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From Bismarck to Beveridge: the Other Pension Reform in Spain

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RESUMEN (NON TECHNICAL SUMMARY)

El sistema de la Seguridad Social en España es un sistema de reparto de tipo contributivo, donde la pensión que recibe un trabajador jubilado depende de su historial laboral (salarios, años de cotización y edad de jubilación). Además, hay que tener en cuenta que las bases de cotización y las pensiones tienen unas cuantías máximas y mínimas que se fijan anualmente por ley y que juegan un papel relevante en el actual sistema de pensiones español. A pesar de la apariencia externa de que apenas se había reformado el sistema de pensiones en España hasta 2011, la acción de modificar levemente dichos parámetros, modificaciones en los topes de las pensiones y de las bases de cotización conllevan importantes implicaciones para la naturaleza del sistema, pero al ser percibidos como secundarios se ha denominado por parte de los expertos en pensiones como la "Reforma Silenciosa" (Boldrin et al. (2000); Jimeno (2002); Alonso y Herce (2003); Conde-Ruiz y Alonso (2004); Conde-Ruiz y Jimeno (2004) y Galasso (2006)).

Los elementos clave de este tipo de reforma son (i) actualizar las pensiones con la inflación en lugar de con el crecimiento de los salarios y (ii) poner un tope a la pensión que puede recibir un individuo (pensión máxima) actualizando dicho tope con la inflación. Estas medidas supondrían un aumento del número de jubilados cuyas pensiones quedarían limitadas por la pensión máxima y por lo tanto cualquiera de las dos medidas disminuiría el gasto en pensiones futuro pues lo que haría, en definitiva, sería reducir la indexación de pensiones a salarios.

El objetivo de este artículo es analizar el potencial que tendría una reforma de este tipo tan discutida en términos teóricos, siendo este el primer artículo que cuantifica y evalúa sus potenciales implicaciones. Para ello se estudiarán los efectos que cambios en los parámetros citados tendrían sobre la sostenibilidad del sistema previo a los cambios aprobados en el año 2011 (para evaluar su potencialidad comparando los resultados con la aprobada en ese año). Se plantean cuatro escenarios donde la base máxima de cotización crece lo mismo que la productividad mientras que la pensión máxima crece a un ritmo menor que la productividad hasta un escenario extremo donde este parámetro no se revaloriza manteniéndose constante en términos reales. Para obtener sus consecuencias en el sistema se ha empleado un modelo de proyección contable, con generaciones solapadas y agentes heterogéneos, de gastos del sistema de pensiones español hasta el año 2070. Modelo desarrollado en González (2013) y empleado en Conde-Ruiz y González (2013) para la reforma de pensiones de 2011.

La actualización de la pensión máxima con la inflación mientras que la base máxima de cotización lo hace con la productividad podría suponer, si se llevara a un escenario extremo, que el porcentaje de individuos que verían topada su pensión aumentaría en las próximas décadas llegando a superar el 70% de las nuevas pensiones en el año 2051 y la pensión media se reduciría hasta un 50% para los trabajadores con estudios terciarios. Además podría tener un importante efecto de contención del gasto. En el caso más extremo podría suponer un ahorro de hasta 3,2 puntos porcentuales de PIB en 2051. Este impacto es de gran importancia en

comparación el de reforma DE 2011 que supondrá un ahorro de 3,7 p.p. de PIB en 2051, según Conde-Ruiz y González (2013) con la misma metodología y el mismo escenario demográfico.

Al mismo tiempo, disminuiría la generosidad media del sistema pero se conseguiría precisamente a través de las pensiones más altas, con lo que se estaría aumentando el grado de redistribución intrageneracional. En este artículo se pone de manifiesto que la denominada como "Reforma Silenciosa" en su supuesto más extremo podría conseguir cambiar por completo la naturaleza del sistema convirtiendo un sistema tipo contributivo o Bismarckiano en otro más asistencial tipo Beveridge.

From *Bismarck* to *Beveridge*: the Other Pension Reform in Spain*

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Abstract

Ageing is the major challenge for the PAYG pension systems in developed countries. Most of them are undergoing reforms in order to adapt to the new demographic reality. The package of reforms implemented includes increasing the retirement age, reducing the replacement rate, or introducing a sustainability factor linking pension to life expectancy. The aim of this paper is to analyse the potential consequences of a different type of reform that is at a very incipient stage in Spain but that could have a significant impact if it were fully implemented. This reform, called 'silent reform' because it is imperceptible to citizens in its early stages, basically consists in increasing maximum pensions in line with inflation instead of wage or productivity growth. This policy is reducing the replacement rate only for high earning workers and increasing the redistributive component of the system. This paper is the first to quantify and evaluate the potential consequences of this type of reform in Spain. We have used an accounting model with heterogeneous agents and overlapping generations in order to project pension expenditure for the next five decades. The results show that this type of reform could potentially contain future expenditure but at the cost of changing the nature of the pension system from a contributory or Bismarckian-type system into a pure redistributive pension system or Beveridgean-type one. The paper also shows that the institutional characteristics (i.e. the existence of maximum limits to pensions and contributions) that make this kind of reform possible are also present in the majority of developed countries with Bismarckian pension systems. Therefore, the lessons learned in this paper could be useful to other countries.

Keywords: ageing, Spanish pension system, reform, sustainability, accounting projection model
JEL Classification: H55, J11, J26

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1 Introduction

There is no doubt that the population ageing is threatening the financial sustainability of Pay-As-You-Go pension systems. In the last decades, many countries have undertaken major reforms and others are now undergoing similar processes. Spain finds itself in this latter case, and several studies have shown that, in the absence of reforms, pension expenditure would increase in the next four decades, accelerating from 2035 onwards (Comisión Europea, 2009; MTIN, 2008; Jimeno et al., 2008; Diaz-Saavedra, 2005; de la Fuente and Doménech, 2009; Rojas, 2005; Sanchez-Martin and Sanchez-Marcos, 2010; Alonso and Herce, 2003; Herce and Fernández (Dir.), 2009). The changes approved in Spain in 2011, which included increasing the retirement age from 65 to 67, among others, together with the introduction of the Sustainability Factor in 2013, are the most significant reforms that have been made in decades.

Despite the last two major reforms of the Spanish pension system, the ageing process is so intense that it will be impossible to prevent the replacement rate from decreasing at least 20 to 25 percentage points, moving from the current 74 per cent to 50 per cent in the next decades[1]. As a result, a public debate has arisen, in which it is argued that it would be fairer if the inevitable fall in the replacement rate were mainly focused on pensioners with the highest pensions.

Therefore, if this type of reform were to be implemented, it would change the basis of the Spanish pension system from a contributory system (or Bismarckian) to a universal pension system (or Beveridgean). Currently, both types of pension models exist in Europe. Bismarckian systems are designed to provide a sufficient retirement income for all workers: from the low skilled to the highly skilled. In contrast, the Beveridgean pension system aims to ensure a minimum pension and, as a result, requires lower contributions, leaving room for the middle classes to add to their pension pot with private savings. Indeed, countries with a Beveridgean system have an average pension expenditure of 6 per cent of GDP, while countries with a Bismarckian pension system have an average expenditure of more than 10 per cent of GDP.

In view of the above, how could this type of reform be implemented? In the case of Spain, this would be feasible if some kew parameters of the pension system were modified - in particular the value of the maximum and minimum pension, as well as the upper and lower limit of the contribution base. This would result in major changes in the redistribution and the overall generosity of the system, which is defined as the ratio between average pension and productivity. In fact, a low intensity reform of this type has been carried out in Spain. Some experts have named it the ‘silent reform’ of the pension system due to the fact that it is almost imperceptible to voters in the initial phase. More specifically, the key measures in this kind of reform are: (i) adjusting pensions in line with inflation instead of wage growth, and (ii) setting a cap to the maximum retirement benefit an individual may receive (maximum pension) and indexing it to inflation. In a period of economic growth, these

[1] The changes approved in 2011 only solve about one-third of the existing problems, as highlighted in several studies (see MEH (2011); Banco de España (2011); de la Fuente and Doménech (2013); Conde-Ruiz and González (2013)).

measures would imply an increase in the number of retired individuals whose pensions would be limited due to the maximum pension limit. For this reason, any of these two measures could reduce future pension expenditure because they would break the link between benefits and wage growth.

The aim of this article is to quantify the potential consequences of this hypothetical reform, which has been widely discussed and studied in theoretical terms in Spain (amongst others Boldrin et al. (2000); Jimeno (2002); Alonso and Herce (2003); Conde-Ruiz and Alonso (2004); Conde-Ruiz and Jimeno (2004)). To date, there are no studies quantifying its implications, and this paper is the first to analyse its hypothetical impact on the Spanish pension system.

The main results of the paper show that if this type of reform were to be fully implemented, it would change the basis of the Spanish pension system by transforming it into a universal pension system (or Beveridgean). We quantified how the intra-generational redistribution element in the pension system would increase. Moreover, we show the important implications that this sort of reform would have on reducing future expenditure, as well as on the overall generosity of the system. In order to evaluate the potential of the reform in the sustainability of the Spanish pension system we compared its effects with those of the 2011 reform, which, among other changes, increased the retirement age from 65 to 67.

The idea of converting the Bismarckian Spanish pension system into a Beveridge one is starting to enter public debate. The financial crisis in Spain has exacerbated income inequality, not only due to significant wage devaluation, but also to a high increase in the long-term unemployment rate. In this respect, Conde-Ruiz and Profeta (2007) have provided a positive theory on why a Bismarckian or a Beveridgean system may arise. They show that income inequality represents the key determinant in social security design and suggest that Beveridgean systems may be supported by a voting coalition between low-income individuals, who favour its redistributive aspect, and high-income individuals, who support the reduced size of the Beveridgean system, which allows them to make more use of private provisions.

Finally, it is interesting to point out that the Spanish Bismarckian pension system is not the only one that has the two institutional elements that are crucial for this sort of reform. In particular, this will be shown in the paper, the upper and lower pension and contribution base caps, which are found in most industrialised countries with Bismarckian pension systems. This means that the implications and lessons learned in this paper may be useful to other countries with a Bismarckian pension system.

This paper is set up as follows: Section 2 discusses the role of limits (upper and lower) to contribution bases and pension benefits, the institutional aspects of the Spanish pension system, and their existence in other countries. The methodology used in our simulations is presented in Section 3.1. Next, the results related to individual pensions are collected in Section 3.2, regarding the percentage of new pensions that are affected by both the upper cap and the amount to which the pension is limited. The implications regarding the sustainability of the pension system are discussed in Section 3.3. In Section 3.4 the consequences for the nature of the system are examined. Finally,

we draw our conclusions. Additional results are presented in the appendix, together with a more detailed explanation of the methodology and the rules for calculating retirement pensions in Spain.

