

*David Acosta-Rosero**

ANALYSIS OF THE GENEROSITY OF SPANISH PENSIONS (2010-2020)

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ABSTRACT: *This paper shows the impact of the legislative changes that increased the statutory retirement age and the number of contributing years on the generosity of the public pension scheme in Spain between 2010 and 2020. To do so, it was necessary to find a way to measure the generosity of the Spanish public pension programme. The methodology provided by Scruggs (2014), which in turn is a further development of that created by Esping-Andersen (1993), allows for the classification of different Welfare States based on their generosity. This article uses this method to quantify the public pension scheme during the ob-*

served period of time and then compare it against hypothetical data where legislative interventions that directly affected the variable data would not have taken place. The results show a clear quantifiable impact of the law over the generosity of the protection programme. However, the overall trend present in the index was not created by the legislative changes, it was only exacerbated by them.

KEY WORDS: *Spain, welfare state, pensions, generosity, public policy, legislative changes.*

JEL CLASSIFICATION: I38, H55, P16

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INTRODUCTION

The public pension system is one of the key components of the Welfare State and it seeks to help maintain the ability of an individual to participate in the market even if he or she has stopped receiving income from work. One of the prerequisites for access to this protection is usually for the individual to have contributed to the system for many years. It can be said that contributory public pension schemes are mandatory programmed savings mechanisms that are tied to employment. Due to the substitutive nature of Spanish contributory pensions, in their standard sense, they allow people to have enough for retirement without the need to concern themselves with the complex decision-making processes necessary to set up and maintain savings and investments that will provide income in those later years. By having a mandatory pension system as the default, the user can overcome certain psychological barriers such as procrastination, and status quo bias (Reeson & Dunstall, 2009). Furthermore, like other programmes of the Welfare State, they are a way to maintain healthy local aggregate demand levels (Bilbao Ubillos & Ochando Claramunt, 2015, p. 318).

Throughout its history, the Spanish pension system has had many challenges and, in recent decades, it has faced two new ones: the sustainability of a pay-as-you-go system, which relies on intergenerational generosity from workers towards pensioners, and the ability to maintain acceptable long-term quality of life levels for its users (Urbano et al., 2021). The first point can be illustrated by considering that in 2007 Social Security in Spain had a surplus of 2.2% of GDP, while in 2015 it registered a deficit of 1.5% of GDP. This change can be mainly attributed to the increase in the contributory pension expenditures compared to GDP (Hernández de Cos et al., 2017, p. 8). This can be partially explained by the increase in number of people retiring and being able to receive a public pension, from 4.73 million people in 2007 to 5.5 million in 2015 and 5.94 million in 2020 (Ministerio de Inclusión, 2023).

Consistent with a broader European trend (Carone et al., 2016), the Spanish Government enacted a series of measures that aimed to correct one of the previously acknowledged challenges: the sustainability of the system. Changes to the Social Security Act (*Ley General de la Seguridad Social*) were implemented to limit, slow down and modify the mechanisms used to calculate public pensions. Among the most important changes are: increasing the statutory retirement age;

increasing the contributing period; penalties for accessing early pensions and rewards for accessing them later in life; modifying pensionable income standards, introducing the 'Pension Sustainability Factor'; and introducing the 'Pension Reappraisal Index'; among others.

Most of these changes focused on the future generosity of pensions and avoided impacting the current users when they were enacted. This delay aimed to limit the purchasing capacity of future pensioners, reducing the benefits of pensions over time (Devesa et al., 2017, p. 9). The estimates in other studies consider a historical average inflation rate of 2% when talking about the loss in purchasing power for future pensioners. In the current context, we are experiencing a dramatic increase in inflation. As a result, the loss in purchasing power described and forecasted (pension retaining 84.11% of their purchasing power after 10 years of retirement for those leaving the job market by 2017) by the above-mentioned authors falls short of current expectations. Other estimates forecast even more dramatic reductions in the average pensions due to differences in the rates of growth between maximum pensions and maximum contributions (Conde-Ruiz & González, 2016, p. 31).

