FOSTERING THE CONTRIBUTORY NATURE OF THE SPANISH RETIREMENT PENSION SYSTEM: AN ARITHMETIC MICRO-SIMULATION EXERCISE USING THE MCVL(*)

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ABSTRACT

This paper analyses the effect of various measures aimed at fostering the contributory nature of retirement pensions in Spain. In so doing, it draws on a sample extracted from a new micro data set –the MCVL– provided by the Social Security Administration. We find that the measures introduced by the 26/1985 and 24/1997 Acts would have reduced the average initial pension of pensioners retiring between 2003 and 2005 and, hence, the system's overall generosity. First, our simulations show that the increase in the number of past wages considered in the primary insurance amount (BR) from two to fifteen years would cut the average initial pension by slightly more than 16%. The extent to which the effect of this reform depends on the characteristics of retirees is tested. Although some factors are found to be significant in explaining this effect, the overall explanatory power is quite low.

Second, strengthening the link between the pension received and the number of contributory years would only decrease the entry pension by around 1.5%, as this reform only affects a small share of pensioners.

Finally an aggregate measure of the effect on expenditure of the estimated pension reduction is obtained. The overall impact on the sustainability of these measures is a substantial cut in the share of expenditure to GDP starting at 1.03% of GDP in 2005 and reaching 2.47% of GDP in 2050. This could be considered the maximum effect as long as only the direct effect on pension reduction is captured. Further research is needed in order to consider the possible behavioural reactions of agents when choosing their retirement age.

Keywords: Retirement pensions, public expenditure, replacement rate.

JEL Class: E62, H55.

1. INTRODUCTION

In recent times the debate concerning the future of the welfare state has shifted to focus on the sustainability of state pension systems. This need to adapt the social security systems, which in most instances came into being at the beginning of the last century, is today clearly recognised and the Spanish system is no exception. Throughout its roughly one-hundred years of existence, the social protection system in Spain has been subject to many reforms; however, some features, including the accepted retirement age, have remained unaltered.

The origins of the present Spanish pension system can be traced to the 1963 Act, which initiated a unification process of different types of benefit and welfare mechanisms. The 1978 Constitution ushered in a new legal framework aimed at separating the contributory nature of the system from direct social welfare – i.e., breaking the link between past contributions and future benefits[1]. Subsequent reforms have sought to foster the contributory nature of the pension system, in other words, to strengthen the link between contributions and benefits *à la Bismarck*, while social assistance has continued to rely on fixed benefits, in a more Beveridgean style. Undoubtedly, this Bismarckian orientation has played a role in improving prospects of sustainability in the face of future demographic ageing, since it tends to result in lower pension entitlements for many workers. At the same time, the reduction in the redistributive impact of the system can be offset by the parallel development of the social insurance system.

The main reforms fostering the contributory nature of the pension system in Spain were introduced by the 26/1985 and 24/1997 Acts and, principally, affect the factors included in the formula for computing the initial pension entitlement (aip), which can be stated as Equation [1][2].

$$\text{aip}_t = \text{BR} \cdot p(n) \cdot (1 - \rho(n, 65 - \text{RA})) \qquad [1]$$

where BR represents what we might term the "primary insurance amount" –or the *base reguladora*– which is an average of previous covered earnings (between a floor and a ceiling) for a specific calculation horizon, most of them

[1] *Ley 193/1963 de 28 de diciembre, sobre Bases de la Seguridad Social and Constitución Española de 27 de Diciembre de 1978.*

[2] *Ley 26/1985 de Medidas Urgentes para la Racionalización de la Estructura y Acción Protectora de la Seguridad Social; Ley 24/1997 de Consolidación y Racionalización de la Seguridad Social.*

being adjusted for inflation. The other two factors establish the share of the *BR* that will be received as benefit, depending on the total number of years worked $-n-$ and on the age at retirement (RA). First, starting from 100%, the share is reduced in line with a fixed scale given by the function $p(n)$. Second, if the worker has not completed 35 working years, the function $p(n)$ gives the annual penalty for each year of early retirement taken.