2 From *Bismarck* to *Beveridge*

2.1 The Mechanism

The pension system in Spain[2] seemed not to have undergone any major reform in the two decades before the reform that was approved in 2011[3], in which the retirement age was increased to 67 among other changes, and the introduction of the Sustainability Factor designed in year 2013[4].

However, even during the period without reforms, and according to some experts, the Spanish social security system was undergoing changes caused by the development of some of the system's key parameters, including the maximum and minimum limits on pensions and contributions. The pension policy over the last fifteen years, as discussed in more detail in Section 2.2, shows two clear trends: i) the value of minimum pensions has increased in real terms, while maximum pensions have been adjusted with inflation - maintaining their value in real terms but reducing their purchasing power in relation to the average wage; and ii) minimum contribution bases have been reduced in real terms, while the upper limit of contributions has remained almost constant in real terms.

The slight modification of these parameters has not received much attention in the media or in political arenas because they have been regarded as secondary factors to the financial sustainability of the pension system. However, as we will see in the paper, persistent changes to these parameters will generate significant modifications in the distributive structure of the social security system and would inevitably have an important impact on both the policy on pensions and their financial sustainability. This is why it has been called a 'silent reform' (amongst others, Boldrin et al. (2000); Jimeno (2002); Alonso and Herce (2003); Conde-Ruiz and Alonso (2004); Conde-Ruiz and Jimeno (2004)). It substantially affects the nature of the social security system without reforming any of the criteria that are considered to be the most important ones, such as the contribution rate, retirement age, contribution bases, pension formulae, etc.

[2]The Spanish social security system is a PAYG system, and is defined as one in which a retired worker receives a pension that is dependent on their employment history (wages, years of contribution to the system and retirement age). In 2013, the Sustainability Factor was designed and approved (Law 23/2013 of 23 December, Reguladora del Factor de Sostenibilidad y del Í?ndice de Revalorización del Sistema de Pensiones de la Seguridad Social) and will come into force in 2019. It will take into account the increase in life expectancy at age 67 in the calculation of the initial retirement pension.

[3]Prior to the 2011 reform, the two most relevant reforms took place in 1997 and 2002. In 1997 eligibility and the reference wage were extended to 15 years and the replacement rate was changed. With the 2002 reform early retirement was allowed at 61 for workers who had not contributed before 1967 but who had a minimum of 30 years of contributions. It also introduced changes to the penalization coefficient linked with age of retirement. See more details in Appendix C.

[4]See Diaz-Gimenez and Diaz-Saavedra (2014) and Sanchez-Martin (2014) for an analysis of the impact of this reform.

Despite the fact that the general population would not notice the impact of this type of reform at its incipient stage, the consequences would be evident in time. Let us look at a scenario in which there is a positive growth rate in productivity and all the pensions (including the maximum pension) are adjusted in line with inflation. If wages (and all contribution bases) grow steadily at the rate of productivity, but the maximum pension threshold is not adjusted in line with wages, then the replacement rate (ratio pension / average wage) will decrease for individuals entitled to the maximum pension - and the ratio (average pension /average productivity) of the system as a whole will also decrease. Therefore, in time, pension value would stop increasing at the same rate as wages and would eventually reach the cap. Consequently, the number of people receiving the maximum pension would increase over time. Moreover, there would be a decrease in the ratio between the average pension and average productivity. Nowadays the number of individuals who retire with a maximum pension is around 3 per cent. If this mechanism were taken to its extreme, with wages growing at the same rate as productivity (and therefore contributions as well), the number of individuals eligible to receive the maximum pension would also increase, although the value of the pension would remain constant in real terms.

This result would imply that this sort of reform would transform the system from a contributory or Bismarckian system (such as the current Spanish system in which pensions depend on past contributions), into a Beveridge system or pure redistributive pension system, in which all individuals receive the same pension regardless of their contributions. This would mean that the very nature of the pension system would change without anyone realising. This critical aspect will be discussed in detail in Section 3.4. The increasing gap between the limits would also affect the sustainability of the system, and, although more individuals would receive the maximum pension the generosity of the system would decrease in time because the maximum pension value would remain constant in real terms. This means that not only would the nature of the system change, but it would also have important effects on containing pension expenditure, as we will see in the next section.

2.2 Institutional elements

The Spanish Social Security system establishes maximum and minimum limits to the contributions and pensions, which are set each year by the government. Employers and employees contribute a percentage of the worker's wages to the social security system[5]. Contributions are limited by both a floor $b_{\min}$ and a ceiling $b_{\max}$. The contribution base represents the fraction of labour earnings subject to social security contributions and it is linked to wage ω:

$$b_t = \begin{cases} b_{\min} & \text{for} \quad \omega_t < b_{\min} \\ \omega_t & \text{for} \quad b_{\min} \leq \omega_t \leq b_{\max} \\ b_{\max} & \text{for} \quad \omega > b_{\max} \end{cases} \tag{1}$$

[5]The statutory contribution rate for common contingencies is 28.3 per cent, of which 4.7 per cent is paid by the worker and 23.6 per cent by the company.

At the same time, the Spanish pension system is characterised by having a minimum (i.e. $p_{\min}$) and a maximum retirement pension (i.e. $p_{\max}$). The minimum pension is intended for those individuals who are eligible to receive a contributory pension but whose contributions are below a certain threshold. This floor depends on the type of pension (retirement, widowhood, disability or orphanage), age (older or younger than 65) and personal circumstances (with or without dependent spouse), and, moreover, there is also an earnings limit. However it does not depend on the number of years of contributions. The maximum pension limits the amount that individuals with higher pensions would receive[6]. The contributory pension that an individual receives can be expressed as:

$$P = \begin{cases} p_{\min} & \text{for} \quad p < p_{\min} \\ p & \text{for} \quad p_{\min} \leq p \leq p_{\max} \\ p_{\max} & \text{for} \quad p \geq p_{\max} \end{cases} \tag{2}$$

These two elements have evolved differently over time. The minimum pension value has historically increased in real terms (with significant increases in the years before the start of the crisis). In contrast, the maximum pension value has remained fairly constant in real terms over the past two decades, due to its rising in line with inflation. Figure 1 shows the trend of the upper and lower limits for both pensions and contributions since 1982, and the following points are relevant for the simulations carried out in this article:

(a) the minimum contribution base decreased slightly during the 1990s, then it increased at a higher rate than the Consumer Price Index from 2004 to 2010 and has dropped since 2010;

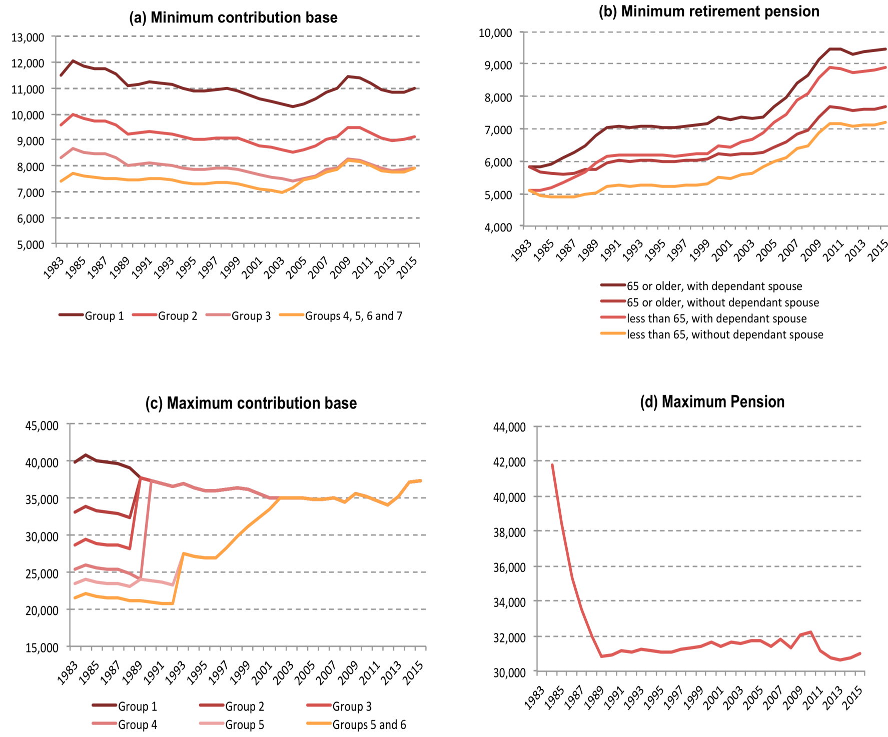
(b) the minimum retirement pension has increased in real terms over the whole period from 1983 to 2012. Throughout the 1990s and between 2004 and 2010 the value of all pensions increased significantly;

(c) the maximum contribution base has historically increased with inflation at the same time that the different professional categories were grouped together, remaining steady in real terms from the year 2002 onwards. It has increased since 2013.

(d) the upper limit for the maximum retirement pension increased in line with inflation up until 2010 but has not followed the trend of real wages. It has dropped in real terms since 2011.

[6]It was established in the year 1984 and it is the same for all pension types and personal circumstances.

Figure 1
Maximum and minimum contributions and retirement pensions (euros/year real terms 2006, 1983-2015)

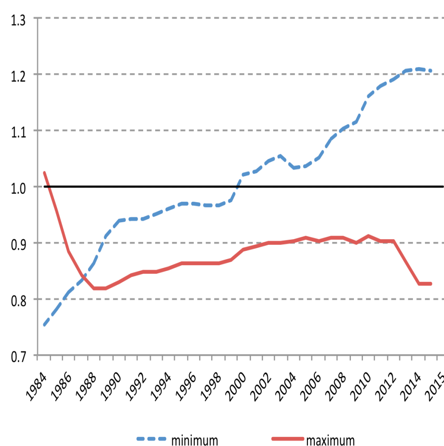


Source: Ministry of Employment and Social Security and INE

In a contributory system, the relation between contributions and pensions (maximum and minimum values) is a key element of the intragenerational redistribution of the pension system and both ratios should be stable and equal to 1. For individuals with complete working histories who always had the maximum (or minimum) contribution base the corresponding pension should be equal to the maximum (or minimum) limit. Figure 2 shows the evolution, since 1984, of the ratio between the minimum pension and contribution base values (pension / contribution base) and the same ratio between the maximum values. The maximum pension has remained steadily below the maximum contribution cap (ratio less than 1) in the last ten years. Since 2000, the minimum pension has grown above the minimum contribution limit (ratio greater than 1). In 2015[7] the maximum pension was 17.1 per cent lower than the maximum contribution base, while the minimum pension was 20.7 per cent higher than the minimum contribution base. This first piece of evidence points towards the system already bearing the effects of a greater difference between the maximum pension and the maximum contribution base. This means that those workers who contribute continuously the maximum amount would receive a lower pension from the system than they should according to their contributions, and vice versa for those who contribute the minimum.