More careful scrutiny reveals that the generosity of this protection programme depends on the laws that govern and regulate it, as well as external elements that factor in the evolution of the components that make up the variables selected to measure it. This paper examines the legislative changes that increased the age necessary to access a full pension, directly impacting the variables of the instrument utilised to quantify pension protection programmes. The effects of life expectancy on pension schemes are clear, especially when considering that longer life spans might result in pension benefits being awarded for longer periods, representing a higher cost for the system.

Many of the legislative changes introduced to combat the 2008 Crisis, especially between 2011 and 2013, were intended to reduce the number of years that a person could enjoy pension benefits by having users work more years and until a higher age. In addition to the increasing life expectancy observed in the last decades, Spain has an ageing population, and its pension system is based on intergenerational generosity. Due to factors such as baby boomers retiring and an inversion in the demographic pyramid, changes in the nature of work and

technology, among others, the public pension system has experienced great stress and its long-term sustainability has come into question (Urbano et al., 2021).

Another important factor to consider is that in the last several years young workers have had a difficult time finding stable jobs. This phenomenon makes it difficult for them to have an adequate pensionable income basis, to be reached after 35 years of paying into to the system, to draw a full pension (Belmonte et al., 2009, p. 127). In conjunction with the previous points, the present and future generations of workers will have a difficult time accessing a reliable, acceptable pension, forcing them to depend on other saving mechanisms within the financial market, consistent with a ‘multi-pillar’ approach. This can be considered as a partial commodification of the social right provided by adequate public pensions.

This paper will begin by outlining the methodology that is used. The design of the index, the type of variables and how to utilise them are shown in the first section. The method utilised to obtain the data is presented, along with the necessary steps to process the information so it can be used. The next section deals with the results obtained from applying the variable data to the index structure. Once the outcomes have been presented, the last section offers conclusions drawn from this process.

Even though the future of the public pensions system is heading towards a less socially responsible and more market-driven outcome, as many of the previously mentioned authors have pointed out, this paper does not seek to deal or address the changes in funding, demographics, sustainability of the programme or purchasing power of future pensions; these topics have already been discussed at length by other authors such as López Gandía (2017), Zubiri (2016), (Hinrichs, 2021), among others. This paper does, however, show the overall behaviour of the programme over time and how a specific change in the law can have extensive repercussions for the programme itself.

METHODOLOGY

The methodology used to quantify the generosity of the public pension schemes is one of the three components of the Social Welfare Generosity Scores (Scruggs, 2014). This methodology was, in turn, based on the work of Esping-Andersen (1993). The pension component of the decommodification index created by

Esping-Andersen, and later adapted by Scruggs for the Social Welfare Generosity Scores, is used to assess the overall generosity of public protection programmes of a country in general, taking into consideration the replacement rates of both: standard (contributory) and social (non-contributory) pensions, the expected duration of a public pension, the qualification period of a standard pension, the funding ratio from the employee and the take-up (coverage) rate.

By examining all the variables previously specified, we can generate a score with wider scope, one that is not only focused on more obvious factors such as the value of the pensions or their coverage alone. In contrast, the value of the index can help explain why a pension system could maintain its generosity even when specific variables were to fluctuate.

Even though this paper utilises the architecture provided by the above-mentioned authors, it has a clear differencing factor when considering the sources of the data used for its calculations. Whereas the data in the Comparative Welfare Entitlements Dataset (CWED), as (Scruggs et al. (2017) state in their 2013 codebook, were taken from various international organisations, including The US Social Security Administration, The European Commission, OECD, among others, the data in this study are gathered mostly from official Spanish sources, such as the National Spanish Statistics Institute, different pieces of legislation and various Spanish ministries. The only exception was the information regarding life expectancy, which was taken from EUROSTAT. The CWED provides an excellent comparison of homogenised international data, while this text offers an in-depth analysis of the Spanish situation.

Another critical difference between the results observed in the CWED and this work relates to the scope and aim of this article. The CWED presents a cross-country comparison using historical data. It also takes into consideration not only pensions, but also unemployment insurance and sick leave. Its goal is to compare the generosity of the welfare state of different countries, or rather the generosity of some programmes aimed to maintaining purchasing power within the local market. In contrast, this article utilises the same structure to present a comparison of the current historical data of one country, in this case Spain, that takes into consideration the effects of legislative changes, and compares it to a hypothetical

scenario in which no legislative changes were introduced. Furthermore, only the impact on the public pension System generosity level is considered here.