The 1985 reform prolonged the earnings period used in calculating the *BR* from an average of the last two years to an average of the last eight years before entering retirement. Furthermore, it made the entitlement conditions more strict by increasing the minimum n from ten to fifteen, though leaving the rest of the $p(n)$ function unchanged. This reform was contested by the unions in the first general strike following the restoration of democracy, and made evident the need for a framework of social consensus. This led to the government, together with most of the political parties and unions, signing the Toledo Agreement in 1995. Thus various recommendations for reform were approved, some of which were introduced by the 24/1997 Act. This specifically made two changes to the *BR* and $p(n)$. First, the earnings period for computing the BR was extended from eight to fifteen years; and, second, in line with the increase in the minimum n introduced by the 26/1985 Act, the scale in function $p(n)$ was adapted.

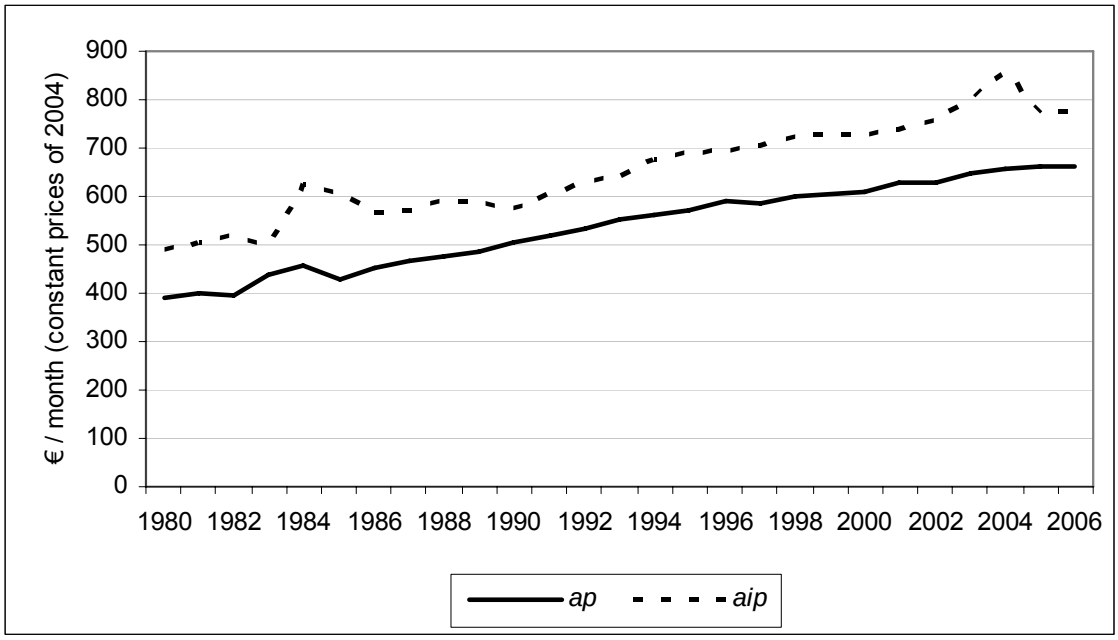
Since these reforms, no further significant changes have been made to these factors, though the directives governing early retirement have become an issue for debate. Thus, in an agreement signed in 2001 between the government, leading employers' associations and trade unions and in the 2003 revision of the Toledo Agreement, new legal guidelines were introduced regulating early retirement (flexible and partial retirement) and the longstanding early retirement norms were modified[3]. What is more, future changes in this area are currently on the reform agenda. In fact, the 2001 agreement contains an explicit statement of the political will to revise the way in which the *BR* is computed so as to take into account in a "progressive" manner the "effort made by the worker throughout his or her entire working life".

The main goal of this paper is to evaluate the effects of the aforementioned legal reforms on the initial pension formula, in order that we might determine the extent to which they will have an impact on the evolution in future expenditure.

[3] *Ley 35/2002, de 12 de julio, de Medidas para el Establecimiento de un Sistema de Jubilación Gradual y flexible.*

Figure 1

EVOLUTION OF AVERAGE CONTRIBUTORY RETIREMENT PENSION (*AP*) AND AVERAGE INITIAL PENSION FOR NEW REGISTRATIONS (*AIP*) (in 2004 €)



Source: Authors' calculations using data from MTAS (several years).

