The Effect of the Great Recession Unemployment on Spain's Pensioners

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El efecto del desempleo de la Gran Recesión en los pensionistas españoles

Resumen. Uno de los impactos principales de la Gran Recesión ha sido el acrecentamiento en la tasa de paro. El desempleo ha tenido un impacto negativo sobre los salarios de los trabajadores que se ha trasladado a las pensiones, cuando los sistemas de cálculo de éstas últimas rentas dependían de aquellas. En este trabajo, se estima el impacto de estos efectos negativos en el sistema de pensiones español. De acuerdo con nuestras estimaciones, el pensionista medio padecerá una pérdida equivalente a 18 meses de pagos sobre la pensión inicialmente estimada. Adicionalmente, el riesgo de pobreza se estima que aumentará entre el 10,6 y el 24,6 por ciento debido a los efectos de la Gran Recesión.

Palabras clave: Gran Recesión; Desempleo; Reforma de pensiones; Riesgo de pobreza.
Clasificación JEL: H5; I30; J30; J64.

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Abstract. One of the main impacts of the Great Recession has been the increase in the rate of unemployment in Spain. Unemployment has a negative impact on the wages of workers, which, in those pension systems where pensions are computed according to wages, eventually affect pension benefits. In this contribution we estimate the impact of these detrimental effects on Spain's pensioners' welfare. According to our estimates the average pensioner is expected to lose the equivalent to 18 monthly payments of the initial pension entitlement. Additionally, the poverty risk faced by pensioners is estimated to increase between 10.6 and 24.6 per cent due to the effect of the Great Recession.

Keywords: Great Recession; Unemployment; Pensioners' Welfare; Poverty Risk; Pension reform.
JEL Codes: H55; I30; J30; J64.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

88

1. Introduction

The importance of pension systems to prevent poverty situations among retired population has been empirically proven by many authors (Sainsbury and Morissens, 2002; Engelhardt and Grubert, 2004; Nelson, 2004; Dang et al. 2006). The ageing process phenomena and projections on future dependency scenarios, however, have led to the concern of the future sustainability of pensions systems. In an attempt to maintain the public nature of these systems, governments started to implement a series of reforms affecting, among other factors, the age of retirement and the method use to compute pension benefits. One of the main consequences of these reforms is the reduction of the replacement ratios provided to pensioners; that is to say, the percentage of the wage restored with the pension benefit. Accordingly, the welfare level enjoyed by the retirees is expected to be also negatively affected after the implementation of these reforms (Butrica et al., 2006; Lachance, 2008; Gonand and Legros, 2009; Pfau, 2006; Sutherland et al., 2008; Peinado and Serrano, 2011, 2012, 2014; Peinado, 2014).

With the burst of the economic and financial crisis of 2007-2009, the debate on the necessity of reducing the expenditure on pensions gained importance. One of the effects of the Great Recession is the increase in the rates of unemployment. According to the data provided by the Spanish National Statistical Institute,[2] by the end of the year 2012 the rate of unemployment in Spain was, and still is, twice higher than the one existing prior to the economic crisis. During the years 2007 and 2008 the rate of unemployment was equal to 8.5 and 8.2 per cent respectively. After the burst of the economic and financial crisis, the rate of unemployment increased until it reached its highest value (26.1 per cent) in the year 2013. Years 2014 and 2015 show signs of recovery, with the latest rate of unemployment being equal to 22.1. However, according to the 2015 Ageing Report published by the European Commission (EC, 2015), the rate of unemployment registered before the burst of the crisis would only be recovered by the 2040s. Under these circumstances, the debate on the sustainability of pensions not only has it focussed on the ageing population process, but also on the consequences for public budget of an economy deeply affected by the unemployment that emerged with the Great Recession. As a consequence, pension system reforms have been designed assuming increasing dependency ratios of the population (which imply higher expenditure on pensions) and high rates of unemployment (which, *from a pure macroeconomic perspective*, imply lower revenues); thus, assuming a policy reform in the direction of the diminution of pension benefit most likely.

However, empirical evidence has shown that unemployment may affect not only the revenues, but also the expenditure of the system. From a pure *micro-economic perspective*, unemployment implies breaks in labour careers that generate a reduction in the income earned by individuals during their working life. According to Potrafke (2012), career interruptions imply two main income costs. The first cost is due to the fact of not having a job and, consequently, not being remunerated by a salary or wage. The second cost is related to human capital depreciation. According to this theory the longer the individual is unemployed, the higher is the capital loss and, consequently, the lower the wage drawn in subsequent jobs, which is assumed to reflect the productivity of the workers. The existence and development of welfare systems, such as the ones existing in Germany or Spain, allow fighting the first type of costs by partially or totally compensating the loss of these

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[2] Data accessed in November 2016 at http://www.ine.es/jaxiT3/Datos.htm?t=4887

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

89

individuals. More concretely, in these types of systems institutions are designed to guarantee a certain benefit for the unemployed during the time they are actively seeking for a job, at least, during a defined period of time. The second type of costs may be compensated by the existence of specific policies and institutions that guarantee a complete labour insertion of the workers who have been unemployed.