Figure 2

Ratio pension / contribution base - minimum and maximum (1984-2015)



Source: Ministry of Employment and Social Security and own elaboration

2.3 Beveridge, Bismarck and limits in an international context

In the case of the Spanish pension system, the relationship between the lower and upper limits of both pensions and contribution bases is one of the key factors in determining its future development. It is a contributory or Bismarckian system and it has a certain degree of intragenerational redistribution

[7]In 2013, the maximum contribution base rose 5 per cent and the maximum pension 1 per cent. In 2014 the maximum contribution increased by the same amount as in 2013, and all pensions including the maximum limit grew by 0.25 per cent.

through its minimum pensions. If we examine PAYG pension systems worldwide, we can see that different degrees of intragenerational redistribution exist and that there are no completely pure Bismarckian systems actually exist[8].

In the previous section we saw that through the application of different growth rates to both the maximum contribution base and the pension benefit it is possible to change the nature of a system from contributory, or Bismarckian, to a pure redistributive, or Beveridgean system. In this section we are going to assess whether the two key elements that would enable such reform in Spain are also present in other pension systems, i.e. the existence of a maximum yearly pension and the existence of maximum yearly earnings. The analysis is purely descriptive and does not aim to show that the mechanism described above is being applied in other countries with similar characteristics. The following Table 1 contains the main institutional characteristics of most developed countries. All countries showed in Table 1 that have a Bismarckian system (BI), with the exception of Finland and Norway, have a maximum cap for contributions to social security. Interestingly, most countries that have a Beveridgean system (BE) do not have a maximum limit for contributions or are funded through general taxation. Furthermore, all countries have a cap on the maximum pension value.

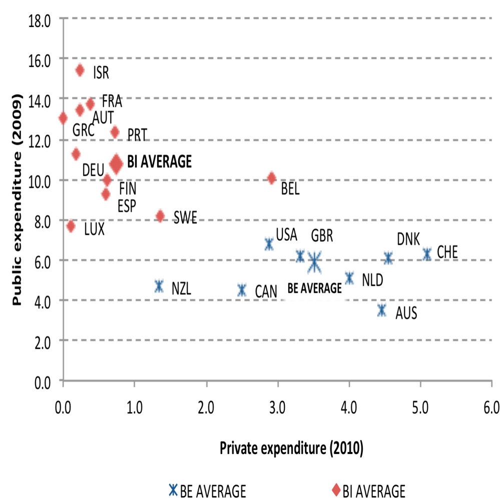
The differences between both types of pension systems were already apparent at the time when they were first introduced. The first social security system was created by von Bismarck in Germany in 1881 and it was of a contributory nature, i.e. a system in which there was a direct relationship between pensions and the financial contributions made by workers. One of the main functions of this system was to provide insurance in the form of income that was paid in certain situations such as in old age or to those with a disability. Later, in 1942, the British economist William Henry Beveridge drew up the 'Beveridge Report', in which he introduced an alternative model of PAYG social security that guaranteed a minimum pension equal for all workers in Britain, which had the purpose of reducing poverty and raising the income of the poorest in order to ensure a certain level of subsistence. It was introduced by the Labour Government elected in 1945.

As Conde-Ruiz and Profeta (2007) highlighted, the adoption of one of these systems depended on several factors, including important political factors. Surprisingly, the Bismarckian system was introduced due to the pressure of what we would today call the middle class, together with the influence of the industrial trade unions. During the same period, the United Kingdom was characterised by a liberal and democratic tradition. There were no collectivist political movements or any notions of the state's responsibility and, therefore, systems of private and voluntary insurance developed. However, the pension system proposed in the Beveridge Report, published in the United Kingdom in 1942, advocated the introduction of a minimum payment system to help reduce poverty. It offered a fixed universal pension that was the same for most workers. Obviously, the redistributive component in a system of this type is fundamental.

[8]There are a number of papers, such as Disney (2004) or Conde-Ruiz and Profeta (2007), that have classified different pension systems in the world as either Bismarckian or Beveridgean.

As shown by Disney (2004) and Conde-Ruiz and Profeta (2007), each system has specific and different characteristics[9], and which were present at the very beginning of both systems. On the one hand, the Beveridgean system has historically been associated with lower pension expenditure in terms of GDP compared to Bismarckian systems. On the other hand, countries with a Beveridgean system tend to have more developed private pension systems and the use of private pension plans is more widespread. The aforementioned differences can be seen in the following Figure 3, in which several countries are classified by type of pension system according to Disney (2004): Bismarckian (BI with a diamond) or Beveridge (BE with star), together with the public and private expenditure of each country. It can be observed how Beveridgean countries spend about 6 per cent of their GDP on public pensions, while Bismarckian countries spend on average more than 10 per cent of their GDP. In contrast, the reverse occurs when analysing expenditure on private pensions. Countries with a Beveridgean system spend much more on private pensions than their Bismarckian counterparts: 3.5 per cent compared with just less than 1 per cent.

Figure 3
Public and private pension expenditure in Bismarckian and Beveridgean countries (% of GDP)



Source: OECD (2013) and Disney (2004)

[9]It is interesting to point out that a more recent classification of countries according to the Bismarkian or Berverdigean nature of the pension system (Krieger and Traub, 2013) gives almost the same result as Disney (2004), which we have used in table 1 and figure 3.

Table 1

Comparison between countries that have a Bismarckian pension system and those with a Beveridgean one

COUNTRY(1)		PENSION EXPENDITURE (% GDP)(2) Public (2009)	Private (2010)	PENSION FUND ASSETS (2011, % GDP)(3)	MAXIMUM YEARLY LIMIT (YEAR 2012)(4) Earnings	Pension
BISMARCK	**AUSTRIA**	13.5	0.2	4.9	€50,760.0	1.78% of the assessment base for each year of coverage (adjusted average earnings in the best 24 years, up to €3,675.13 a year)
	BELGIUM	10.0	2.9	4.2	€ 47,960.3	60% of average lifetime earnings (75% for a married couple if the spouse has no income)
	FINLAND	9.9	0.6	75.0	NO	€77.64 to €7,303.56 depending on marital status other pension income received (limit of €16,095.4 according to marital status)
	FRANCE	13.7	0.4	0.2	€36,372.0	€36,372
	GERMANY	11.3	0.2	5.5	€67,200.0	€67,200.0
	GREECE	13.0	0.0	0.03	€66,561.6	€33,280.8
	ITALY	15.4	0.2	4.9	€93,622.0	€96,149
	LUXEMBOURG	7.7	0.1	1.9	€108,089.4 (five times the legal social minimum wage)	€84,134.76
	NORWAY	5.4	1.6	7.4	NO	7.1 times the base amount which is 82,122 kroner (May 2012)
	PORTUGAL	12.3	0.7	7.7	€36,372.0	92% of the reference earnings used for pension calculation
	SPAIN	9.3	0.6	7.8	€39,148.8	€35,320.46
	SWEDEN	8.2	1.4	9.2	440,622 kronor	60% of the insured's average income above 44,900 kronor in the 15 best years. For years with earnings below 44,900 kronor, 96% if single; 78.5% if married
	BISMARCK AVERAGE	10.8	0.7	10.7		
BEVERIDGE	**AUSTRALIA**	3.5	4.5	92.8	Total cost is financed from general government revenues	Fixed amount depending on personal characteristics
	CANADA	4.5	2.5	63.7	C$ 48,300.0	C$ 6,404.4
	DENMARK	6.1	4.5	49.7	Up to 2,160 kroner (for a full-time worker)	68,556 kroner with at least 40 years of residence
	IRELAND	5.1	–	46.2	NO	€230.30 a week (complements depending on marital status and personal characteristics)
	JAPAN	10.2	–	25.1	7,440,000 yen	Different maximum depending on retirement age and marital status
	NETHERLANDS	5.1	4.0	138.2	€49,297.0	Fixed amount depending on marital status and personal characteristics
	NEW ZEALAND	4.7	1.3	15.8	Total cost is financed from general government revenue	Fix amount depending on personal characteristics
	SWITZERLAND	6.3	5.1	110.8	NO	27,840 francs
	UNITED KINGDOM	6.2	3.3	88.2	NO	Â£ 5,157.6
	USA	6.8	2.9	70.5	$ 110,100.0	$ 28,392 (year 2011)
	BEVERIDGE AVERAGE	5.9	3.5	70.1		

Source: (1) Classification following Disney (2004); (2) OECD (2013) Year 2008 for public expenditure of Sweden and private expenditure in Norway. Year 2009 for private expenditure in The United States. OECD does not obtain data of private expenditure in Ireland and Japan; (3) OECD Global Pension Statistics; (4) U.S. SSA (2012).

Moreover, it is interesting to see that in several countries the replacement rate drops for those with the highest wages, which is due to the existence of upper limits for contributions and for pensions (see Table 2). As we have seen, the key elements to implement this kind of reform already exist in most countries with a Bismarckian system. Although we do not intend to show that countries that have upper caps in place are necessarily going to implement this sort of reform (explained in Section 2.1), we believe, nevertheless, that the implications and lessons learned in the case of Spain could be useful to other countries with a Bismarckian pension system.

Table 2
Pension Replacement Rate*

	Gross (% average wage)						Net (% average wage)					
	Male			Female			Male			Female		
Country	50	100	150	50	100	150	50	100	150	50	100	150
Austria	78.1	78.1	77.6	78.1	78.1	77.6	92.1	91.6	88.9	92.1	91.6	88.9
Belgium	47.6	46.6	35.3	47.6	46.6	35.3	64.2	60.9	49.1	64.2	60.9	49.1
Finland	55.8	55.8	55.8	55.8	55.8	55.8	66.6	63.5	65.0	66.6	63.5	65.0
France	56.8	55.4	48.2	56.8	55.4	48.2	66.9	67.7	62.0	66.9	67.7	62.0
Germany	37.5	37.5	37.5	37.5	37.5	37.5	53.4	50.0	49.0	53.4	50.0	49.0
Greece	58.9	46.2	41.9	58.9	46.2	41.9	66.8	54.1	52.4	66.8	54.1	52.4
Italy	69.5	69.5	69.5	69.5	69.5	69.5	82.2	79.7	81.6	82.2	79.7	81.6
Luxembourg	89.5	76.8	72.5	89.5	76.8	72.5	98.4	88.6	83.7	98.4	88.6	83.7
Netherlands	94.0	90.5	89.3	94.0	90.5	89.3	101.3	95.7	94.1	101.3	95.7	94.1
Portugal	75.1	73.8	72.5	75.1	73.8	72.5	87.7	89.5	88.4	87.7	89.5	88.4
Spain	82.1	82.1	82.1	82.1	82.1	82.1	89.1	89.5	89.3	89.1	89.5	89.3
Sweden	64.4	64.4	73.1	64.4	64.4	73.1	63.9	63.6	78.2	63.9	63.6	78.2

Source: OECD (2015)
*Note: The gross/net replacement rate is defined as gross/net pension entitlement divided by gross/net pre-retirement earnings for a person who entered the labour force at age 20.