An aggregate analysis fails to provide us with any clear conclusions. As can be seen in Figure 1, the average initial pension over the last few decades has, in general, shown a tendency to increase. In real terms, its 2006 value is 58% higher than the value recorded in 1980, which means an annual cumulative growth rate of 1.8%, higher even than productivity growth for the same period (averaging an annual 1.6%). After the 1985 reform, the average initial pension remained virtually constant or even fell slightly; however, it showed a marked upward trend after 1990. The 1997 reform seems to have coincided with a new deceleration in the growth rate of average initial pensions, from an annual 3% in the period 1990-1997 to almost half between 1997 and 2002. While those changes seem to reflect the aforementioned reform measures, no definite conclusions can be drawn without first undertaking a rigorous analysis of the micro data. The evolution in average pensions is, after all, affected by many factors besides those considered in the legal pension formula given in equation (1). The most notable of these are the existence of pension thresholds and various differential features of special regimes.

The recent availability of a new micro dataset –the *Muestra Continua de Vidas Laborales* (MCVL)– improves future prospects for micro simulation in Spain. In particular, this data set allows us to quantify the effects of the reform measures described above. The goal of the present paper is, therefore, to use the MCVL data in undertaking an evaluation of the effects of reform measures aimed at

fostering the contributory nature of the pension system by changing the weight given to the contributor's working career –both in terms of past wages and number of years worked– in the initial pension formula. We focus our attention on past measures applied in Spain that might enable us to extract conclusions about the effect of further extensions to these reforms.

A number of other papers deal with this issue though most of them draw on macro data: Monasterio *et al*. (1996), Herce *et al.* (1998) and Bonin *et al*. (2001) analyse the effect of 24/1997 Act on the sustainability of the system. Jiménez (2006) and Boldrin *et al*. (2004) –the latter being part of an international comparative project– analyse the effect of these measures using a preliminary pilot version of the MCVL with a smaller sample size. We deviate from the latter in the data set used and in the kind of analysis developed. They estimate the sensitivity of retirement hazard to retirement incentives and pensioners characteristics so that they try to capture both the direct mechanical (or arithmetic) effect and the indirect behavioural effect, while this paper strictly focus on the direct effect trying to analyse the main factors driving it.[4]

In the following, Section 2 describes the general features of the data set and the sample used in the study. Section 3 is devoted to a discussion of the results of reforms on the average pension and an evaluation of the overall effect on sustainability. Finally Section 4 summarises the main conclusions.

2. DATA

2.1. General description

The MCVL is a sample extracted from Social Security administrative data[5]. Four per cent of all individuals registered with the Social Security administration –both contributors and recipients of benefits– over the sampling year are selected and their entire life time history in the social security records is included in the data set[6]. Thus, although it is not a pure panel, the data set is rich in longitudinal data. This feature, however, complicates the structure of the information and the registration unit varies

[4] See also, Argimón *et al.* (2007) estimate the probability or retiring depending on some socioeconomic variables, using the 2004 wave of this data base.

[5] See MTAS (2006b) for a detailed description of the MCVL, available upon request at www.seg-social.es/Internet_1/Lanzadera/index.htm? URL=82.

[6] In this way both workers and pensioners are included and also individuals receiving unemployment benefits or benefits prior to early retirement. The latter can be identified by the type of relation they have with the Social Security.

substantially ranging from the person –in the personal data file– to the contract –in the affiliation file– or to the contract and year –in the contribution file. This structure also complicates our data selection. Furthermore the quality of data is not homogenous, deteriorating the further back in time we go as more data are missing. Thus we see that the data collection itself was initiated at different points in time: data on pensions were first included around 1996; data on contributions around 1980; while some data on affiliation (contract registering) are available from as early as 1970. Clearly all these factors condition our analysis. In the Section that follows we provide details of the data employed. We focus primarily on the pension file whose registration unit is the benefit and the year, but we also recover contributory data for those individuals in our sample.

Among the difficulties of dealing with such a large administrative data set –the sample size reaches about a million people in 2005– the most challenging are dealing with empty contribution bases and relating contribution, affiliation and benefit data from the same individual, all defined with different registration units. In particular, in order to extract reliable data regarding contributions in a specific time unit, it is necessary to follow up all the contracts in which an individual has been involved, computing time and contribution separately so as to avoid an erroneous correspondence between working time and contribution per unit of time. In the next section we describe in detail how we dealt with this.

2.2. Data employed in the analysis

This paper, as outlined above, seeks to examine the impact of certain reform measures on the pension formula. The MCVL allows for this kind of analysis because it contains data of the main factors included in the initial pension formula. Specifically, over the period covered by the data base, we are able to recover the number of working years, the life cycle contributions of the individual and the retirement age, thus determining any penalizations for early retirement.