Interestingly, when the unemployment phenomena are analysed, there is a point at which *macroeconomics and microeconomics meet*: namely, the wage curve; that is to say, the relationship between the rate of unemployment (macroeconomic variable) and real wages earned by individuals (microeconomic variable). Empirical evidence on the wage curve suggests that there is a negative causal relationship between unemployment and wages; that is to say, not only the wages of unemployed but the wages of all the workers in a given area are affected by unemployment phenomena. First publications on the wage curve estimated a value for the unemployment elasticity of real wages equal to -0.10 (Blanchflower and Oswald, 1990, 1994, 1995, 2000, 2005; Card, 1995). These estimates have been produced for many years and evidence is now available for different countries (Montuenga, García and Fernández, 2003; Baltagi and Blien, 1998; Baltagi, Blien and Wolf, 2000, 2012; Sanz de Galdeano and Turunen, 2005); these contributors conclude the existence of a significant and negative relationship between the rate of unemployment and real wages; that is to say, wherever the rate of unemployment is higher, real wages are lower.

Whether it is because individuals have been unemployed at some point during their working lives or because they have developed a career in a region affected by high rates of unemployment, the wages of these workers are expected to be lower. Moreover, the detrimental effects derived from this wage diminution are not only noticeable during working lives but also during retirement, especially in those systems in which pensions are computed according to the wages earned by individuals. This is especially evident for public social security systems where pension benefits entitled at the age of retirement are a function of past wages (usually through contributions made by workers during their labour careers). Potrafke (2012) estimates the effects that career interruptions may have on German pension benefits. He concludes that the most controversial effects for pensioners are produced when the breaks in their labour careers are produced at the beginning of their working lives and the less controversial effects when the break is produced at the end of their working lives. Peinado and Serrano (2017) work on the hypothesis of the wage curve and extend it to pension benefits. They assume that, if unemployment is to negatively affect wages, in those systems in which pensions are computed according to past wages of individuals, the effect on unemployment must also be transmitted to pensions; and, consequently, the rates of unemployment faced during the working life must define, to an extent, the pension benefit entitled for the pensioners in these systems. In order to advance in this direction they estimate the unemployment elasticity of real pensions in Spain, concluding that the existence of a negative relationship between unemployment and the regulatory base[3] of the pension is equal to -0.135.

Under these circumstances, the argument for the reform of pension systems to work in the direction of reducing expenditure on pensions is not straightforwardly supported. In fact, due to unemployment increase during the Great Recession, the pension benefits in the

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[3] The Regulatory Base is the component of the pension computed according to the contributions made by individuals during their working lives.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

90

type of systems mentioned above, are expected to diminish and, as a consequence, to cause a loss of welfare for the generations of affected pensioners.

Research on the effects of the Great Recession on pensioners, mainly developed for the US, has focused on investigating retirement decisions and security. In those systems in which the age of retirement may be delayed, individuals who in a job decide to retire later after the recession in an attempt to guarantee longer and higher income paths during retirement (Johnson, Smith and Haaga, 2013). However, unemployed elderly people tend to retire earlier to start drawing a pension benefit to compensate, in the short run, income loss or diminution (Bosworth, 2012). Some authors have shown that, as a consequence of the financial losses during the recession, workers and retirees have changed their consumption-saving patrols (Hurd and Rochwedder, 2012; Argento, Bryant, Victoria and Sabelhaus, 2015). Dushi et al. (2013) estimates the effect of the Great Recession on workers' participation and contribution decisions in the US finding a diminution in the proportion of workers who decreased or even stopped contributing to the pension system as well as a the existence of a link between the amount contributed and the diminution in the earnings registered during the crisis.

However, and even when social security has proven to be a major source of income (Fichtner, Phillips and Smith, 2012), few contributors have focused on investigating the effects that the Great Recession may imply for the welfare enjoyed by retirees. Munell and Rutledge (2013) conclude that, given the decline in resources, the Great Recession has had a profound effect on the retirement security of older American population. They show that insufficient economic and health coverage may shorten lives of retired population, advising policymakers on the necessity of support social security and develop a more robust retirement income system. Butrica, Johnson and Smith (2011a, 2011b) use a simulation model in the Urban Institute named DYNASIM3, to measure the impact of the Great Recession on future retirement incomes in the US. They find that the recession effectively reduces earnings, resulting in permanently lower Social Security benefits and literally "an unexpected blow to the oldest boomers' retirement security, a growing concern for many even before the economy faltered" (Butrica, Johnson and Smith, 2011b, p2).

