fiscal rules such the Stability and Growth Pact, and they have attracted the attention of many authors (see, for example, Buiter, 2003, or Buti, Eijffinger and Franco, 2003, and the references therein and, particularly, Franco, Marino and Zotteri, 2006, in the case of pensions). Simplicity ensures that the indicators used to assess the outlook of the system are easily understood by the public opinion. Transparency implies that the methodology is easily reproducible and that the sensitivity of indicators to changes in the hypothesis about future scenarios is well known. The credibility of the institutions responsible for the elaboration of the projections and the indicators is a key aspect in order to increase the society receptiveness to the results. In some cases, external reviewing may be convenient. Finally, publicity and periodicity of the indicators will improve the communication strategy over time as the public opinion get accustomed about the usefulness of this kind of information, not implying necessarily the need of a reform every time the indicators are published. In the last two decades, projections of the Spanish pension system by official institutions were only made to set up the reform of the system (in 1984 and 1995, before the 1985 and 1997 reforms). At the present moment, there is the commitment of presenting these projections every three years to the European Commission. However, it would be convenient to update, at least nationally, the set of indicator every year, since monitoring the system continuously is a need in complex and ever-changing societies, even if reforms were not required.

Besides, the communication strategy will improve also if the indicators are accompanied by measures of the uncertainty surrounding the projection exercises. The crucial point here is that the forecast errors of past scenarios are usually used to diminish the credibility of pension system projections into the future, as we showed in the previous section. Therefore, to prevent this kind of critique, it is convenient to make clear from the beginning that the projections are subject to forecasts errors (actually, they do not mean to be forecasts, but projections), and that, even taking into account the existing uncertainty, the projections under different assumptions may shed light about the challenges of the pension system. For this purpose, it should be convenient to compute confidence intervals

around a baseline scenario based on alternative procedures.[17]

A first possibility is to obtain the confidence intervals based on stochastic simulation of the different variables which affect the baseline. This approach has been followed, among others, by Ahn, Alonso-Meseguer and García (2005), Lee, Miller and Anderson (2004), the US Social Security Trustees and the CBO. To obtain probabilistic intervals, it is necessary to make some statistical assumptions concerning the rates of growth of population, productivity and many other variables used in the projection, and obtaining the confidence interval around the baseline scenario using, for example, bootstrapping methods. Although, in principle, this approach may be comprehensive of the uncertainty around the projection, it is very demanding in its computational details and, at the end of the day, is very dependent on the distributions assumed for the different parameters of the model.

A second approach to represent the uncertainty around the projection is to assume low and high expenditure scenarios for the demographic, socio-economic and institutional hypothesis, as we have done in the previous section. This allows obtaining also fan charts, stemming not from the statistical properties of the series, but from our different scenarios. This procedure is simpler and, at the same time, more transparent since it is very easy to analyze the sensitivity of the projection and indicators to changes in the priors.

Although many indicators may satisfy the above requirements, in this paper we focus on two of them. The first indicator forecasts the pension system balance for the next 25 years, complemented by the information about the capabilities of the reserve fund (in case it exists, as in Spain) to ensure the self-financing of the system in case of deficits. The second one computes the actuarial balance up to 2060 (determined by the population projections horizon) of the public pension system and, eventually, the required revenue and expenditure adjustments.[18]

Figure 9 represents the graphical medium-term indicator for the central scenario (that is, the one based on the intermediate assumptions in demography, macroeconomics

[17] Actually, these extensions are increasingly incorporated even in more complex methodologies. For instance, Fehr and Habbermann (2006) combine stochastic population forecasts and the overlapping-generation approach in the evaluation of pension reforms in Germany, to account explicitly for the uncertainty arising from future population

[18] We are aware that these indicators, in line with the traditional "crossover dates" and "fund exhaustion" used in the US, were criticized by Gokhale and Smetters (2006). According to these authors, the 75 years horizon published by US social security administration is misleading and biased against potential reforms, so they advocate for the infinite horizon figures. We defend our approach in two ways. First, demographic projections, available only up to 2060, show that ageing in Spain might top in our time horizon (between 2052 and 2054). And, secondly, we find that publishing these indicators for Spain, as is done in the US, would be, at least, a step forward in order to improve the knowledge of citizens about their pension system and to set a public debate with standard numbers.