Though in principle it is possible to analyse all potential pensioners –i.e., all the individuals in the sample– we opted to focus on the current cohort of pensioners, because of the quality of our data. One of the main problems we faced was that many contracts were missing data. Thus for example we might find no recorded contribution for one specific worker, while data regarding affiliation showed the worker to be actually contributing. An imputation process might be defined to provide figures for the missing contributions by using data for the same individual or data for similar contracts or individuals. In fact for some studies this would be unavoidable. Nevertheless, given the arbitrariness in

the definition of any possible criteria, we opted for another strategy. Thus, we chose to focus on actual pensioners for whom the value of the *BR* was registered in the data set. For these individuals, we were able to compute the estimated *BR* from their contributions registered in the MCVL and then to compare it with the actual value registered in the data set. This proved to be a natural filter for selecting the individuals whose records were most accurately registered.

The quality of data prevents us from analysing the impact of the measures at the time of their enactment. As outlined above, data regarding pensions has been registered since 1996 while data regarding contributions was first registered in 1980, but to compute the *BR* we need to be able to recover the contributions for the last 15 years. Hence we opted to measure the effect of those measures on new registrations for the most recent years available, i.e., 2003 to 2005. Below we describe the estimation process adopted in detail.

For pensioners, the total number of lifetime working years considered in computing the initial pension is also registered in the MCVL. Nevertheless, it is also necessary to obtain the annual working time, in order to fill the gaps in the contribution data, in line with Spanish legislation[7]. Hence the annual contribution period or working time is obtained by recovering all the contracts signed by the individual for each year, taking into account part-time work as well as the possibility of contracts that ran simultaneously. At the same time, the average hourly contribution can be obtained[8]. Using annual working time and contributions, the *BR* can be estimated and compared with the registered value. The average adjustment obtained for the ratio of the computed to real *BR* is 96.32% for a sample of 8,576 new registrations made between 2003 and 2005[9]. By focusing on these most recent years we are able to avoid missing contributions, which tend to increase in number the further back in time one goes[10]. If we limit the adjustment to a 5% deviation, we end up with a sub-

[7] When the individual presents a non-contributory period within the last 15 years considered for computing the *BR*, the minimum contribution threshold –depending on the regime and contribution group– rather than zero is considered to compute the *BR*.

[8] To do so, it is possible to use a part-time coefficient which is available in the data set. Nevertheless, given that this variable presents a number of unreliable values we focus on full-time contracts which amount to 90% of all contracts.

[9] Note that the value of the average adjustment implies that the individuals selected have no missing contributions in the last 15 years. By manipulating the *BR* rule, it can be easily shown that a missing value even in the first years would imply a minimum under estimation of more than 5%.

[10] Of the total new registrations made within the period, 35% are lost as they do not even appear in the contribution file. Focusing on the general regime also means a further 14% of individuals are lost. Furthermore, by focusing on standard causes of retirement –recorded more accurately in the MCVL– another 1.5% are eliminated.

sample of 6,137 individuals and the error is an average overestimation of 0.5%. The results shown below involve an additional filter: 75 individuals were eliminated as they presented a deviation above 100% for some of the ratios computed below. This allows us to conclude that the individuals considered present no missing data in their past contributions. We can then evaluate the effect of an extension on the number of past contributions used to compute the BR from two to eight (26/1985 Act), and then from eight to fifteen (26/1997 Act), as is undertaken in Section 3.1 below. To do this, however, we need to recover contribution data dating back to 1988. Thus, we are unable to extend this measure further using micro data, but we analyse this question in greater detail in Section 3.1[11].

3. RESULTS

In this Section we report the results of the micro simulation exercise. In Section 3.1 we compute the effect of changing the number of past contributions included in the *BR* and we run a regression analysis to test how this is affected by the socioeconomic variables available in the MCVL. Then, in Section 3.2, the effect of changing the weight given to the number of contributory years in the share of the *BR* received as a pension is considered. Finally, Section 3.3 discusses the effects on redistribution and on sustainability.