To the best of our knowledge, there is no contribution estimating the effects that due to the macro-micro-economic relationship between unemployment and wages, the increase in the rate of unemployment during the Great Recession is expected to have on the welfare level enjoyed by future retirees. However, as some authors reveal,[4] advancing knowledge in this topic is an issue of major relevance for policy makers to design adequate proposals to avoid poverty situations among retired population. The aim of the present paper is, precisely, to estimate this effect; that is to say, the effects that the increase in the rate of unemployment during the Great Recession may have on the welfare level of future pensioners. In order to reach this goal we combine estimation and simulation techniques to estimate a model for the Spanish pension system. The latter allows estimation in terms of poverty, the dynamic impact that the macroeconomic variable 'unemployment' has on the microeconomic variable 'pension benefit', which may eventually affect the evolution of the level of welfare enjoyed by retired population.

The paper is structured as follows. Section 2 explains the Spanish pension system. Section 3 describes the data and methodology used. Section 4 contains the main empirical results. Finally, section 5 summarises and concludes.

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[4] Maurer, Mitchell and Warshawsky (2011) advise on the necessity to better understand and literally 'reengineering retirement pensions' to improve retirement security.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

91

2. The Spanish Pension System

The Spanish pension system is defined as an unfunded pay-as-you-go social security system. During their working lives workers make contributions to the public administration (social security system). These contributions have a double function. On the one hand, the amount of contributions gathered by administration each of the years of reference is used as a source to financing pension benefits to current retirees. On the other hand, the contributions made, as well as the number of contributed years, are recorded by the relevant administration to create a contributor's profile; namely the volume of contributions, the number of years of the contributions and age of retirement. These features will be used in the future to compute the corresponding pension benefit.

There are different schemes of contributions:[5] i) the general scheme, which comprises several minor schemes and concentrates 81 per cent of contributors;[6] ii) the scheme for self-employees; iii) the scheme for fishers and, iv) the scheme for miners. The work we present uses data for the general scheme.[7]

In the general scheme, the amount of contributions is used to compute the regulatory base RB_i of each individual *i*. More precisely, the last fifteen years of taxable average earnings are taken into account on a monthly basis to compute the value of the regulatory base as in expression (1)

$$RB_i = \frac{\sum_{t=1}^{24} w_t^i + \sum_{t=25}^{180} w_t^i \frac{CPI_{25}}{CPI_t}}{210} \tag{1}$$

where w_t^i are the taxable average earnings or wage[8] contributed to the pension system by individual *i* in month *t* and CPI_t is the consumer price index at month *t*. As the above expression shows, the last two years of contributions (months 1 to 24) are computed at their nominal value, while the contributions made during the previous 13 years (months 25 to 180) are brought-up to the 25th month prior to retirement according to the consumer price index. Contributions to the social security system are made on a monthly basis, that is to say,

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[5] The relevant classification utilised is undertaken by the social security administration for the year 2016. Available at: http://www.seg-social.es/Internet_1/Trabajadores/Afiliacion/Informaciongeneral/index.htm. Access date: November, 2016.

[6] According to the last report published by the Spanish ministry of employment and social security (2016), from 17,194,357 affiliates 13,892,446 (81 per cent) are registered in the general scheme; 3,149,472 (18 per cent) in the scheme for self-employed, 58,891 in the scheme for fishers and 3,548 in the scheme for miners. The remaining 11,101 individuals are classified as carers.

[7] We use this scheme for two main reasons. First, because of its representativeness within the national context. Second, in view of the estimates in this paper are computed for the pensioners in the general scheme, it follows that using any other scheme would bias the results of our estimates.

[8] The social security system defines a maximum pension and, accordingly, a maximum amount of contributions. Taxable average earnings are the same as the wage earned by individuals but for those whose wage is higher than the maximum defined. In year 2016 the maximum amount of contribution was equal to 3,642 euros. Given the aim of our study and adopted methodology, which use the rate of poverty to quantify welfare, the existence of top boundaries are not determinant and, consequently, we can use the term 'taxable average earnings' or 'wages'. Similarly, there is a minimum quantity or lower bound of contributions as well as a minimum pension benefit, which is different for the different types of workers. As an example, in the year 2016, the minimum varied between 764.40 to 1,067.40 euros per month. Available at http://www.seg-social.es/Internet_1/Trabajadores/CotizacionRecaudaci10777/Regimenes/RegimenGeneraldelaS10957/Inform acionGeneral/index.htm Access date: November, 2016.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

92

12 contributions per year worked. However, the amount of pensions drawn per year is divided into 14 payments – one payment per month plus two extra payments (one in June and another in December)-. For this reason the number of months included in the numerator of expression (1) is 180 –fifteen years times twelve contributions per year- while the number of months included in the denominator is 210- fifteen years times fourteen payments per year.