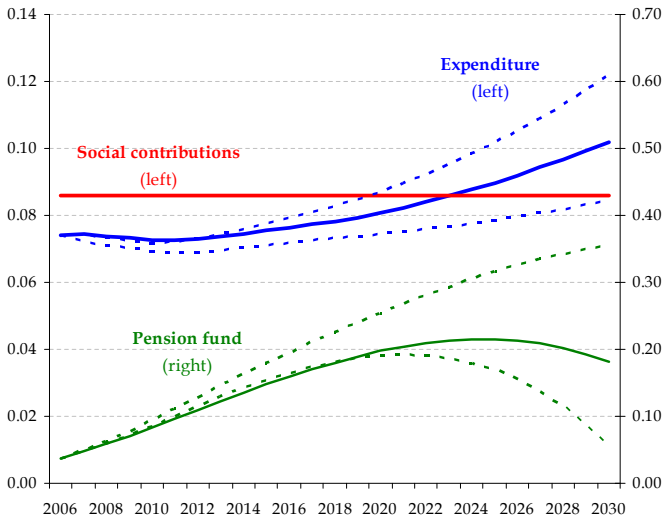

Figure 9: *Medium-term indicator (central and high/low expenditure scenarios, GDP share).*

and pension levels), as well as for the high and low expenditure scenarios (which combine Demo 1, Macro 1 and Institut 1, and Demo 3, Macro 3 and Institut 3, respectively, named scenarios 1 and 7). It is a selective zoom of the previous Figure 5. Social security contributions will be lower than contributory public pension expenditures in the time horizon considered (precisely, in 14 to 25 years), signalling the need of a debate on a reform agenda. The pension reserve fund, which could exceed 21 per cent of GDP in the central scenario, allows measures to be gradually phased-in.

In the long run, the capability of the pension system to be self-financed should be evaluated in actuarial terms. We assume a real discount factor of 3 per cent (as the Congressional Budget Office, 2004, or the Committee on Monetary, Financial and Balance of Payments Statistics, 2008). Figure 10 contains the projection until 2060 of pension expenditures vs. total revenues (including not only social contributions, but also pension fund interests), for the same three scenarios, in 2007 present value, which cover the whole plausible range of results (central and scenarios 1 and 7), according to our assumptions.

This projection implies that debt, in present terms, would amount 66.2 per cent of 2007 GDP (1.6 per cent of annual GDP from 2007 to 2060), with a wide interval from −113.4 per cent to even a surplus that amounts to 21.6 per cent of 2007 GDP. An increase in social contributions of 0.6 per cent each year (applied since 2009), or an annual decrease

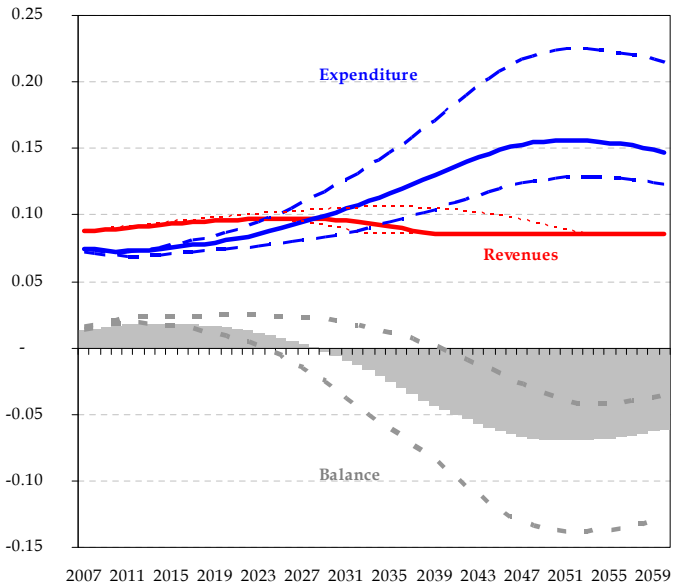

Figure 10: *Long-term indicator (central and high/low expenditure scenarios, GDP share, 2007 present value).*

in expenditure of 0.5 per cent, could balance the system up to 2060. The same figures are calculated for the alternative scenarios, and summarized in Table 3.

5. Conclusions

Medium and long-term projections of public expenditures are crucial in modern societies in order to anticipate the futures challenges of the public sector. Given its relative size on public spending, these projections are particularly important in the case of public pension expenditures, as it is been acknowledged in the on-going redefinition of the budgetary medium term objectives in the European Union or in the new Satellite National Accounts proposed by the ECB and the European Commission. However, in many cases these projections are not well understood by the public opinion, who ignores many aspects about the functioning of public pension systems, and are very often watered down under the argument that the projection errors made in the past suggest that this kind of exercises is of limited value.

In this paper we have suggested a set of indicators about the future performance of the Spanish public pension system and a suitable method of representing their uncer-

Table 3. Summary indicators of the pension system.