3.1. Extending the earnings history entering the calculation of the *BR*

As discussed in the introduction, an extension to the earnings history included in the calculation of the *BR* will, in principle, reduce its level, and hence the initial pension, given the way the *BR* is computed as an average of past contributions – wages if they are not affected by thresholds. If, as it is reasonable to expect, earnings grow during a working career, the more past wages that are included, the more the *BR* will decrease. The computation rule seeks to minimise this loss to some extent by indexing past wages to inflation – except for the last two years. In this way some of the loss produced by inflation is recovered, but the increase in real wages over the period is not incorporated at all. As a result, for most workers the marginal replacement rate is below one, i.e., the pension received is lower than the wage received immediately before retirement. Only for those who experience a fall in real wages or periods of

[11] Information regarding contributions was first gathered in 1980, but it is more reliable after 2001. The providers of the sample found that the share of contracts with missing data fell from 78% in 1984 to 94% in 1992 and to 99% in 2003.

unemployment during the last 15 years before retiring are likely to experience a replacement rate above one[12].

Table 1 below summarizes the overall effect of an increase in the earnings period considered in the *BR* for all the individuals in the sample. The second column shows the average adjustment of the *BR* that determined the sample selection, as explained above. Columns three to six show the increase in pension resulting from a change from eight to fifteen years (Ratio15_8), from two to eight years (Ratio8_2), from two to fifteen years (Ratio15_2) and the number of observations, respectively.

Table 1

THE OVERALL EFFECT OF INCREASING THE COMPUTATION PERIOD

	***BR* Adj.**	**Ratio15_8**	**Ratio8_2**	**Ratio15_2**	**N. individuals**
Total sample	96.32%	93.75%	91.26%	86.33%	8,576
5% adjustment	100.50%	93.27%	91.12%	85.58%	6,137
Final sample: >100%	100.51%	93.12%	89.54%	83.72%	6,062

Source: Authors' calculations using MCVL data.
Note: *BR* Adj. = *BR* computed / *BR* observed in data.

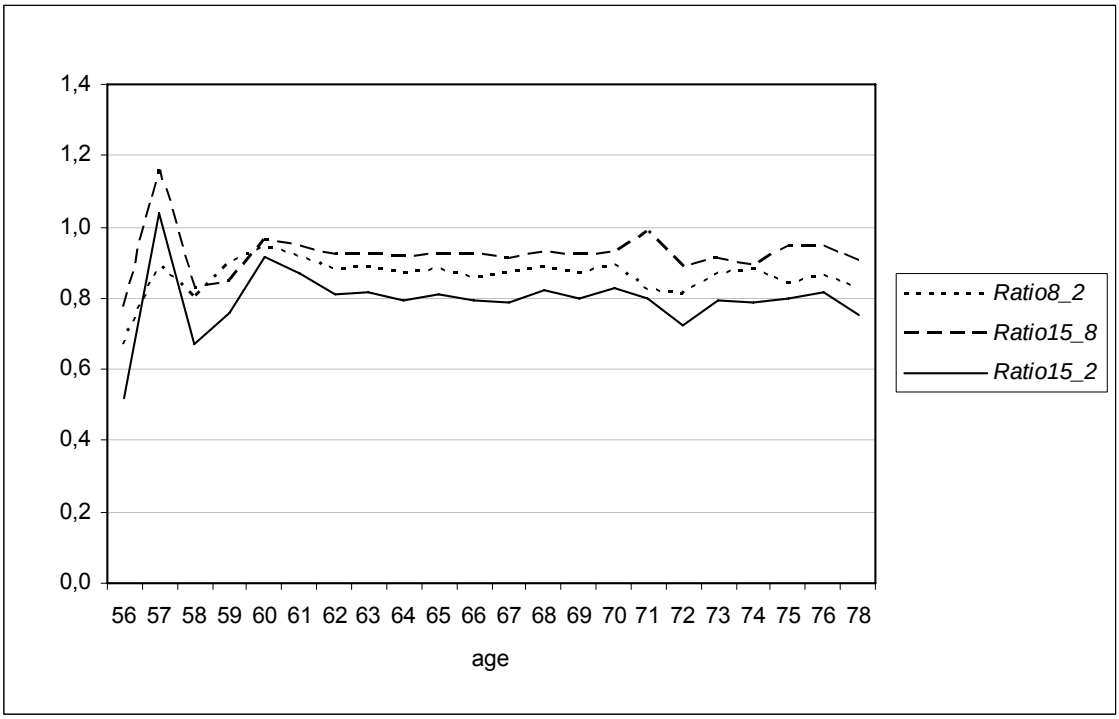
As expected, on average the *BR* is always lower as a result of an increase in the computation period. Nevertheless, this increase depends on the moment at which it happens. Though in the first case –when going from the last two to the last eight years– only six years are included as opposed to seven –when going from eight to fifteen years, there is a greeter reduction. As we shall see below, this is due to the shape of the longitudinal earning profiles which are found to have been more steady in recent years, while they tended to grow more rapidly in earlier years.