The number of years contributed and the age of retirement are used to define the percentage of the regulatory base that would finally be entitled to the individual. This percentage is known as the 'coefficient applied to the regulatory base'. According to the number of years contributed, the coefficient may vary from being equal to 50 per cent for those individuals who have contributed for 15 years - which is the minimum, required to draw a pension- and 100 per cent for those who have contributed for 35 or more years.[9] The legal age of retirement is established at the age of 65. Early retirements are penalised with a reduction in the coefficient applied equal to 8 percentage points per year prior to the legal retirement age and retirement after the age of 65 implies an increase in the coefficient applied equal to 2 percentage points per year, being 70 the maximum age at which the individual may retire. Accordingly, the final pension benefit entitled is defined as in expression (2)[10],

$$B_{i0} = \eta_i RB_i \qquad (2)$$

where the final pension benefit entitled B_{i0} at the initial year *t=0* is determined by the product between the individual coefficient η_i of individual *i* and the corresponding regulatory base RB_i of that individual.

Once the pension is entitled, the new pensioner starts to draw the monthly benefit B_{i0} for a year (or the remaining months until the natural year ends) plus two extra payments; one in June and another one in December. From this time on, each New Year pensions are brought up to date according to an index, which is previously defined by the corresponding government in terms of the Social Security budget approved in same year. Until 2012, the index used to calculate pension benefits was the Consumer Price Index. After the Social Security reform of 2011,[11] the estimated coefficient is yearly approved by law, and being the minimum coefficient equal to 0.25 per cent increase and the maximum equal to the value of the increased registered for the CPI in the year plus 0.5 per cent.[12] Estimation is undertaken multiplicatively; that is to say, the total amount of pension benefit is yearly brought-up-to-date as in expression (3):

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[9] Each additional year of contribution implies a 3 percentage point increase in the coefficient. This increase is applied until the 25th year contributed. Contributing one additional year from 26 to 35 implies an increase in the coefficient of 2 percentage points.

[10] From the first of January of 2013 the regulatory base is computed according to the Spanish Official Law *BOE-A-2011-13242.* In order to reach our aim, that is to say, to account for the effects of the Great Recession we need to distinguish between the effect of unemployment on pensions and the effect of the reform. Using data prior to the recession is an issue of major relevance, thus, to achieve our porpoise. Accordingly, in order to implement our analysis we pay attention to the regulation existing before the recession. This allows computing the counterfactual scenario and estimating the expected effect of the Great Recession.

[11] Spanish Official Law *BOE-A-2011-13242*

[12] Spanish Official Law *BOE-A-2013-13617.*

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

93

$$B_{it} = \prod_{t=0}^{T} B_{i0}(1 + r_t) \tag{3}$$

$$t = 1, \dots, T.$$

where B_{it} is the monthly pension benefit drawn by pensioner *i* at year *t*, B_{i0} is the corresponding initial pension drawn during the year in which the pension was legally recognised and r_t the revalorisation factor applied according to the corresponding law for year *t* and T the last year of interest.

3. Data and Empirical Methodology

3.1. Data

The study is implemented using the Spanish Survey of Continued Labour Careers or its Spanish acronym *MCVL* for the period 2005-2008[13], available on request from the Spanish Ministry of Work and Social Security. The data, which comprises several sub- data sets, matches personal features of the individuals such as gender or education from census data, compiled by the Ministry regarding the labour (industry sector or contributory group) and pension (regulatory base, coefficient applied, number of years of contribution) related characteristics of the individuals. Obviously, only for those individuals who, in a given year of reference have been workers and become pensioners are *all* these characteristics available at the same time. For those who are only workers or only pensioners, during the reference period, the relevant features cannot be matched. Consequently, the analysis in this paper has been implemented for those pensioners for whom complete information is available; that is to say, for the people who retire during each of the years of reference from 2005 to 2008.

Having complete information for these individuals is an issue of major relevance, given the aim of the paper. We aim to quantify the effects that the increase in the rate of unemployment during the Great Recession may have on the welfare level of pensioners who have not been unemployed during the years prior to retirement.[14] Thus, it is important to identify the pensioners who are unemployed by the time they retire and leave them out of the study. As may be drawn, the pensioners we leave out of the study not only would they be affected by the macroeconomic effect of unemployment on wages but also by the microeconomic one, that is to say, having been unemployed.[15] Accordingly, we use the pensioners for whom complete data is available and, afterwards, we leave out of our study those pensioners who enter the pension system from an unemployment situation; thus, including in the study only those workers who retire from employment. Obviously, these pensioners are the ones whose wages reflect the macroeconomic effect of unemployment on pensionable earnings and consequently, on pensions.