VARIABLE TREATMENT AND INDEX CONSTRUCTION

To compare and utilise the information provided by each variable, it is necessary to normalise the data and obtain their Z-scores. This process is applied to every variable except for the take-up rate because this represents the proportion of the population that is affected by the other characteristics of the public pension programmes. The following formula is necessary to achieve this result:

(Value in year t – the average value for 2010-2020 period) / Standard Deviation for t ranging from 2010 to 2020.

Once the Z-scores have been found, they can be used in the index, whose structure is the following:

*Public pensions generosity = {z(Standard Pension Replacement Rate) + z(Public Pension Replacement Rate) + z(Expected duration of the pension) + z(Qualification period of the standard pension * -1) + z(Employee Funding Ratio *-1) + 12.5} * Take-up rate*

Three considerations are worth noting. The first is that an increase in the value of the qualification period or the employee funding ratio represents a decrease in the generosity of the pension system; hence, when used in the index they are multiplied by -1 in order to represent negative values. The second consideration is that in the particular case of this study, the employee funding ratio does not undergo any alteration. Therefore, it can be considered a non-influential variable and in the construction of the index presented in this paper, a value of 1 has been assigned to it for all its normalised values. Finally, a value of 12.5 is added before multiplication to avoid any negative values that might distort the results.

VARIABLES AND THEIR SOURCES

Standard Pension Replacement Rate

The replacement of the standard pensions can be considered as the proportion of income from the final year of work before retirement that is replaced by the

annual pension income once a person has retired. The average gross yearly income for a person 55 years old and older has been used as a proxy for the last income before retirement. However, due to the nature of complementary minimum pension payments, which are means-tested, it was necessary to find decile-specific information (Instituto Nacional de Estadísticas, 2022). The data for each decile is matched against the average contributory pension payment (Instituto Nacional de Seguridad Social - España, 2022). For the first decile, the minimum pension payment data, taken from the State General Budget Law (Ley 36/2014, de 26 de diciembre, de Presupuestos Generales del Estado para el año 2015, 2014) were used instead of the average pension payment.

Table 1: Standard pension replacement rate- Spain (2010-2020)

Year	Replacement Rate
2010	0.783
2011	0.808
2012	0.787
2013	0.802
2014	0.802
2015	0.821
2016	0.821
2017	0.833
2018	0.824
2019	0.827
2020	0.824

Source: Instituto Nacional de Estadísticas, Instituto Nacional de la Seguridad Social and General Budget Law from 2010 to 2020

Social Pension Replacement Rate

The social pension replacement rate is the proportion of the work-related income in the last year prior retirement covered by the average social pension amount paid to qualifying retirees. The social pension is not linked directly to labour contributions, but instead it is means-tested. Once again, the average gross yearly income of people 55 years old and older is used. The average social pension payment is taken from the IMSERSO yearly reports (IMSERSO, 2022).

Table 2: Social pension replacement rate

Year	Average Social Pension / year (€)	Average yearly salary (55 and older) (€)	Social pension replacement rate
2010	3847.08	22059.36	0.174
2011	3964.20	22107.90	0.179
2012	4110.00	22273.08	0.185
2013	4213.68	22302.01	0.189
2014	4249.80	22644.55	0.188
2015	4248.12	22659.01	0.187
2016	4271.88	22469.60	0.190
2017	4290.00	22600.46	0.190
2018	4424.40	23412.62	0.189
2019	4594.08	23859.64	0.193
2020	4668.96	24514.00	0.190

Source: Instituto de Mayores y Servicios Sociales and Instituto Nacional de Estadísticas

Expected length of a public pension

Due to the permanent nature of pension payments, this variable takes into consideration the statutory age for retirement and the life expectancy of the population. The former is taken from the legislation that regulates the protection programme, the Social Security Act - Ley General de la Seguridad Social or LGSS - (Real Decreto Legislativo 8/2015, de 30 de octubre, por el que se aprueba el texto refundido de la Ley General de la Seguridad Social, 2015, sec. Disposición transitoria séptima). The latter is taken from a data set provided by EUROSTAT, which shows the life expectancy of the Spanish population from 2010 to 2020 (EUROSTAT, 2021). It is important to point out that the value for 2020 is an estimate. By subtracting one from the other, what is left is the number of years that a person should be able to enjoy a retirement pension.