3 From Bismarck to Beveridge: the case of Spain

The aim of this paper is to analyse the potential effects of a pension reform through changes to the maximum limits (contribution bases and pension values) in the coming decades up until 2070. We will quantitatively study the potential consequences to the Spanish pension system of different growth rates between the maximum contribution base and the maximum pension benefit. In particular, we will look at the potential effects of such a reform regarding sustainability, as well as its ability to alter the nature of the pension system, i.e. to transform a contributory or Bismarckian pension system (the current Spanish pension system) to a Beveridgean system. The model used is an accounting model with heterogeneous agents and overlapping generations in order to project revenues and expenditures of the pension system for the next six decades.

As seen in the previous section, maximum and minimum limits are fixed each year by the government. Although it is not possible to capture exactly how the effects of these decisions will evolve in time, we are going to set out different possible scenarios. First of all, we will assume that both the upper and lower caps for contributions and pensions will grow at the same rate as productivity. This scenario will be called 'scenario 1 or neutral', i.e. where the mechanism explained in Section 2.1 does not apply. We will also examine three alternative scenarios in which the growth rate of the maximum pension benefit is lower than the productivity rate. Specifically:

- two 'middle scenarios': the maximum contribution base grows alongside productivity, as in the neutral scenario, but the maximum pension increases 50 and 30 percent of the productivity growth, respectively. They are called scenario 2 or (1, 0.5) and scenario 3 or (1, 0.3), respectively.
- a 'scenario 4 or extreme scenario' (or (1, 0)): the maximum contribution grows at the same pace as productivity, as in the neutral scenario, but the maximum pension benefit is not indexed with productivity and remains constant in real terms.

The methodology used for the projections is described in the next section and in Section 3.2 we present the results obtained concerning the impact of the reforms on: i) the number of new pensions that are capped and ii) the quantity by which the new pensions are limited. In order to analyse the impact on individual pensions we will focus on pensions obtained by employees (or under the General Regime) who retire at the legal age of 65, because it is the most affected group by this sort of reform[10]. We will also discuss their possible effects on the sustainability of the pension system (Section 3.3) prior to the 2011 reform (in this case we also consider the workers who retire early). This will allow us to analyse the potential of this type of reform by comparing the results from 2011 obtained in Conde-Ruiz and González (2013) with the same model, the same methodology and the same demographic scenario[11]. Finally, we will highlight the implications of the system through the analysis of its generosity and the replacement rate (Section 3.4).

3.1 Projection methodology

The developed model is an accounting projection model with heterogeneous agents and overlapping generations, used for the projection of revenues and expenditures of the Spanish social security system with overlapping generations and heterogeneous agents. It includes a high degree of individual distinction (by age, gender, nationality and level of education)[12]. The simulation period starts in

[10]Appendix A provides details of these results in case of early retirement between 61 and 64 and for self-employed individuals.

[11]It is important to point out that it is not appropriate to compare our results with the impact of the 2013 reform as generated by other authors (MINECO, 2014; Diaz-Gimenez and Diaz-Saavedra, 2014; Sanchez-Martin, 2014) because they use a methodology and demographic scenario different to ours.

[12]Model developed in González (2013) and used in Gonzalez, Conde- Ruiz and Boldrin (2009) to analyse the impact of the migration phenomena in the Spanish pension system and in Conde-Ruiz and González (2013) to evaluate the pension reform approved in 2011.

2006 and runs over six decades up to 2071.

The simulation strategy is developed in three main phases (see section B in the Appendix for more detail). Firstly, the population projection based on the Cohort Component Population Projection Method with the aforementioned heterogeneous agents is employed. Secondly, the reconstruction and projection of employment history is carried out using data from the Continuous Sample of Working Histories of Social Security (Muestra Continua de Vidas Laborales, MCVL)[13], micro data from the Labour Force Survey (LFS), and the corresponding data from the National Statistical Institute of Spain (Instituto Nacional de Estadística de España, INE) to obtain the transition probabilities for five different working situations (employed, self-employed, unemployed, disabled and another situation of inactivity) according to the different heterogeneous agents considered. During their working lives, individuals contribute to the system. Once they retire they receive a retirement pension that depends on the terms of their employment history. We also take into account that they may generate a widow's pension when they die. The calculation of the pension expenditure is the third stage of the projection process.

STAGE 1: Demographic Projection. The first phase of the model consists on the projection of the population up to 2071. To calculate this projection we employ the Cohort Component Population Projection Method. We adopt the overall demographic hypotheses regarding life expectancy (and corresponding survival probability) and fertility rates released by the Spanish National Institute of Statistics (INE) in its long-term projection scenario up to 2051 (see INE, 2005). For the period 2051-71 we assume a stable development of the three variables from 2051 onwards. The total figures projected by the INE for total number of births and net migration flows are categorised by gender, age and nationality. Moreover, we have taken into account the level of education of future generations as it constitutes an important factor regarding employability. We assume that all the new generations will reach the same level of education as the most educated individuals so far, (i.e. those born in 1975 and who were 32 years old in 2007). The implications of this assumption mean that the percentage of the labour force with only an elementary level of education will decrease and that the percentage of university graduates will increase by ten points by 2060 (see González, 2013).

STAGE 2: Projection of Work History. We project both revenue and expenditure of the social security system taking into account the assumptions about labour force participation, employment and productivity until the year 2051 in line with the macroeconomic scenario used by Spain's Ministry of Economy and Finance (joint exercise with the European Commission for long term pension expenditure projection (European Commission, 2011). From the year 2051 onwards it is assumed that forecasts will remain constant until 2071. Our underlying assumption is that the relevant legislation will not change; therefore the contributions will grow parallel to wages, which in turn will grow at the same rate as labour productivity.

[13] The Continuous Sample of Working Histories is a database created by the Spanish Ministry of Labour and Social Affairs that contains records of the working and pension histories of 4 per cent of the people who, at any time in the corresponding wave, had a registered record with the social security system, either as contributors or as pensioners. For more details see Seguridad Social (2006) and Argimón and González (2006).

Individuals between 15 and 64 years of age can be in five possible situations during their working life: working as an employee, be self-employed[14], unemployed, receiving disability benefits or be in another situation of inactivity[15], such as being in education. Between the ages of 66 and 99, it is assumed that individuals are retired, with or without the right to receive a pension, according to the rules determined by law.

We have defined 120 different groups of individuals (12 groups divided by gender, education and nationality, and 10 by age between 15 and 64) whose contributions to the system and their pensions upon retirement we simulate. To reconstruct complete working histories we use real work histories from when they started working gathered from MCVL data. Both macroeconomic assumptions and the probability of being in one of the five labour situations defined by age, gender, nationality and educational level are incorporated in order to calibrate the corresponding rates of activity, employment and unemployment for each of the different groups of individuals. Then, we simulate a virtual work history for the following years in order to obtain the complete work histories spanning the whole projection period.

Finally, retirement patterns of individuals classified by gender, educational level and age are observed through MCVL data. Individuals can retire early (between the ages of 61 and 64) or at the ordinary age of 65, differentiating them by gender and level of education. It is important to point out that we do not model the endogenous behavioral reactions of individuals to developments in the economic and legal environment; however, we gain in the microeconomic precision and data reliability of our simulations carrying out the computational exercise at the highest disaggregated level. In this regard we are not considering that the introduction of the type of reform analysed in this article may introduce perverse incentives in the labour supply of workers. For example, if workers know that from a certain level of labour income an increase in additional contributions to the system does not imply an increase in their pension, they will have an incentive to reduce their declared hours of work or wages. If this were the case, we would be overestimating the wages in the economy and therefore the social security revenue in our results.

STAGE 3: Revenues and Expenditures Projection. Once the work histories of each of the 12 different groups (by age, gender, skill and nationality) are obtained, we have the key elements to calculate the corresponding retirement pensions: i) number of years of contributions, ii) wages (i.e. the contribution base) and iii) retirement age. The average pension benefit for each group is then calculated using these records and by applying the legislation[16]. Pension expenditure takes into account pensions at 65 and early retirement between 61 and 64. The total expenditure of the system is the sum of expenditure on retirement, widow's and disability pensions [17].

[14]This distinction enables us to apply the characteristics of each scheme regarding retirement, for example in the special scheme for self-employed (Régimen Especial de Trabajadores Autónomos, RETA) early retirement is not allowed.

[15]Including the situation of inactivity is relevant because there are differences by gender, educational level and nationality as shown in González (2013).

[16]See Appendix C for more details about the rules on retirement in Spain.

[17]See González (2013) for more detail about widow's and disability pensions.

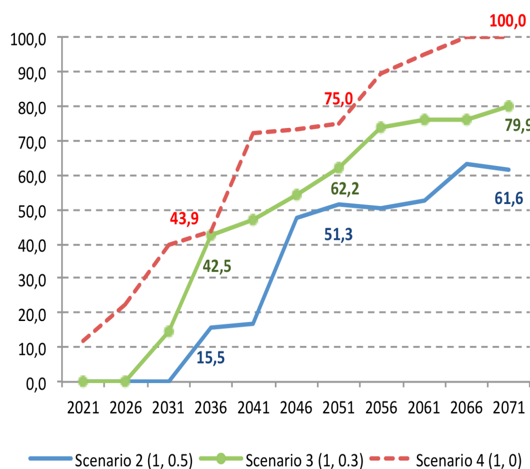
3.2 Impact on individual pensions

The first noticeable effects of different increases in the maximum pension and the contribution limits would be an increase in the number of individuals whose pensions would have been capped. That is, in the future it is expected that new pensions will be higher, not only because wages will also be higher due to their growth in line with productivity, but also because individuals will have better work histories due to improvement of their education level. This is especially true for women, whose increased participation in the labour market, together with higher qualifications, will lead to higher pensions in the future. However, if the maximum pension value grew at a lower rate than productivity and the maximum contribution base grew alongside productivity, it would mean that a greater number of pensions would be capped as time passes.