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[13] Notice that using the period prior to the burst of the Great Recession is important to prevent pensions including the effect of the increase in unemployment; that is to say, to prevent estimates' bias.

[14] We do the estimates for a subset of pensioners in Peinado and Serrano (2017). This enables us to use their estimates to account for the effects of the Great Recession.

[15] One of the problems of the data is that it is not possible to identify career interruptions for the fifteen years prior to retirement when pensioners enter the system form a job. However, Peinado and Serrano (2017) show that the estimates are robust in this respect, and, accordingly, we can undertake the estimates in this paper using their result.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

94

As will be explained in the empirical methodology, we approach the concept of welfare in terms of the monetary poverty related to the pension benefit entitled, for which we define poverty as the 60 per cent of the median income published by Eurostat (2016).

3.2. Empirical Methodology

In order to implement the analysis, we combine estimation and simulation techniques to estimate the dynamic evolution of the poverty rate faced by retired population in Spain during the time they are expected to draw a pension benefit, which is estimated to be equal to 22 years.

In a first step we select the value of the regulatory base for each pensioner in the dataset and deflated it to 2005 euros[16] to identify the real value of the regulatory bases in the data.[17] Subsequently, we propose two different scenarios. The first scenario, or counterfactual, called in this paper '*Before the Great Recession*' provides the path of the pension benefit that each pensioner would draw for each of the years in which she/he is expected to draw a pension, that is to say, 22 years. In order to compute this value, we multiply the coefficient applied to each pensioner by the corresponding regulatory base and compute the initial pension benefit. This value is then brought-up-to date according to index applied by law[18] to build the whole path of the expected pension benefit for the years that the individual is entitled the pension. The pensioners in our dataset enter the system between the years 2005 and 2008 and are expected to be drawing a pension for 22 years. As a consequence, the pensions of the individuals in our data have been brought up-to-date at the value defined by the corresponding social security law.[19]

The second scenario '*After the Great Recession*' is designed to account for the effects of the increase in the rate of unemployment due to the Great Recession. In this scenario the regulatory base of each pensioner is reduced to 5 per cent.[20] Subsequently, the resulting regulatory base is multiplied by the corresponding coefficient for each pensioner in the dataset and, finally, brought up to date as undertaken for the counterfactual. Once the two paths of pension benefits have been built for each pensioner in the dataset, we define a simple dynamic non-parametric econometric model to estimate the consequences that the increase in unemployment, through the effects that it has on pension benefits, may imply for the whole retired population in Spain.

Let P_{it}^k denote the poverty situation of pensioner *i* in year *t* under scenario *k* and PL_t the poverty line at year *t*. Then, as shown in expression (4), the poverty situation P_{it}^k may be define as a dummy variable that takes the value of one for pensioner *i* when the benefit drawn at year *t* B_{it}^k is equal or lower than the poverty line PL_t at year *t* and zero otherwise.

$$P_{it}^k = \begin{cases} 1 & if \ B_{it}^k \leq PL_t \\ 0 & if \ B_{it}^k > PL_t \end{cases} \tag{4}$$

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[16] Deflated according to data from the Spanish National Statistical Institute (INE).

[17] These real values are the ones used in Peinado and Serrano (2017).

[18] According to Spanish Social Security regulation, until the year 2012 pensions had been brought up to date according to the CPI. From 2013 on, pensions are brought-up to date according to a factor that is, at minimum, equal to 0.25 per cent and, maximum, equal to CPI plus 0.5.

[19] Until the year 2012 according to the CPI; from 2013 to 2017 it was equal to 0.25 given the change in regulation social security reform of 2011 (Spanish official laws *BOE-A-2011-13242* and *BOE-A-2013-13617*). From 2018 on we assume a relevant factor equal to 0.25 per cent, which is the value that has been applied during the last years and, according to regulation, the minimum value to be applied.