Table 3: Expected length of a public pension

Year	Life expectancy (years)	Statutory retirement age (years)	Expected duration of a public pension (years)
2010	82.40	65.00	17.40
2011	82.60	65.00	17.60
2012	82.50	65.00	17.50
2013	83.20	65.08	18.18
2014	83.30	65.16	18.13
2015	83.00	65.25	17.75
2016	83.50	65.33	18.17
2017	83.40	65.42	17.98
2018	83.50	65.50	18.00
2019	84.00	65.67	18.33
2020	82.40	65.83	16.57

Source: EUROSTAT and Ley General de la Seguridad Social

The qualification period for the Standard Pension

The information for this variable is also contained in the LGSS mentioned above. It is worth mentioning that starting from 2013, both the statutory retirement age and the number of contribution years needed to access a full public pension have been increasing and will continue to do so until 2027.

Table 4:The qualification period for a full standard pension

Year	Number of years
2010	35
2011	35
2012	35
2013	35.25
2014	35.5
2015	35.75
2016	36
2017	36.25
2018	36.5
2019	36.75
2020	37

Source: Ley General de la Seguridad Social

Employee funding ratio

Once again, the State General Budget Law provides the necessary information for this variable. It is worth noting that this is the only variable that did not change during the study period.

Take-up rate

The take-up rate or coverage represents the number of people over the statutory retirement age that receive public pension payments, regardless of whether they are standard or social. To find this information, it was necessary to know the number of people receiving a standard pension, the number of people receiving a social pension and the number of people over the statutory retirement age. The first was taken from the National Social Security Institute (Instituto Nacional de Seguridad Social – España, 2022), the second from IMSERSO (IMSERSO, 2022; Subdirección General de Gestión, Área de Prestaciones Económicas, 2017) and the third from the National Statistics Institute (Instituto Nacional de Estadísticas, n.d.).

Table 5: Public pensions take-up rate- Spain (2010-2020)

Year	Standard pension users	Social pension users	Population over the retirement age	Public Pension take-up rate
2010	5,000.811	254,989	7,810,401	0.6729
2011	5,104.603	253,259	7,982,998	0.6712
2012	5,187.801	250,382	8,128,038	0.6691
2013	5,308.720	250,527	8,222,748	0.6761
2014	5,416.669	253,450	8,354,544	0.6787
2015	5,500.709	254,025	8,470,200	0.6794
2016	5,592.192	255,165	8,538,499	0.6848
2017	5,688.286	256,690	8,623,543	0.6894
2018	5,793.854	257,023	8,706,423	0.6950
2019	5,904.788	261,044	8,767,276	0.7033
2020	5,964.194	260,169	8,844,545	0.7038

Source: Based on information taken from INSS, IMSERSO and INE.