In this section, we will analyse the consequences of the widening of the gap between the maximum pension value and the maximum contribution base for different groups of individuals, bearing in mind that the level of heterogeneity of the model is very high since individuals are classified according to their age, sex, educational level and nationality. The analysis in this section will focus on employed people (General Regime) who retire at 65 because it is the most affected group by this sort of reform. Moreover, our model also allows for the observation of what happens with early retirement (age 61-64) and the self-employed. Details about these groups are included in Appendix A.

The impact on the percentage of new pensions that are limited by the upper cap varies from scenario to scenario, as shown in Figure 4. The effects start to be evident in 2036 in scenario 2 (or scenario (1, 0.5)), in 2031 in scenario 3 (or scenario (1, 0.3)), and in 2021 in scenario 4 or extreme scenario. In Figure 4 we show the projected trend of percentage of pensioners affected in the coming decades. By 2051, 51 per cent of new pensions would be capped in scenario 2, while in the most extreme scenario this proportion rises to 75 per cent. In this case, scenario 4, the effects would begin in 2021 and the percentage of capped pensions would rise over time exceeding 70 per cent by 2051 and reaching 100 per cent in 2071.

FIGURE 4
Percentage of new capped pensions. Scenario comparison (2021-71)



In a more detailed analysis, included in Table 3, men would be affected more than women by the mechanism described in Section 2.1 in every scenario. If we take the educational level into account, university graduates would have the highest percentage of limited pensions. This is to be expected, as graduates have a more complete work history and earn higher wages. There are also differences between the categories for men and women. However, women's pensions would be generally less affected, although those with higher qualifications would see their pensions capped. From 2041, the percentage of women with a university degree and capped pension benefit is higher than for their male equivalents. This is due to improved educational and work histories than their older counterparts.

TABLE 3
Percentage of new capped pensions by scenario, gender and skill

		Scenario 2 (1, 0.5)			**Scenario 3** (1, 0.3)			**Scenario 4** (1, 0)		
		2021	2051	2071	2021	2051	2071	2021	2051	2071
Male	Primary						24.7		25.8	34.7
	Secondary		16.6	15.9		16.6	15.9		16.6	25.9
	Tertiary		40.4	39.4		40.4	39.4	22.8	40.4	39.4
	TOTAL	0.0	57.0	55.3	0.0	57.0	80.0	22.8	82.8	100.0
Female	Primary						12.4			23.5
	Secondary			13.1		13.1	13.1		13.1	22.2
	Tertiary		45.7	54.3		54.2	54.3		54.2	54.3
	TOTAL	0.0	45.7	67.4	0.0	67.3	79.8		67.3	100.0

Once we have obtained the percentages of new pensions affected, it is interesting to evaluate their impact on what the average pension is worth. Since a higher percentage of capped pensions are to

be expected than in the neutral scenario, it is therefore also expected that this sort of reform would reduce the value of the average pension of the system. For example, within four decades, the value of new pensions could be between 6.7 per cent and 30.9 per cent lower than the benefit recognized in the neutral scenario (see Table 4).

TABLE 4
Variation of the average new pension value in each scenario against the neutral one (%, 2021-71)

	Scenario 2 (1, 0.5)	Scenario 3 (1, 0.3)	Scenario 4 (1, 0)
2021	-	-	-
2031	-	-1.3	-6.3
2041	-1.9	-8.5	-19.3
2051	-6.7	-15.6	-30.9
2061	-11.1	-23.3	-40.6
2071	-15.5	-29.4	-49.0

Following the individual details of the model, the value of pensions would decrease more for men than for women in any of the proposed scenarios (Table A.2 in Appendix A). This is because men have higher contribution bases than women for any given level of education. Furthermore, if we take skill into account in the case of the extreme scenario, the resulting pensions could register a 44 per cent reduction in their quantity by 2051. In the case of university graduates, there is nearly a 60 per cent loss by 2071 (see Table A.3 in Appendix A).

In Table 5 we compare the potential results of a pension reform as the analysed in this article with the reform of the Spanish pension system approved in 2011[18] in order to assess its potential. It is clear that the effects on the average pension are very similar to those obtained under scenario 2 or (1, 0.5).

TABLE 5
Variation of the average new pension value by scenario. Comparison with 2011 reform (year 2051)

	Scenario 2 (1, 0.5)	Scenario 3 (1, 0.3)	Scenario 4 (1, 0)	Reform 2011 Conde-Ruiz and González (2013)
TOTAL	-6.7	-15.6	-30.9	-9.1
Gender				
Male	-8.8	-17.8	-33.4	-8.1
Female	-4.3	-13.2	-28.0	-10.1
Skill				
Primary			-11.7	-11.5
Secondary	-3.5	-10.1	-24.3	-11.1
Tertiary	-10.3	-23.4	-40.4	-7.4

[18]See Appendix C for further details of changes under this reform.

3.3 Impact on sustainability

In this section we will analyse the potential implications that changes in the pension system such as those described in this paper would have on the evolution of total pension expenditure based on the different scenarios presented. As described in Section 3.1, we obtained the work histories and key elements necessary to calculate retirement pensions (number of years of contributions, contribution bases and retirement age). Then, we calculated the corresponding average pension for each group and applied the corresponding legislation. Total pension expenditure includes retirement pensions at 65 and early retirement between 61 and 64, taking into account both retirees under the employees or General Regime (Régimen General, RG) and under the special scheme for self-employed (Régimen Especial de Trabajadores Autónomos, RETA). As we have indicated, we will obtain the results based on the Spanish pension system prior to the 2011 reform for comparison.

As expected, the total pension expenditure will increase in the coming decades, not only due to higher life expectancy but also due to the fact that pensions will be higher because of the improvement of work histories. However, if the maximum contribution cap grows at the same rate as productivity and the upper pension limit remains constant in real terms (our extreme scenario), the value of the new pensions will be limited, as shown in the previous section, which would have implications in terms of the total pension expenditure. The difference between the neutral and the extreme scenarios would be perceptible from 2031 onwards because there would be a significant number of retirees at 65 entitled to the maximum pension. In fact, population dynamics plays an important role since, as seen in figure 5, the maximum number of new pensions is reached in 2040, when larger numbers of people (those from the baby boom) would retire and the trend of pension expenditure a percentage of GDP would adopt an inverted 'U' shape. At the same time, under the extreme scenario, pension expenditure for new pensions would continue to increase until 2046. From that point onwards there would be a two-fold effect: the number of new retirement pensions at 65 would be lower due to population dynamics, and the type of reform analysed would have its greatest impact in 2046.

If the characteristics mentioned were to remain constant over time, pension expenditure would be lower. Total expenditure would be lower if the scenario were closer to the extreme scenario, and it could reach, in comparison with neutral scenario, 3.2 percentage points (p.p.) of GDP by the year 2051 (see Table 6). The reason for this is obvious: in our model all wages grow in line with productivity and this means that all contribution bases (including the maximum) also grow at this rate. This implies that the Reference Wage (Base Reguladora) also grows for all individuals, which in turn generates the growth of benefit amount. Due to the fact that pensions have a maximum limit, a greater number of workers are entitled to the maximum pension. The higher the percentage of workers with a maximum pension, the lower the expenditure of the system. Moreover, if the maximum pension increase is 30 (scenario 3 or (1, 0.3)) or 50 (scenario 2 or (1, 0.5)) per cent of productivity growth, then expenditure would be lower from 2041 onwards and, by 2051, it would be down 1.4 p.p. of GDP in scenario 3 and 0.4 p.p. of GDP in scenario 2.

Figure 5
New retirement pensions at 65 and expenditure: extreme and neutral scenarios (2021-71)

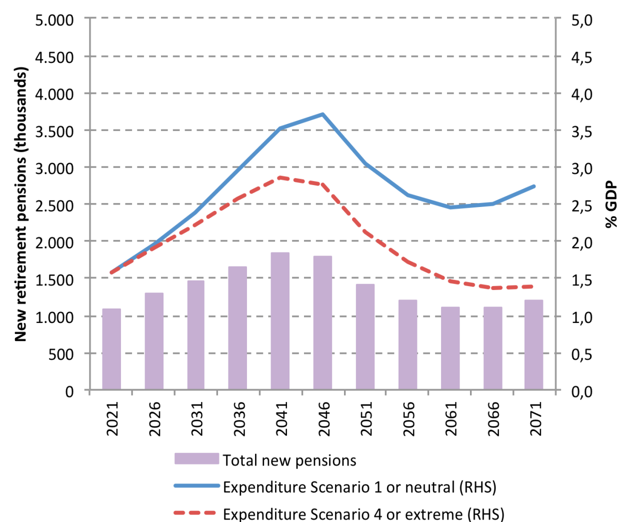


Table 6
Total pension expenditure and reduction by scenario (2021-71)

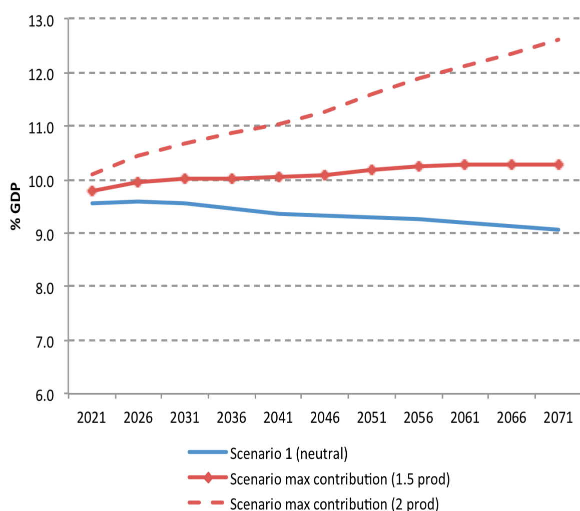
	Expenditure (% GDP)	Reduction (p.p. GDP)		
	Scenario 1 (neutral)	Scenario 2 (1, 0.5)	Scenario 3 (1, 0.3)	Scenario 4 (1, 0)
2021	9.2	0.0	0.0	0.0
2031	13.4	0.0	0.0	-0.2
2041	20.1	-0.1	-0.5	-1.3
2051	24.3	-0.4	-1.4	-3.2
2061	22.9	-0.8	-2.2	-4.7
2071	21.4	-1.5	-3.3	-6.1

Therefore, if the Spanish Pension System were to shift towards a Beveridgean one along the lines of the mechanism described in section 2, there would be a significant effect on containing pension expenditure. As seen in this paper, it could lead to a 3.2 p.p. of the GDP reduction of expenditure by 2051 (Table 6) in an extreme scenario, compared with the 3.7 p.p. of GDP reduction under the 2011 reform, based on the same methodology and the same demographic scenario as in Conde-Ruiz and González (2013)[19].