[20] According to Peinado and Serrano (forthcoming) the increase in the rates of unemployment during the Great Recession are expected to generate a 5 per cent reduction of the regulatory base of Spanish pensioners.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

95

Once the poverty situation for each pensioner *i* is detected for each of the reference years *t*, we use the Nelson-Aalen[21] cumulative hazard function to estimate the cumulative probability of poverty $\widehat{CPP_t^k}$ at time *t*. The cumulative hazard function measures the total amount of risk that has been accumulated up to time *t*. The estimator proposed by the Nelson and Aalen function can be described as in expression (5). Where n_j^k is the number at risk at time t_j under scenario *k*, d_j^k is the corresponding number of failures at time t_j, and the sum is over all distinct failure times less than or equal to *t*.

$$\widehat{CPP_t^k} = \sum_{j|t_j \leq t} \frac{d_j^k}{n_j^k} \tag{5}$$

We then define the corrected cumulative probability of poverty $CCPP_t$ at *t* of scenario *k* as the cumulative risk of poverty at that year *t* corrected by the probability of being poor at time zero $\widehat{PP_0}$; that is to say, at the year in which the pension is entitled[22] as in equation (6):

$$\widehat{CCPP_t^k} = \widehat{PP_0^k} + \widehat{CPP_t^k} \tag{6}$$

Let $\widehat{CCPP_t^B}$ denote the corrected cumulative probability of poverty before the increase in the rate of unemployment registered as a consequence of the Great Recession, and $\widehat{CCPP_t^A}$ denote the corresponding probability after the Great Recession. We can then define the effect on poverty associated with the increase in this rate of unemployment $\widehat{EPUGR_t}$ as in expression (7):

$$\widehat{EPUGR_t} = 1 - \frac{\widehat{CCPP_t^B}}{\widehat{CCPP_t^A}} \tag{7}$$

A value of $\widehat{EPUGR_t}$ greater than zero would imply an increase in the cumulative probability of poverty for the retired population associated with the increase in the rate of unemployment during the Great Recession. As an example, a value of $\widehat{EPUGR_t}$ equal to 0.1 would be interpreted as follows: the increase in the rate of unemployment registered during the Great Recession is expected to increase the cumulative poverty rate faced by pensioners at *t* by 10 per cent.

4. Empirical Results

Figure 1 shows the complete path of the expected average real pension for an individual during her/his life as pensioner. The evolution of two different values is represented: the value of the expected pension when the effect of the Great Recession is

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[21] We use Nelson-Aalen rather than Kaplan-Meier survivor function for efficiency reasons (Klein and Moeschberger, 2003) but both functions could be used to implement the estimates for this contribution.

[22] Estimates for the Nelson-Aalen cumulative hazard assume that the population in the first year is not affected; that is to say, they are at risk but they are not still affected by the phenomena analysed. In our case, in which poverty is observed since the moment the pension is entitled, we correct the estimates of the function to obtain the value of the poverty rate that has been accumulated since the moment that the individual was entitled the pension benefit.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

96

not taken into account 'Before the Great Recession' and the corresponding value when the effect of the Great Recession is computed 'After the Great Recession'.