RESULTS

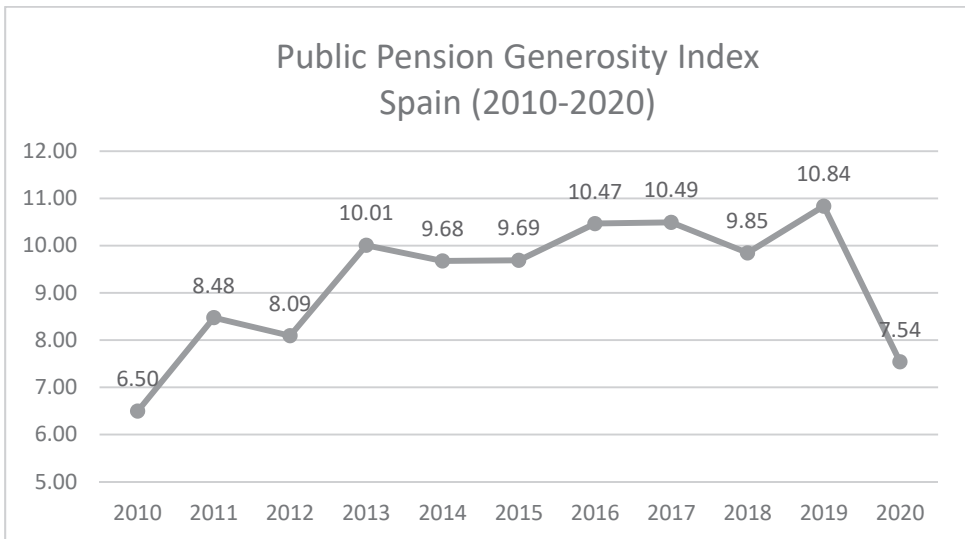
The natural and normalised values used for the calculations of the results provided can be seen in the tables of Annex 1. The process of finding the information necessary to feed the variables and construct the index presented some interesting outcomes. First of all, even though many legislative changes affected the calculation and access to public pensions in Spain during the last decade, the only legal change that directly affected the variables of this index came into effect in 2013. It specifically increased the number of contribution years necessary to access a full pension and also increased the statutory pension age. The Seventh Transitory Disposition of the Social Security Act effectively modified the data for three out of the six variables: the expected duration of the pension, the qualification period for a standard pension and the take-up rate.

Delving deeper into each of the variables that make up the index, some considerations can be noted. The standard pension replacement rate values increased during the observer period due to an increase in average pension payments (18%), as well as in the minimum pension (23%), an increase that

outpaced the growth of the average salary of people aged 55 and older (11%). The same is true for the social pension replacement rate, where the increase in the average benefit payment (21%) also surpassed the increase in the average salary.

As indicated before, the legislative changes had a direct impact on the expected duration of the pension by reducing its length by 0.83 years. Additionally, during the period of study, life expectancy grew until 2019 but fell sharply in 2020, ending up at the same levels as in 2010, which is shown in Table 3. The qualification period, also affected directly by the law, saw an increase in the required number of contributing years for a public pension, going from 35 to 37, as can be seen in Table 4. The employee funding ratio, as noted, saw no changes. The take-up rate, however, was indirectly affected by the law increasing the statutory retirement age. Nevertheless, there were gains in the number of people enjoying public pensions (19% for standard pensions and 2% for social pensions) which made this growth higher than the increase in the population over the retirement age (13%).

Figure 1: Public Pension Generosity Index - Spain (2010-2020)



Source: Author's calculations

Processing the information provided in the above variables illustrates the evolution of the index over time. However, when considering that the legislative

changes affecting three of the variables did not take place, the impact of those changes becomes clear. Table 6 presents the historical values and hypothetical values of the index. The natural and normalised values used in Table 6 can be found in Annex 1. As can be seen in Table 6, the values for both indexes, the historical one and the hypothetical one, are the same until 2012. From there on, the values continue to diverge due to the constant application of the changes.

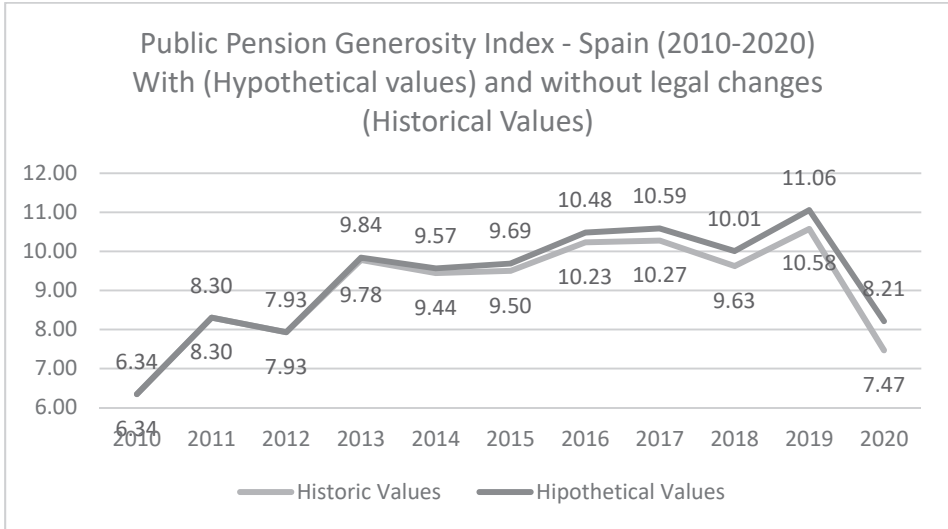
Table 6: Public pension generosity index - Spain (2010-2020) along with hypothetical values