(Central and high/low expenditure scenarios scenarios)

	High-expenditure	Central	Low-Expenditure
Key facts			
Year Expenditure > Revenues	2020	2024	2031
Year Fund=0	2032	2038	2052
Accumulated debt until 2060			
(annual GDP share)	-3,4%	-1,6%	0,5%
(2007 GDP share)	-113,4%	-66,2%	21,6%
Necessary adjustment (from 2009)			
Revenues (annual)	1,4%	0,6%	-0,2%
Expenditure (annual)	-1,1%	-0,5%	0,1%

Note: Not including the short-term economic uncertainty factor
Source: Own elaboration

tainty, in order to improve the communication to the public opinion and to prevent future criticisms about their forecast accuracy. We have argued that simple, transparent, credible, public, and periodically updated indicators, which take explicitly into account the uncertainty about future demographic, economic and institutional developments, may contribute to improve the debate on the policies and to support governments in the continuous reforms needed to strengthen the pension system.

To illustrate our proposals, we have taken the Spanish public pension system as workhorse. Spain is a particularly interesting case since the social security system has been in surplus for nine consecutive years, in contrast to the projections made just a decade ago. We have shown that these projections errors from 1996 to 2006 can be explained by an unexpected favourable performance of the labour market, mainly due to the effects of immigration. Despite the current favourable situation, Spain will face one of the highest increases in public expenditure among EU countries due to ageing, as shown by all the indicators we have proposed, even taking into account the demographic, economic and institutional uncertainty surrounding the projections. This expected increase in pension expenditures encourages fostering a debate on the challenges of the Spanish public pension system in good times better than in bad times, in order to have a wider margin of manoeuvre, given that reforms have been less far-reaching than in other European economies, notably Germany, Italy or Sweden.

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7. Additional tables

Table A1. Main socio-economic assumptions

Central scenario	2006	2010	2030	2060
Participation rate				
Total	72,2%	75,6%	75,2%	79,7%
Female	61,8%	66,9%	68,9%	77,6%
Male	82,4%	84,0%	81,3%	81,8%
Unemployment rate				
Total	8,3%	7,7%	6,5%	4,1%
Female	11,4%	10,4%	8,1%	4,0%
Male	6,1%	5,6%	5,1%	4,1%

Source: INE and own elaboration

Table A2. Per capita income growth decomposition, 1996-2060

Central scenario, average annual growth, p.p.							
	GDP/Lpop	GDP/L	L/LS	Ls/L16-64	L16-64/Lpop	GDP	Lpop
1996-2006	2,6	0,4	0,4	1,7	0,1	3,7	1,2
2007-2010	1,5	0,9	-0,2	1,2	-0,3	3,3	1,8
2010-2015	1,2	1,3	-0,1	0,4	-0,4	2,3	1,1
2015-2020	1,4	1,5	0,1	0,0	-0,2	2,1	0,7
2020-2025	1,4	1,5	0,1	0,0	-0,2	1,7	0,4
2025-2030	1,3	1,5	0,1	0,1	-0,4	1,5	0,2
2030-2035	1,2	1,5	0,1	0,3	-0,7	1,3	0,1
2035-2040	1,1	1,5	0,1	0,5	-0,9	1,2	0,1
2040-2045	1,1	1,5	0,1	0,6	-1,0	1,2	0,0
2045-2050	1,4	1,5	0,1	0,5	-0,6	1,3	-0,1
2050-2055	1,8	1,5	0,1	0,3	-0,1	1,5	-0,2
2055-2060	2,0	1,5	0,1	0,2	0,2	1,6	-0,3

Source: INE and own elaboration

Table A3. Institutional assumptions. Recent developments and projections (I)

Take-up ratio: Lpens / L+65				
	Observed	Central	MTAS (2005)	EPC (2006)
1996	1,19			
2006	1,14			
2010		1,13	1,10	1,18
2020		1,10	1,09	1,16
2030		1,08	1,02	1,14
2040		1,05	0,96	1,08
2050		1,03	0,93	1,00
2060		1,00	---	---
Average	1,15	1,06	1,02	1,11

Source: INE, Ministerio de Trabajo y Asuntos Sociales and own elaboration

Table A4. Institutional assumptions. Recent developments and projections (II)

Average real pension increase (Gpens/pLpens)				
	Observed	Central	MTAS (2005)	EPC (2006)
1996	2,10			
2006	2,06			
2010		1,85	2,30	1,37
2020		1,77	1,67	1,90
2030		1,68	1,80	1,90
2040		1,77	1,70	1,70
2050		1,69	1,50	1,42
2060		1,56	---	---
Average	1,88	1,72	1,79	1,67

Source: INE, Ministerio de Trabajo y Asuntos Sociales and own elaboration