Figure 1. Estimates of the Dynamic Evolution of the Average Pension Benefit in Spain Before and After the Great Recession
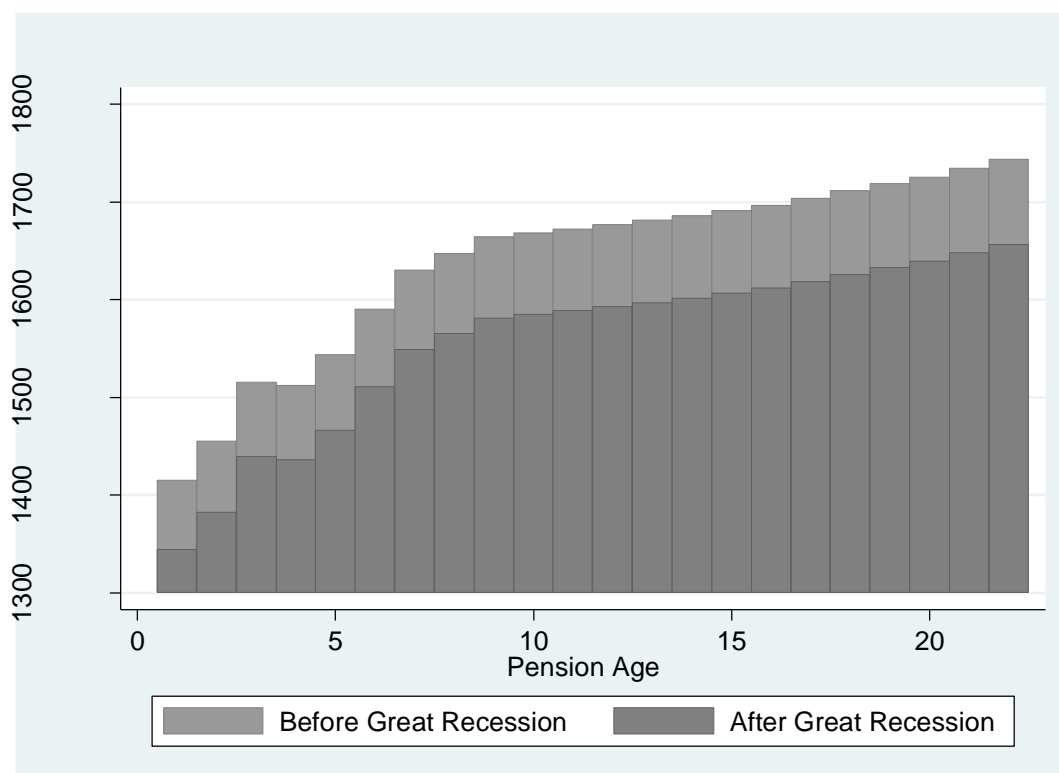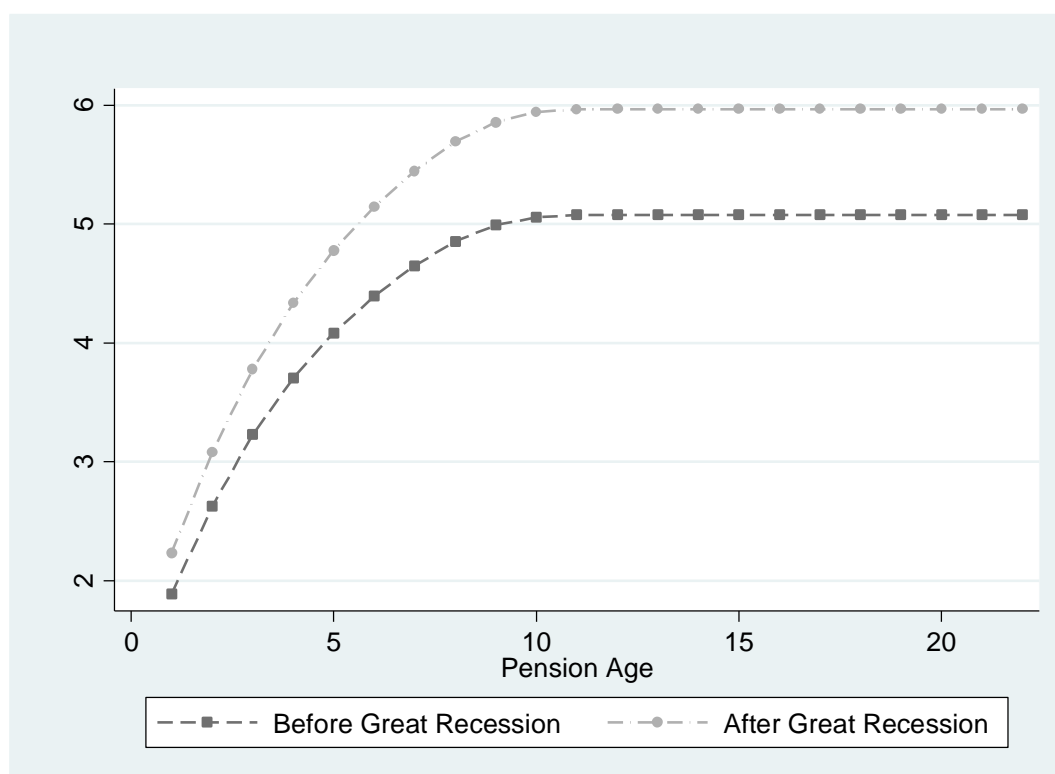

Source: Authors' estimates.

Before the Great Recession, pensioners had been expected to draw an average pension that evolved from a value equal to 1,415 euros per month for the first year, that is to say, the year in which the pension was entitled, to 1,743 euros per month for the last year of her/his life as pensioners. After the Great Recession, the corresponding values of the pension benefit are 1,345 and 1,656 euros respectively. Looking at the evolution of the pension benefits we reach two main conclusions: i) the Great Recession, through the increase in the rate of unemployment, is expected to generate a reduction of pension benefits equal to 25,258 euros; in other words, the average pensioner is expected to lose 18 (one year and a half losses) of the monthly initial payments before the recession; and ii) as time passes by, the loss becomes higher. Concretely, the loss registered for the pension benefit during the first year is equal to 71 euros per month while at the end of the life it is estimated to be equal to 87 euros per month; that is to say, as time passes by or as pension 'gets older' the expected losses become greater. This is due to the method used to bring pensions up to date, which, as explained above, is multiplicative. Accordingly, even when the law establishes increases that must always be positive, the longer the pensioner is drawing the benefit the higher it will be the perverse effect that the Great Recession has on the initial pension, as shown by the estimates.