Year	Historical Values	Hypothetical Values
2010	6.34	6.34
2011	8.30	8.30
2012	7.93	7.93
2013	9.78	9.84
2014	9.44	9.57
2015	9.50	9.69
2016	10.23	10.48
2017	10.27	10.59
2018	9.63	10.01
2019	10.58	11.06
2020	7.47	8.21

Source: Instituto Nacional de la Seguridad Social, Instituto Nacional de Estadísticas, Ley General de la Seguridad Social, Ley de Presupuestos Generales del Estado, Instituto de Mayores y Servicios Sociales, EUROSTAT

This behaviour can be seen in Figure 2. The divergence between both sets of values is evident and can be traced to its starting point, 2013. Even though the difference between the historical and the hypothetical values is only 0.74 or close to 10%, the gap is large enough to be noticeable, portraying the latter as superior to the former.

Figure 2: Public Pension Generosity Index (2010-2020) - Historical vs. Hypothetical Values



Source: Author's calculations

CONCLUSION

It is evident from the analysis presented here that legislative changes have had an impact on the generosity of the pension programmes in Spain, at least with the measuring tool that has been used in this paper. A clear deviation from the historical values takes place as soon as the modifications are implemented. However, factors that go beyond the scope of the legislative changes considered and their direct influence have pushed significantly and more markedly contributed to the development of the index, such as the increase in the replacement rates in 2011 and 2013, with the most dramatic of the factors being the sharp fall in the life expectancy of the population in 2020.

Until 2020, the trend in pension programme behaviour was driven primarily by the high replacement rates of both the contributory and the social pensions. Moreover, the constant increase in life expectancy that took place until 2019 brought a sustained increase in the length of retirement pensions. Lastly, the take-up rate for both types of retirement benefits continued to rise year after year; in the case of the contributory pensions, this increase was even higher than the

growth rate of the population over the statutory retirement age. Nevertheless, when speaking about the variables that negatively affect the index, the worker's contribution had a null effect while the influence of the qualification time was not enough to counter the other variables.

The most important insight is that the legislative changes enacted during this period directly affected the index value and reduced the generosity of the pension system, but they did not create any new trends nor significantly alter the behaviour of the index variables in any meaningful way. They did, however, exacerbate the tendencies already present in the system.

Making the necessary changes to the architecture of the programme that would allow for retirees to have a dignified retirement, regardless of their income, is the crux of the matter. The challenge now, leading to future avenues of research, is trying to figure out how the Spanish public pension system will be able to maintain and expand its generosity for those currently working, taking into consideration the constantly changing labour market and conditions, and the growing dependency on this system.

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Annex 1: Tables with natural and normalized values for the Pension Generosity Index. Historical and Hypothetical comparison.

Table A 1: Natural values: pension generosity index in Spain (2010-2020)

	Natural Values					
	Replacement Rate: Contributory Pension	Replacement Rate: Social Pension	Duration of pensions in years	Qualification period in years	Employee funding ratio	Take-up
	2010	0.783	0.174	17.400	35.000	0.170
2011	0.808	0.179	17.600	35.000	0.170	0.671
2012	0.787	0.185	17.500	35.000	0.170	0.669
2013	0.802	0.189	18.117	35.250	0.170	0.676
2014	0.802	0.188	18.134	35.500	0.170	0.679
2015	0.821	0.187	17.750	35.750	0.170	0.679
2016	0.821	0.190	18.167	36.000	0.170	0.685
2017	0.833	0.190	17.984	36.250	0.170	0.689
2018	0.824	0.189	18.000	36.500	0.170	0.695
2019	0.827	0.193	18.334	36.750	0.170	0.703
2020	0.824	0.190	16.567	37.000	0.170	0.704

Source: Author’s calculations.