[19]We have focused the analyses on the mechanism of the 'silent reform' when the maximum pension benefit grows at a lower rate than the maximum contribution base and the minimum pension benefit grows at the same rate as productivity. If we assume an alternative scenario where the minimum pension remains constant in real terms, then the effects over future expenditure would be more pronounced, as can be seen in Appendix D.

If we analyse the revenue of the social security system as a percentage of GDP, it is easy to understand that, if all the contribution bases (including the maximum contribution base) grow at the same rate as worker productivity (i.e. scenario 1), total contributions will remain constant over time. However, it is also possible that an additional impact of the reform described previously could arise if we consider different scenarios where the maximum contribution base[20] would grow at a higher rate than productivity. In this sense, we have considered two alternative scenarios: one where the maximum contribution base grows at 1.5 times the productivity growth rate and a second scenario where it grows at twice the productivity growth rate. As can be seen in Figure 6, the impact on social security revenues could be significant, while in the second case it could imply an increase of around 3 percentage points of GDP by the year 2061.

Figure 6
Revenues under different maximum contribution growth rates (2021-71)



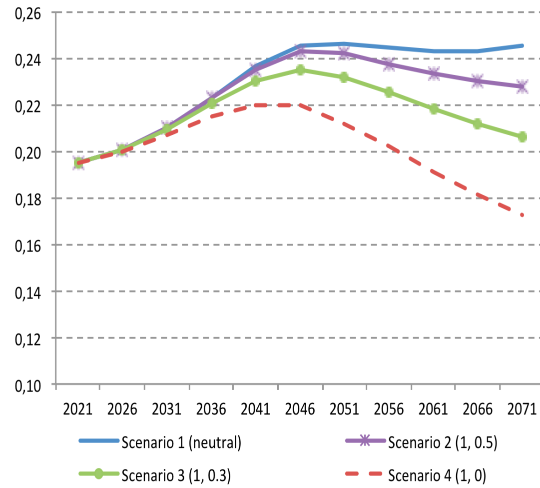
3.4 Implications for the nature of the system: from *Bismarck* to *Beveridge*

If the process set out in this paper were to adopted, i.e. that the maximum contribution cap grows at the same pace as productivity and the upper benefit cap remains constant in real terms, it would have a significant effect on pension expenditure. However, it would also take place at a cost, since it would have important distributional consequences. Regarding the generosity of the system (defined

[20] According to data from the Continuous Sample of Working Histories of Social Security, the percentage of workers in Spain with the maximum contribution base would be around a 10-15 per cent. Cuadrado et al. (2011) and Bonhomme and Hospido (2012) observed that the 10th percentile of female earnings distribution is capped, rising to nearly 20 per cent for male earnings.

as the ratio between average pension and productivity[21]), the maximum would be reached in 2051 in all scenarios, but in the more extreme scenario there would be a lower level of generosity across the system. Within four decades, generosity would be the 24.2 per cent in scenario 2, 23.2 per cent in scenario 3 and 21.2 per cent in scenario 4 or extreme, versus 24.6 per cent in a neutral scenario (Table A.4 in Appendix A). Generosity would decline over time in all scenarios from 2051 onwards, when the number of pensioners affected increases, and would be most pronounced in the extreme scenario (see Figure 7). This sort of pension reform could become a powerful mechanism to avoid the transfer of growth in productivity to pensions. Note that if no such changes were made, growth in productivity would transfer to the contribution bases (or wages), then to the Reference Wages, and finally to pensions.

FIGURE 7
Ratio of average pension to productivity (2021-71)



The ratio between pension value and contribution base can provide an insight into what would happen to the nature of the system under the type of reform analysed in this article. It is known as replacement ratio because it highlights the relation between an individual's pension and their last wage. If the pension system is purely contributory or Bismarckian, this ratio remains roughly constant in line with contributions. This implies that if someone has a higher salary (i.e. a higher

[21]The ratio of total pension expenditure to GDP can be decomposed as a function of three main components: demographics, the labour market and the institutional factor. The following equation illustrates the role generosity plays in the institutional factor and so on in the total expenditure as percentage of GDP.

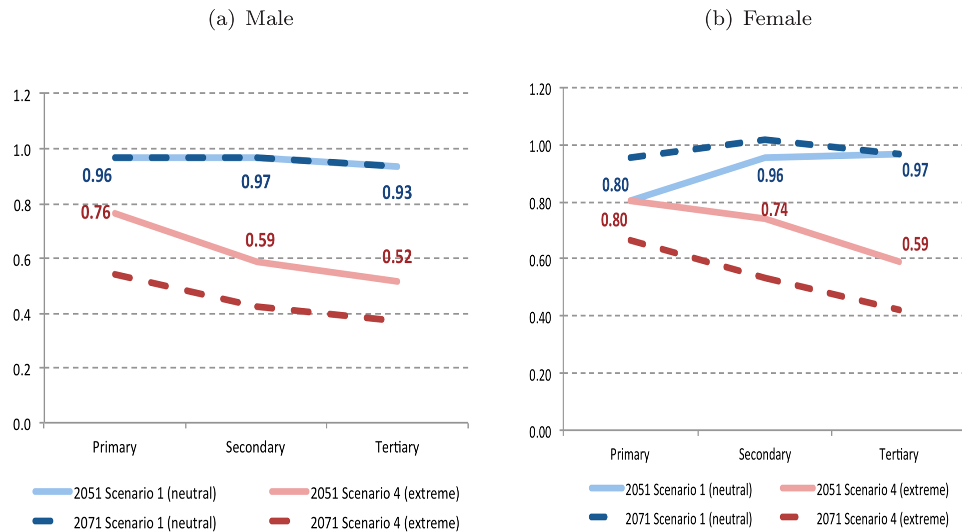
$$\frac{\text{Pension Expenditure}}{GDP} = \underbrace{\frac{\text{Pop. }>65\text{ years old}}{\text{Working Age Pop.}}}_{\text{Demographic Factor}} \cdot \underbrace{\frac{1}{\text{Employment Rate}}}_{\text{Labor Market Factor}} \cdot \underbrace{\overbrace{\frac{\text{Number of pensions}}{\text{Pop. }>65\text{ years old}}}^{\text{Elegibility}} \cdot \overbrace{\frac{\text{Average Pension}}{\text{Average Productivity}}}^{\text{Generosity}}}_{\text{Institutional Factor}}$$

contribution base), he will contribute more overall and will be entitled to receive a higher pension. As observed in Figure 8, the ratio is maintained nearly constant in the neutral scenario. In the case of female university graduates the replacement rate increases slightly due to the fact that they have more complete work histories, therefore gaining access to higher pensions.

In a Beveridgean or pure redistributive pension system pensions do not depend on contributions to the system. As stated previously, in a system of this type, the replacement rate decreases with respect to wages because all individuals receive the same pension regardless of their salary. Therefore, workers with higher wages have a lower replacement rate. This is precisely the result of maintaining the maximum pension value constant in real terms, while the maximum contribution base increases at the same pace as productivity. Figures 8(a) and 8(b) show these contrasts as reflected in our extreme scenario for Spanish individuals retiring at 65, in which the replacement rate would decrease alongside the level of education.

FIGURE 8
Ratio first pension / last contribution base. Neutral and extreme scenario by gender

(a) Male (b) Female



The results obtained in this article prove that it would be possible to change the nature of the system from a contributive or Bismarckian type to a Beveridgean one. The kind of reform analysed in this paper would increase the intragenerational redistribution element in the pension system. This means that apparently small changes in some factors could lead to a significant structural reform that would completely change the nature of the system[22].

[22]This sort of reform also has implications in terms of the Internal Rate of Return (IRR). Following the methodology described in Jimeno and Licandro (1999) and Carpio et al. (2002) we have calculated the IRR for employed people (General Regime) who retire at 65. If the extreme scenario or scenario 4 took place, individuals in this group would have 3.4 per cent IRR as opposed to 4.4 per cent in the base scenario for the year 2051. It is noteworthy that this reduction would affect men and women differently. Men would have 2.9 per cent IRR in the extreme scenario and 4.0 per cent in the neutral scenario; meanwhile, women would have 3.9 per cent IRR instead of 4.7 per cent. Educational

4 Conclusions and discussion

The Spanish social security system, as well as many other European ones, has to face the challenge that an ageing population presents. There is no doubt that the average replacement rate (RR) will decline due to ageing pressure. However, there are several ways this reduction could be achieved: either by decreasing the RR linearly and guaranteeing the contributory element of the system, or by reducing the RR only for high earning workers and increasing the redistributive component of the system. We have shown that a full implementation of the pension policy that has already been adopted by the Spanish current and previous governments would result in the second option. This policy consists on increasing maximum pensions in line with inflation instead of wage or productivity growth. This paper explores the potential effects and implications of this theoretical idea and shows that it has relevant effects over the generosity of the pension system (by decreasing the ratio between the average pension and the average productivity) and its financial sustainability. We have shown that these changes could have significant effects on the expenditure of the system. In the most extreme case, it could imply a lower expenditure of 3.2 percentage points of GDP by 2051 and 6.1 p.p. of GDP by 2071. This impact is of great importance when compared to the effects of the 2011 pension reform. Conde-Ruiz and González (2013) demonstrated, using the same methodology and the same demographic scenario as in this article, that the 2011 reform (in which the calculation period was extended, retirement age was increased to 67 and a modified replacement rate was applied to the reference wage) may imply a 3.7 p.p. of GDP reduction of expenditure by 2051.

As we have seen, different growth rates between the maximum pension benefit and the maximum contribution base constitute per se a potential powerful reform mechanism that also has distributional effects. The policy of indexing the maximum pension with inflation may seem harmless and may seem not to imply any institutional change to the pension system, at least in the early stages. However, it is not the case in a context of growing wages (in real terms), as we have shown in this paper. In particular, the application of this type of reform could imply, in an extreme scenario, an average retirement benefit reduction of 50 per cent in the long term for workers with a tertiary education level. This means that it would reduce the average generosity of the pension system and would contribute its the financial sustainability.

However, given that this decrease in the average generosity of the system would be achieved by reducing only higher pensions, the reform also increases the degree of intragenerational redistribution of the system. Therefore, we have also shown that the reform could completely change the nature of the system, transforming it from a contributory or Bismarckian system into a pure redistributive or Beveridgean one.