Figure 2 shows the evolution of the cumulative risk of poverty both before and after the Great Recession. It is observed that poverty risk increases as time passes by in both cases; that is to say, before and after the recession.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

97

Figure 2. Dynamic Evolution of Corrected Cumulative Poverty Risk of Spanish Pensioners Before and After the Great Recession

This phenomenon is explained by the fact that pension benefits are brought up to date according to indexes that do not take into account evolutions in productivity as does the median equivalent income, which defines the poverty threshold in the society. Accordingly, as pensioners become older the likelihood of being poor is greater for the pensioners who remain out of poverty.[23] Additionally the value of the rate of poverty is almost stabilised from the fifth year on, suggesting that the first years of pensioners' lives are critical to define poverty situations among the retired population.

Table 1 shows the values for the corrected cumulative poverty risks before the Great Recession, $\widehat{CCPP}_t^B$, after the Great Recession, $\widehat{CCPP}_t^A$, and the effect of the recession, $\widehat{EPUGR}_t$, for each of the years during which the pension is drawn. Before the Great Recession the corrected cumulative risk of poverty evolved from 2.1 per cent in the first year to 5.1 per cent in the last year. However, after the Great Recession values increase to being equal to 2.6 per cent and 6 per cent respectively. As a conclusion, the impact of the increase in the rates of unemployment during the Great Recession is expected to increase the estimated risk of poverty among retired population between 10.6 and 24.6 per cent, this being the increased maximum for the first year in which the pension is entitled.

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[23] For further analysis on this issue see Peinado and Serrano (2011), Peinado and Serrano (2012) and Peinado (2014).

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

98

Table 1. Dynamic Evolution of the Corrected Cumulative Poverty Risk Before the Great Recession $\widehat{CCPP}_t^B$, After the Great Recession $\widehat{CCPP}_t^A$ and Effect of the Recession $\widehat{EPUGR}_t$

Pension Age (t)	$\widehat{CCPP}_t^B$ (%)	$\widehat{CCPP}_t^A$ (%)	$\widehat{EPUGR}_t$ (%)
1	2.07	2.58	24.6
2	2.37	2.74	15.6
3	2.55	2.82	10.6
4	4.55	5.29	16.3
5	5.08	5.97	17.5
6	5.08	5.97	17.5
7	5.08	5.97	17.5
8	5.08	5.97	17.5
9	5.08	5.97	17.5
10	5.08	5.97	17.5
11	5.08	5.97	17.5
12	5.08	5.97	17.5
13	5.08	5.97	17.5
14	5.08	5.97	17.5
15	5.08	5.97	17.5
16	5.08	5.97	17.5
17	5.08	5.97	17.5
18	5.08	5.97	17.5
19	5.08	5.97	17.5
20	5.08	5.97	17.5
21	5.08	5.97	17.5
22	5.08	5.97	17.5

Source: Authors' estimates.

5. Summary and Conclusions

To date one of the main objectives of public pension systems has been to provide a socially acceptable level of welfare to the retired population. However, the ageing population process, which implies higher expenditure on pensions and lower revenues enhanced by the burst of the Great Recession, which implies even lower revenues to face the payment of the pensions, have led the Spanish governments to implement a series of reforms to guarantee the sustainability of pension systems. These reformist scenarios, which mainly imply a reduction of the pension benefits provided and the subsequent diminution in the level of welfare enjoyed by the pensioners protected, had not taken into account the existence of the macro-micro-economic relationship between unemployment, wages and pensions. Increases in the rates of unemployment are expected to reduce wages and, as a consequence, for those pension systems in which pension benefits are computed according to the wages registered during the working life of individuals, pension benefits are expected to be lower. These lower benefits are expected to, on the one hand, diminish the expenditure on pensions and, on the other hand, affect the welfare level of the retired population.

International Review of Economic Policy - Revista Internacional de Política Económica
vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

99

In this contribution we estimate the impact of the increase in the rates of unemployment registered during the Great Recession on Spanish pensioners' welfare. Our analysis is focussed on the relationship between unemployment, wages and pensions that empirical evidence suggests for Spain. According to our estimates the average Spanish pensioner is expected to lose the equivalent to 18 monthly payments of the initial pension entitled. Additionally, the poverty risk faced by pensioners is estimated to increase between 10.6 and 24.6 per cent due to the effect of the Great Recession as estimated and shown above. That is to say, the welfare level of Spanish pensioners is expected to diminish due to the increase in the rate of unemployment during the Great Recession. Our main policy recommendation is for policy- makers to take into account the possible existence in their country or region of a relationship between the rate of unemployment and pension benefits. Wherever this relationship exists, it is expected for the increase in the rate of unemployment registered during the Great Recession to have a negative impact on the pensions and, consequently, the welfare level enjoyed by the future cohorts of retirees in the area that is expected to be lower. Accordingly, the challenge is to design reforms of the pension system that not only does it guarantee financial sustainability but also a desirable level of welfare to pensioners.

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100

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101

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vol.2, nº.1, 2020, pp. 87-102 (ISSN 2695-7035)

102