Table A 2: Normalised values: pension generosity index in Spain (2010-2020)

	Z-Scores						Public Pension Generosity Index
	Replacement Rate: Contributory Pension	Replacement Rate: Social Pension	Duration of pensions	Qualification period in years	Employee funding ratio	Take-up	
Average	0.812	0.187	17.778	35.818	0.170		
Standard Deviation	0.01602707	0.005153344	0.477968117	0.69976383	5.55112E-17		
2010	-1.82863151	-2.397087847	-0.789896734	1.16922564	1	0.673	2010 6.50
2011	-0.225696208	-1.443386801	-0.371458782	1.16922564	1	0.671	2011 8.48
2012	-1.561269067	-0.431185308	-0.580677758	1.16922564	1	0.669	2012 8.09
2013	-0.64392579	0.424477305	0.710203324	0.81196225	1	0.676	2013 10.01
2014	-0.623025797	0.179406697	0.74577055	0.45469886	1	0.679	2014 9.68
2015	0.581214106	0.141779033	-0.057630318	0.09743547	1	0.679	2015 9.69
2016	0.575592128	0.653640547	0.814812812	-0.2598279	1	0.685	2016 10.47
2017	1.311050567	0.595608588	0.431942086	-0.6170913	1	0.689	2017 10.49
2018	0.746915609	0.43180461	0.465417122	-0.9743547	1	0.695	2018 9.85
2019	0.952661664	1.124778469	1.164208502	-1.3316181	1	0.703	2019 10.84
2020	0.715114298	0.720164707	-2.532690805	-1.6888815	1	0.704	2020 7.54

Source: Author’s calculations.

Table A 3: Natural values: historical vs. hypothetical values comparison (2010-2020)

	Natural Values					
	Replacement				Employee	
	Rate: Contributory Pension	Replacement Rate: Social Pension	Duration of pensions in years	Qualification period in years	Employee funding ratio	Take-up
2010	0.783	0.174	17.400	35.000	0.170	0.673
2011	0.808	0.179	17.600	35.000	0.170	0.671
2012	0.787	0.185	17.500	35.000	0.170	0.669
2013	0.802	0.189	18.200	35.250	0.170	0.673
2014	0.802	0.188	18.300	35.500	0.170	0.672
2015	0.821	0.187	18.000	35.750	0.170	0.670
2016	0.821	0.190	18.500	36.000	0.170	0.673
2017	0.833	0.190	18.400	36.250	0.170	0.674
2018	0.824	0.189	18.500	36.500	0.170	0.675
2019	0.827	0.193	19.000	36.750	0.170	0.677
2020	0.824	0.190	17.400	37.000	0.170	0.672

Source: Author's calculations.

Table A 4: Normalized values: historical vs. hypothetical values comparison (2010-2020)

	Z-Scores					
	Average	Standard Deviation				
	0.812	0.01602707	0.187	18.073	35.818	0.170
			0.00515334	0.510064	0.699763833	5.551E-17

	Replacement	Duration		Qualification period in years	Employee		Public Pension	
	Rate: Contributory Pension	Replacement Rate: Social Pension	of pensions in years		funding ratio	Take-up	Generosity Index	
2010	-1.82863151	-2.3970878	-1.31891	1.169225644	1	0.673	2010	6.14
2011	-0.225696208	-1.4433868	-0.9268	1.169225644	1	0.671	2011	8.10
2012	-1.561269067	-0.4311853	-1.12285	1.169225644	1	0.669	2012	7.73
2013	-0.64392579	0.4244773	0.249523	0.811962253	1	0.673	2013	9.65
2014	-0.623025797	0.1794067	0.445577	0.454698862	1	0.672	2014	9.38
2015	0.581214106	0.14177903	-0.14258	0.09743547	1	0.670	2015	9.50
2016	0.575592128	0.65364055	0.837685	-0.259827921	1	0.673	2016	10.29
2017	1.311050567	0.59560859	0.641631	-0.617091312	1	0.674	2017	10.40
2018	0.746915609	0.43180461	0.837685	-0.974354704	1	0.675	2018	9.82
2019	0.952661664	1.12477847	1.817954	-1.331618095	1	0.677	2019	10.88
2020	0.715114298	0.72016471	-1.31891	-1.688881486	1	0.672	2020	8.01

Source: Author's calculations.