These results hold if we control for retirement age. Figure 2 shows the value of the three ratios as a function of retirement age. The decrease in the BR is still observed and is, in fact, higher when going from two to eight years than when going from eight to fifteen. The value of the ratios is quite independent of retirement age, especially for ages near normal retirement age, i.e., between 60 and 70. Similarly the effect of this measure is not particularly affected by a change in the birth cohort, as shown in Figure 3. Again for the more representative cohorts –those retiring between 60 and 70, and hence born between 1935 and 1945, the value of the ratios seems quite stable.

[12] Although, as indicated above, the minimum contribution is considered in those cases in which the worker has a non-contributing unemployment period within the last 15 years, it is more likely that this situation will reduce the *BR*, and hence the replacement rate.

Figure 2

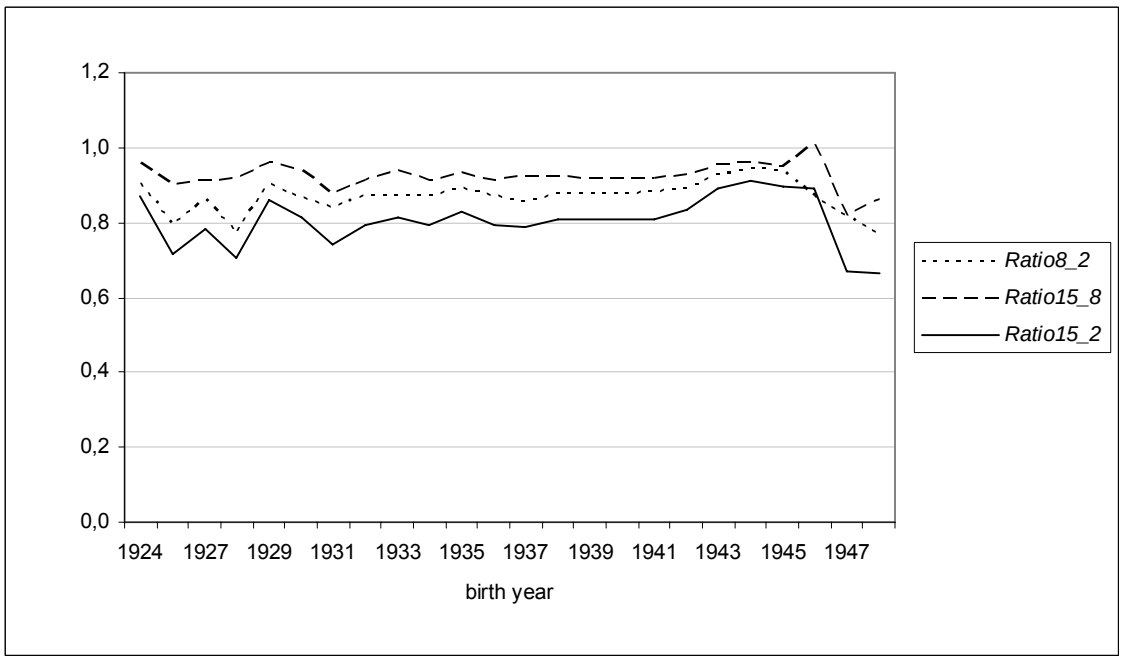
EFFECTS OF AN INCREASE IN THE COMPUTATION PERIOD IN RELATION TO RETIREMENT AGE



Source: Authors' calculations using MCVL data.

Figure 3

EFFECTS OF A CHANGE IN THE COMPUTATION PERIOD IN RELATION TO BIRTH YEAR



Source: Authors' calculations using MCVL data.

As the effect of changing the computation period does not seem particularly dependent on the retirement age and the birth year, we next considered whether sex and birth year might have a differential effect. Table 2 shows the value of the ratios as a function of these variables. The effect of sex seems to be small, but the ratios seem to evolve in the same direction as above: both when going from two to eight years and when going from eight to fifteen, females experience a smaller effect. Similarly this holds when controlling for the retirement year. We also observe that the more recent the retirement year, the less marked is the effect of increasing the computation period, albeit less noticeably so.