This result is crucial as it opens the door to a possible reform of the pension system in Spain. The intensity of the ageing process will inevitably make the average replacement rate drop significantly. At the same time, widening income inequality has increased political support for lowering the replacement

background is also a factor and those at higher levels would be the most affected.

rate only for the highest pensions. Regarding this, it is important to point out that the Bismarckian system was originally created as a response to the demands of the middle class to provide a sufficient level of income in old age. Universal pensions in a pure redistributive system (i.e. Beveridgean) were created with the aim of providing a minimum pension equal for all workers, but leaving enough room for individuals to add to their pension packages with private savings. Both models already exist in Europe, and the only danger of this kind of change is not the change itself, but rather introducing it in a timely manner to give citizens enough time to adapt their decision-making regarding savings to the new pension system.

The main limitation of our methodology is that we assume decisions made by the workers (retirement age or educational level) are exogenous. In other words, our simulations are subject to the 'Lucas critique' in the sense that we do not model endogenous behavioural reactions of workers to changes in the rules of the social security system and their effects over the relative prices. In this respect, our simulation does not take into account important implications. For example, the introduction of this type of reform may introduce perverse incentives in the labour supply of workers because it reduces the incentive to contribute to the system. Another dimension, which is not discussed in this paper, is the saving decisions of the individuals. The so-called 'silent reform' would clearly increase the incentive for saving for old age by reducing the replacement rate. However, this simplification has allowed us to incorporate a very precise institutional detail of the Spanish pension system within the model, as well as a high level of individual heterogeneity amongst individuals.

Finally, the institutional features that allow the mechanism to transform the pension system towards a Beveridgean type (maximum pension and maximum contributions) are not exclusive to the Spanish pension system. In fact, as we have shown in the paper, they are present in most industrialised countries that have a Bismarckian pension system. Therefore, we believe that the lessons learned from the case of Spain could be useful for other countries.

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APPENDIX

A Detailed results

Table A.1
Percentage of new capped pensions by regime and age of retirement. Extreme scenario (2021-71)

	General Regime					Self-Employment Regime
	65 years	64 years	63 years	62 years	61 years	Regime
2021	11.9	0.0	0.0	0.0	0.0	0.0
2031	40.0	28.5	20.7	0.0	0.0	0.0
2041	72.3	53.3	56.8	34.4	18.4	0.0
2051	75.0	78.0	80.1	44.0	56.1	0.0
2061	94.9	91.7	85.3	74.2	80.4	34.3
2071	100.0	100.0	96.6	70.1	74.2	68.6

Table A.2
Variation in new pensions value in the neutral scenario by gender (%, 2021-71)

	Scenario 2 (1, 0.5)		**Scenario 3 (1, 0.3)**		**Scenario 4 (1, 0)**	
	Male	Female	Male	Female	Male	Female
2021						
2031			-2.3		-9.1	-1.4
2041	-3.5		-10.4	-6.2	-21.3	-16.8
2051	-8.8	-4.3	-17.8	-13.2	-33.4	-28.0
2061	-13.6	-8.6	-25.5	-21.0	-42.9	-38.2
2071	-17.4	-13.6	-31.8	-27.0	-51.0	-47.0

Table A.3
Variation in new pensions value in each scenario, by gender and level of education (%)

		Scenario 2 (1, 0.5)			**Scenario 3 (1, 0.3)**			**Scenario 4 (1, 0)**		
		2021	2051	2071	2021	2051	2071	2021	2051	2071
Male	Primary						-15.4		-17.0	-38.4
	Secondary		-6.0	-16.3		-16.9	-28.3		-30.3	-47.7
	Tertiary		-15.1	-28.0		-28.1	-43.0	-0.2	-44.0	-59.9
Female	Primary						-0.5			-22.6
	Secondary			-4.4		-0.2	-17.7		-15.7	-39.9
	Tertiary		-6.4	-19.8		-19.5	-36.5		-37.4	-55.3

Table A.4

Generosity (ratio average pension / productivity) of the system in each scenario (%, 2021-71)

	Scenario 1 (neutral)	**Scenario 2 (1, 0.5)**	**Scenario 3 (1, 0.3)**	**Scenario 4 (1, 0)**
2021	19.5	19.5	19.5	19.5
2031	21.0	21.0	21.0	20.7
2041	23.6	23.5	23.0	22.0
2051	24.6	24.2	23.2	21.2
2061	24.2	23.3	21.8	19.1
2071	24.5	22.8	20.6	17.2

B Detailed Methodology

The model developed is an accounting projection model with heterogeneous agents and overlapping generations, in which individuals live for 17 periods. Every period corresponds to five calendar years. Individuals enter the economy at the age of 15 and live, at most, until the age of 100. The maximum potential working life of an individual is therefore 10 periods (from age 15 to age 64), as 65 is the legal retirement age. The maximum period of potential life in retirement (for individuals retiring at 65) is 7 periods. Individuals are classified by age and also by gender (male and female), educational level (primary school, secondary school and tertiary education), and by country of origin (natives and immigrants). There are a total of 12 different groups of individuals and each one is divided into 17 subgroups according to age.

The model includes a great deal of detail regarding the Spanish pension system, which allows us to differentiate between employees contributing to the general system (Régimen General de la Seguridad Social) and self-employed workers contributing to the special self-employment scheme (Régimen Especial de Trabajadores Autónomos), which are analysed separately. The total number of qualifying years or years of contributions, the contribution bases and the retirement age are elements that determine the calculation of an individual's pension and are all taken into account.

The projection model contains individual heterogeneity and institutional detail that is a noteworthy characteristic of this model in comparison with other models used to project pension expenditure in Spain. Firstly, it can distinguish age, sex, educational level and nationality (versus other models, such as in Jimeno, 2003; Diaz-Saavedra, 2005; Sanchez-Martin and Sanchez-Marcos, 2010; Jimeno et al., 2008; Diaz-Gimenez and Diaz-Saavedra, 2006, 2009; Sanchez-Martin, 2001, 2010). Secondly, as far as we are aware, our model is the first to consider five different working situations for any given individual (employed, self-employed, unemployed, disabled and inactive) versus papers by Jimeno, 2003; Alonso and Herce, 2003; Sanchez-Martin, 2001, 2010; Diaz-Saavedra, 2005; Diaz-Gimenez and Diaz-Saavedra, 2006, 2009; Rojas, 2005; Sanchez-Martin and Sanchez-Marcos, 2010. Moreover, this is one of few models that employs data gathered from the administrative

database called Continuous Sample of Working Histories (Gil et al. (2008); Moral-Arce et al. (2008) and Herce and Fernández (Dir.) (2009) also employ this database) to predict accurately contributions in accordance with individual heterogeneity. It includes detail at the institutional level that allows us to obtain precise data on pension value and incorporates widow's pensions. The model also takes into account other important elements in the system such as the upper and lower cap of both contributions and pension benefits; key elements that are being examined in this paper. Other articles that have taken this into account to some extent include Jimeno (2003); Sanchez-Martin and Sanchez-Marcos (2010); Diaz-Saavedra (2005); Diaz-Gimenez and Diaz-Saavedra (2006, 2009); Moral-Arce et al. (2008).

STAGE 1: Demographic Projection. The demographic situation in the year 2006 is taken as the starting point in order to be consistent with data from the database Muestra Continua de Vidas Laborales (MCVL) for the same year. We adopt the overall demographic hypotheses regarding life expectancy (and corresponding survival probability) and fertility rates released by the Spanish National Institute of Statistics (INE) in its long-term projection scenario up to the year 2051 (see INE, 2005). For the migratory hypothesis we combine its short term forecasts for the period 2010-20 and long term forecasts for the period 2021-51 released in the year 2010 (see INE, 2010). For the period 2051-71 we assume a stable trend for the three variables from 2051 onwards. The total figures projected by the INE for total number of births and net migration flows are categorised by gender, age and nationality.

STAGE 2: Projection of Work History. We project both revenue and expenditure of the social security system. Assumptions about labour force participation, employment and productivity until the year 2051 are in line with the macroeconomic scenario used by Spain's Ministry of Economy and Finance. Individuals can be in five possible situations during their working life. Specifically, between ages 15 and 64, an individual may be employed by a company, be self-employed[23], unemployed, receiving disability benefits or be in another situation of inactivity such as studying. Between the ages of 66 and 99 it is assumed that individuals are retired, with or without the right to receive a pension, according to the rules determined by law.

There are a total of 120 different groups of individuals (12 groups divided by gender, education and nationality, divided into 10 age subgroups) whose contributions to the system and their pensions upon retirement we simulate. To reconstruct complete working histories first we use real work histories from when they started working up to the year 2006 from MCVL data. Then, we simulate a virtual work history for the following years in order to obtain the complete work histories spanning the whole projection period. We take into account individual heterogeneity and the different rules applicable under the employed and self-employed regimes.

[23]In Spain, there are several contribution schemes organised by different sectors, but we assume the full integration of regimes into two main groups in the future: one for those employed within the General Regime (Régimen General, RG) and other for self-employed individuals contributing under the Special Scheme for Self-Employed (Régimen Especial de Trabajadores Autónomos, RETA), as recommended by the Toledo Pact Commission but not yet implemented.

Using the micro data obtained from the Labour Force Survey we calculated transition probabilities for the five possible situations between ages 15 and 64 in each time period of the life cycle according to age, gender, skill and nationality. Then, we estimated the probability of each of the five work situations conditional on the situation in the previous period using a Monte Carlo simulation. The estimation process follows a finite Markov chain that is, for the set of individual characteristics, homogeneous across workers and the corresponding conditional transition probability matrix[24].

The transition probabilities obtained are consistent with the situation observed for the base year and the expected trend of the average employment rate over the projection period. Therefore, the virtual future history is obtained by incorporating macroeconomic assumptions and the probability of being in one of the five labour situations, differentiating by age, gender, nationality and educational level, in order to calibrate the corresponding rates of activity, employment and unemployment for each of the different groups of individuals. Finally, retirement patterns are observed through MCVL data by gender, educational level and age and individuals can retire early (between 61 and 64 years) or at the ordinary age of 65, differentiating them by gender and level of education.

STAGE 3: Revenue and Expenditure Projections. The model projects the work histories of the individuals (according to age, gender, skill and nationality) and their contributions to the system. It follows the assumed growth rate of wages (which corresponds to the growth rate of productivity from a macroeconomic scenario). The total revenue is equal to the sum of employed, self-employed and unemployed contributions [25] (for further details see (González, 2013)). Once the work histories of each of the 12 different groups are generated, we have the key elements for calculating the retirement pensions: i) number of qualifying years, ii) wages (i.e. the contribution base) and iii) retirement age. With these records, and by applying the legislation (see Appendix C for more details about the legislation on retirement in Spain, the average pension for each group is calculated. Pension expenditure takes into account pensions from age 65 and early retirement between 61 and 64. The total expenditure of the system is the sum of expenditure on retirement, widow's and disability pensions[26].