Table A 5: Joint natural values (2010-2020)

		Natural Values					
		Replacement Rate: Contributory Pension	Replacement Rate: Social Pension	Duration of pensions in years	Qualification period in years	Employee funding ratio	Take- up
Natural values	2010	0.783	0.174	17.400	35.000	0.170	0.673
	2011	0.808	0.179	17.600	35.000	0.170	0.671
	2012	0.787	0.185	17.500	35.000	0.170	0.669
	2013	0.802	0.189	18.117	35.250	0.170	0.676
	2014	0.802	0.188	18.134	35.500	0.170	0.679
	2015	0.821	0.187	17.750	35.750	0.170	0.679
	2016	0.821	0.190	18.167	36.000	0.170	0.685
	2017	0.833	0.190	17.984	36.250	0.170	0.689
	2018	0.824	0.189	18.000	36.500	0.170	0.695
	2019	0.827	0.193	18.334	36.750	0.170	0.703
2020	0.824	0.190	16.567	37.000	0.170	0.704	
Hypothetical values	2010	0.783	0.174	17.400	35.000	0.170	0.673
	2011	0.808	0.179	17.600	35.000	0.170	0.671
	2012	0.787	0.185	17.500	35.000	0.170	0.669
	2013	0.802	0.189	18.200	35.250	0.170	0.673
	2014	0.802	0.188	18.300	35.500	0.170	0.672
	2015	0.821	0.187	18.000	35.750	0.170	0.670
	2016	0.821	0.190	18.500	36.000	0.170	0.673
	2017	0.833	0.190	18.400	36.250	0.170	0.674
	2018	0.824	0.189	18.500	36.500	0.170	0.675
	2019	0.827	0.193	19.000	36.750	0.170	0.677
2020	0.824	0.190	17.400	37.000	0.170	0.672	

Source: Author's calculations.

Table A 6: Joint normalized values (2010-2020)

		Z-Scores					
Average Standard deviation		0.812	0.187	17.925	35.818	0.170	
		0.01602707	0.005153344	0.515842	0.69976383	5.5511E-17	
		Replacement Rate: Contributory Pension	Replacement Rate: Social Pension	Duration of pensions	Qualification period in years	Employee funding ratio	Take-up
Natural values	2010	-1.82863151	-2.39708785	-1.01802	1.16922564	1	0.673
	2011	-0.225696208	-1.4433868	-0.6303	1.16922564	1	0.671
	2012	-1.561269067	-0.43118531	-0.82416	1.16922564	1	0.669
	2013	-0.64392579	0.424477305	0.371943	0.81196225	1	0.676
	2014	-0.623025797	0.179406697	0.404899	0.45469886	1	0.679
	2015	0.581214106	0.141779033	-0.33952	0.09743547	1	0.679
	2016	0.575592128	0.653640547	0.468872	-0.2598279	1	0.685
	2017	1.311050567	0.595608588	0.114112	-0.6170913	1	0.689
	2018	0.746915609	0.43180461	0.145129	-0.9743547	1	0.695
	2019	0.952661664	1.124778469	0.792615	-1.3316181	1	0.703
	2020	0.715114298	0.720164707	-2.63286	-1.6888815	1	0.704
Hypothetical values	2010	-1.82863151	-2.39708785	-1.01802	1.16922564	1	0.673
	2011	-0.225696208	-1.4433868	-0.6303	1.16922564	1	0.671
	2012	-1.561269067	-0.43118531	-0.82416	1.16922564	1	0.669
	2013	-0.64392579	0.424477305	0.532845	0.81196225	1	0.673
	2014	-0.623025797	0.179406697	0.726703	0.45469886	1	0.672
	2015	0.581214106	0.141779033	0.145129	0.09743547	1	0.670
	2016	0.575592128	0.653640547	1.114419	-0.2598279	1	0.673
	2017	1.311050567	0.595608588	0.920561	-0.6170913	1	0.674
	2018	0.746915609	0.43180461	1.114419	-0.9743547	1	0.675
	2019	0.952661664	1.124778469	2.083709	-1.3316181	1	0.677
	2020	0.715114298	0.720164707	-1.01802	-1.6888815	1	0.672

Source: Author's calculations