Table 2

EFFECTS OF A CHANGE IN COMPUTATION PERIOD

a) As a function of sex

Ratio8_2	Ratio15_8	Sex	Ratio15_2	N.º cases
89.34%	92.91%	Male	83.32%	4,844
90.33%	93.95%	Female	85.32%	1,218

b) As a function of retirement year

Retirement year	Ratio8_2	Ratio15_8	Ratio15_2	N.º cases
2003	91.96%	93.39%	86.56%	1,848
2004	91.15%	93.26%	85.72%	1,959
2005	90.42%	93.18%	84.70%	2,330

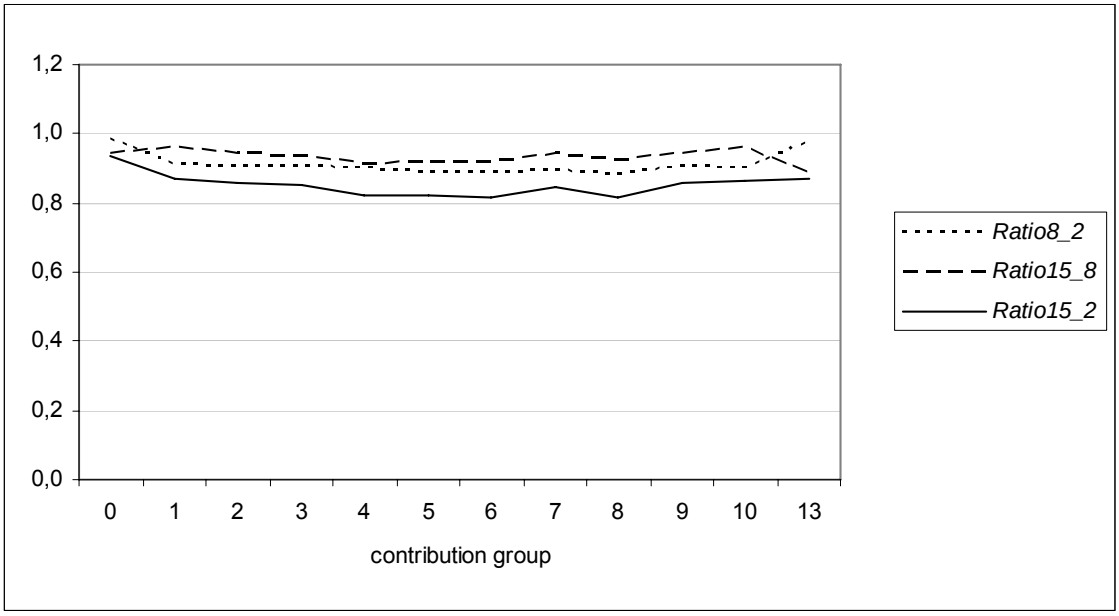
Source: Authors' calculations using MCVL data.

Finally, we examined variables reflecting the income level of individuals. First, Figure 4 shows the value of the ratio by contribution group. To take a common reference point, the contribution group in 2003 was considered for all pensioners[13]. The value of ratios is quite stable though lower values are observed for intermediate groups.

[13] Specifically, the minimum contribution group in 2003 for all contracts held in that year is taken.

Figure 4

EFFECTS OF A CHANGE IN COMPUTATION PERIOD IN RELATION TO CONTRIBUTION GROUP (minimum group in 2003)