C Retirement in Spain

The key factors for calculating retirement pensions in Spain, up to the application of the Sustainability Factor in year 2019, are: i) eligibility, ii) number of qualifying years, iii) wages through contribution bases and iv) retirement age.

Eligibility depends on the number of years that contributions were made and on the age of

[24]See González (2013) for further details.

[25]Given the configuration of the Spanish system, a person receiving unemployment benefit generates rights for retirement through the contribution.

[26]See González (2013) for more details about widow's and disability pensions.

retirement. Pensions are granted to individuals who have contributed to the system for at least 15 years, two of which must be within the last fifteen years prior to retirement, who have reached the age of 65 (prior to the 2011 reform) and have retired from the active labour force. Early retirement can be taken from 61 to 64 by those individuals with a minimum period of contribution of 30 years and incurs a percentage reduction of the pension benefit[27]. For eligible individuals, the Spanish system provides an old age pension benefit equal to: $p_t = \alpha\theta\widetilde{w}$, where $\widetilde{w}$ is the reference wage (Base Reguladora), θ is the replacement rate (percentage applied to the reference wage or Base Reguladora) and α is the penalty for early retirement. The reference wage represents the weighted average of contributions to social security over the 15 years prior to retirement (following the system before the 2011 pension reform), and where contributions made in the two years prior to retirement are indexed to inflation (equation C.1).

$$\widetilde{w_t} = \frac{\left(\sum_{i=1}^{24} b_{t-i} + \sum_{i=25}^{180} b_{t-i}\frac{CPI_{t-25}}{CPI_{t-i}}\right)}{210} \tag{C.1}$$

where b_t is the contribution base at time t and CPI_t represents the consumer price index at time t. The denominator is equal to 210 because it takes into account that the Spanish social security pension pays pensions in 14 payments per year[28]. This reference wage may not coincide with the actual wage, due to the existence of upper and lower caps for contributions. Moreover, a replacement rate is applied to the reference wage depending on the number of qualifying years. An individual who has reached the minimum of 15 qualifying years (or years of contributions) will receive a benefit equal to the 50 per cent of the reference wage; for the next 10 years (up to year 25), each year will add a 3 per cent to the replacement rate; between years 26 and 35, each year will contribute an additional 2 per cent. When the individual has contributed the maximum of 35 years, the replacement rate is equal to 100 per cent, and any further years of contribution have no marginal value for workers.

$$\alpha = \begin{cases} 0 & \text{for} \quad N < 15 \\ 0.5 + 0.03\,(N-15) & \text{for} \quad 15 \leq N \leq 25 \\ 0.8 + 0.02\,(N-25) & \text{for} \quad 25 < N < 35 \\ 1 & \text{for} \quad N \geq 35 \end{cases} \tag{C.2}$$

where N represents the qualifying years (or years of contributions). Finally, coefficient α relates

[27] Prior to the 2011 reform, the two most relevant reforms took place in 1997 and 2002. In 1997, the number of years required to be entitled to a retirement pension was increased from 8 to 15 years with the corresponding timetable. Moreover, the period for calculating the reference wage was extended from 8 to 15 years and the replacement rate was established as 50 per cent for the first 15 years of contributions. Each additional year up to year 25 adds 3 per cent and from that year onwards, each additional year adds another 2 per cent until reaching 100 per cent for 35 years of contributions. Pensions have been indexed to inflation since this reform. Later, the 2002 reform allowed for early retirement at 61 for those workers that had not contributed before 1967 and had contributed a minimum of 30 years. Moreover, it also introduced changes to the penalization coefficient for early retirement and a premium for late retirement was introduced (2 per cent per additional year beyond 35 years of contributions or qualifying years).

[28] Ley 24/1997, de Consolidación y racionalización del Sistema de Seguridad Social.

pension benefits to retirement age according to the following formula:

$$\alpha = \begin{cases} 0 & \text{for} \quad R < 61 \\ 1 - \gamma\,(65 - R) & \text{for} \quad 61 \leq R < 65 \\ 1 & \text{for} \quad R = 65 \end{cases} \tag{C.3}$$

where R represents retirement age. The discount parameter γ is equal to 8 per cent for individuals with less than 30 qualifying years (or years of contributions) and between 7.5 per cent and 6 per cent for the rest depending on the number of qualifying years. The corresponding minimum (p_{min}) and maximum (p_{max}) limits will be applied to the resulting pension. Note that while the formulas for calculating retirement pensions are the same for employees (or General Regime, RG) and the special scheme for self-employed (Régimen Especial de Trabajadores Autónomos, RETA), early retirement is not possible under RETA.

The 2011 reform did not affect eligibility but introduced some changes to three key parameters including the replacement rate, the period of calculation and the retirement age, as well as establishing a transitional period until the year 2027 to reach the new values. The number of years required to reach 100 per cent of the reference wage was increased from 35 to 37 years, changing the scale to a regular and proportional one from the minimum one of 50 per cent at 15 years. The period of contributions is extended to the last 25 years (instead of 15 years) and the statutory retirement age is raised from 65 to 67 by 2027 (although workers who have contributed for at least 38.5 years will be entitled to a full pension at age 65). The reference wage after the 2011 reform is calculated as follows[29]:

$$\widetilde{w_t} = \frac{\left(\sum_{i=1}^{24} b_{t-i} + \sum_{i=25}^{300} b_{t-i} \frac{CPI_{t-25}}{CPI_{t-i}} \right)}{350} \tag{C.4}$$

Retirement age. There is a well known pattern: workers retire either at the first legally permitted age[30] or at 65, evidence for which is collected in papers such as Jimenez-Martin and Sanchez-Martin (2000); Boldrin et al. (2004); Jimenez-Martin and Sanchez-Martin (2007). The model takes into account that individuals can retire early (between 61 and 64 years) or at the ordinary age of 65 if before the 2011 reform (or at the correspondent age after the reform), and be classified by gender and level of education[31].

[29]The Sustainability Factor in Law 5/2013 will link the initial pension to changes in life expectancy at age 67. Its application will begin in 2019 and it will be automatically reviewed every five years. In addition, the law established a new Pension Revaluation Index that is obtained taking into account the balance between the revenue and expenditure of the system. All pensions, including the minimum one, will be adjusted annually by this percentage with a floor of 0.25 per cent and a cap based on Consumer Price Index growth plus 0.5 per cent.

[30]Early retirement at 60 in Spain was only possible for those who had made contributions before 1967 (the number of these cohorts are currently reducing due to aging). In 2001, the minimum retirement age was set at 61.

[31]See González (2013) for more details on retirement patterns in Spain.

Qualifying Years. The complete work histories show that workers who retire within four decades have, on average, longer work histories. A general increase in both the number of men and women in this category is observed, regardless of nationality[32].

Total pension expenditure. Pension value is calculated for each group at each point in time according to the corresponding law and taking into account the number of qualifying years (or years of contributions) and the retirement age. We then apply the corresponding floor (p_{min}) and ceiling (p_{max}) to the resulting amount. The formulae for calculating pensions are the same for employees (RG) and self-employed (RETA), although in the latter the possibility of early retirement is not allowed. Total expenditure for retirement pensions is the sum of pensions that take place at 65 and between 61 and 64.

D The role of the minimum pension

As we have seen throughout this article, the mechanism through which the 'silent reform' is being implanted consists of imposing the rule that the maximum pension value must grow at a lower rate than the maximum contribution base. This mechanism opens up an effective way of widening the gap between the total contributions paid and the total benefit received by highly skilled workers. The positive effects on the financial sustainability of the system could be amplified by a symmetrical mechanism of strategically playing with minimum contribution bases and minimum pensions.

In the Spanish pension system the contributory pension is initially obtained through direct application of the rules of the Spanish Social Security system. If the resulting pension is lower than the level of the minimum pension set by law, it will be topped up to guarantee the minimum amount. Furthermore, the value of the minimum pension ranges according to age, family circumstances, retirement age and type of pension.

The minimum pension has experienced a variable trend over time. In recent years, its value has grown at the same rate as worker productivity and well above the inflation rate. In the results presented in the previous sections we assumed that the minimum pension value was growing at the same rate as productivity. This means that the effects over future spending that we obtained would be larger if instead we assumed that the minimum pension remained constant in real terms. In this case, as we can see in Table D.1, the reduction in pension expenditure could be nearly one percentage point of GDP by 2041 and 2051. The effects beyond that year are slightly lower due to the enhanced working histories of the future retirees[33].

[32] Native men would exceed 40 qualifying years regardless of educational level. Women with secondary education qualifications (high school and college graduate) would experience the largest increase, reflecting women's increased participation in the labour market. However, only for those with a university degree would the gap between both genders be reduced (see González, 2013).

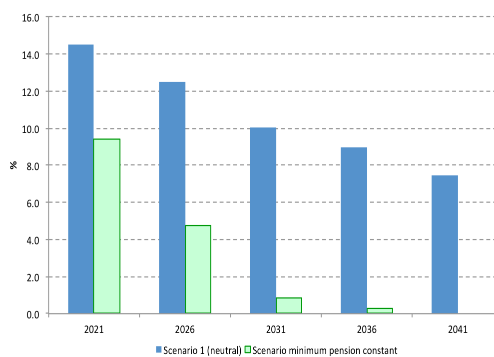
[33] See Diaz-Gimenez and Diaz-Saavedra (2015) for the consequences of exempting minimum pensions from the Pension Revaluation Index (PRI) that was introduced in the 2013 reform of the Spanish Pension System and making their real

Table D.1
Savings scenario constant minimum pension (2021-71)

	Expenditure (% GDP) Scenario 1 (neutral)	Savings (p.p. GDP) Scenario minimum pension constant
2021	9.2	-0.2
2031	13.4	-0.6
2041	20.1	-0.9
2051	24.3	-0.9
2061	22.9	-0.8
2071	21.4	-0.6

The savings made in total pension expenditure are important because lowering the value of the minimum pension fixed by law would mean that the share of low-skilled workers entitled to supplement their contributory pension is lower. As presented in Figure D.1, in an scenario where the minimum pension in constant in real terms the percentage of new pensioners that would require a supplement to their pension would almost disappear by the year 2031.

Figure D.1
Percentage of new pensions with minimum supplement



value a constant share of per capita output instead.