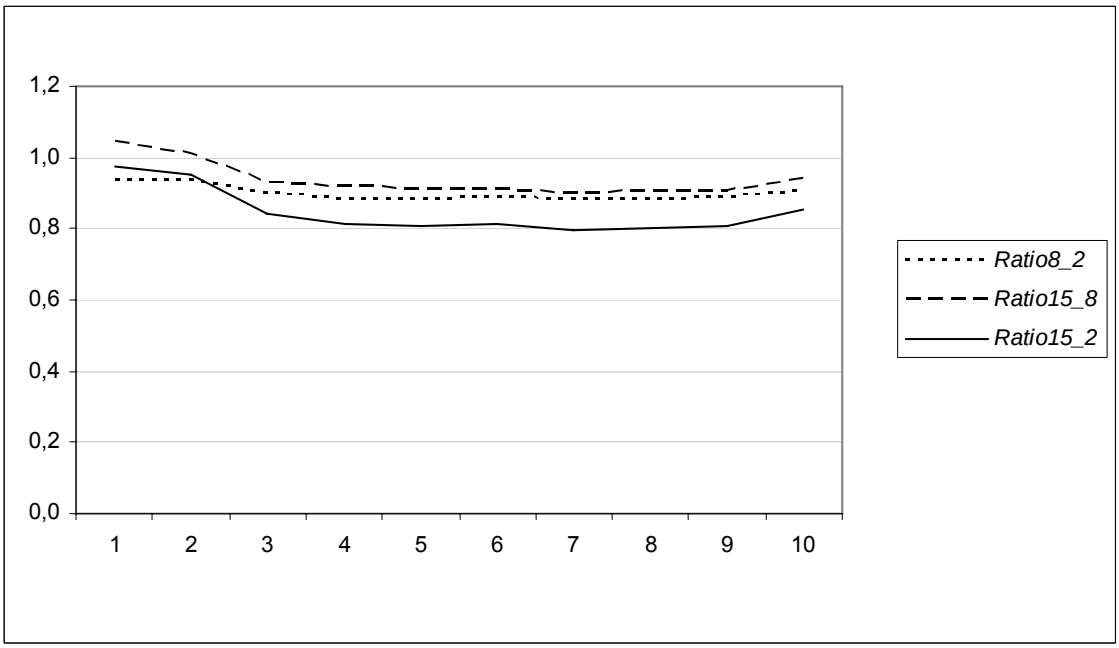


Source: Authors' calculations using MCVL data.

Note: 0 stands for the non declared contribution group.

Figure 5

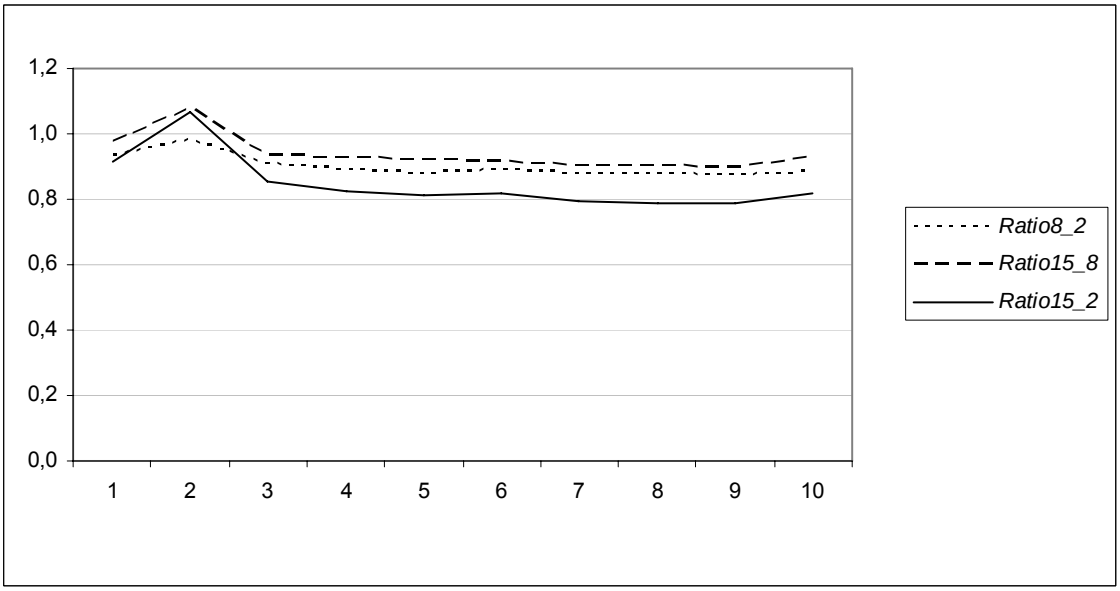
EFFECTS OF A CHANGE IN COMPUTATION PERIOD IN RELATION TO PENSION DECILE (pension in 2005)



Source: Authors' calculations using MCVL data.

Figure 6

EFFECTS OF A CHANGE IN COMPUTATION PERIOD IN RELATION TO CONTRIBUTION DECILE (average hourly contribution in 2003)



Source: Authors' calculations using MCVL data.

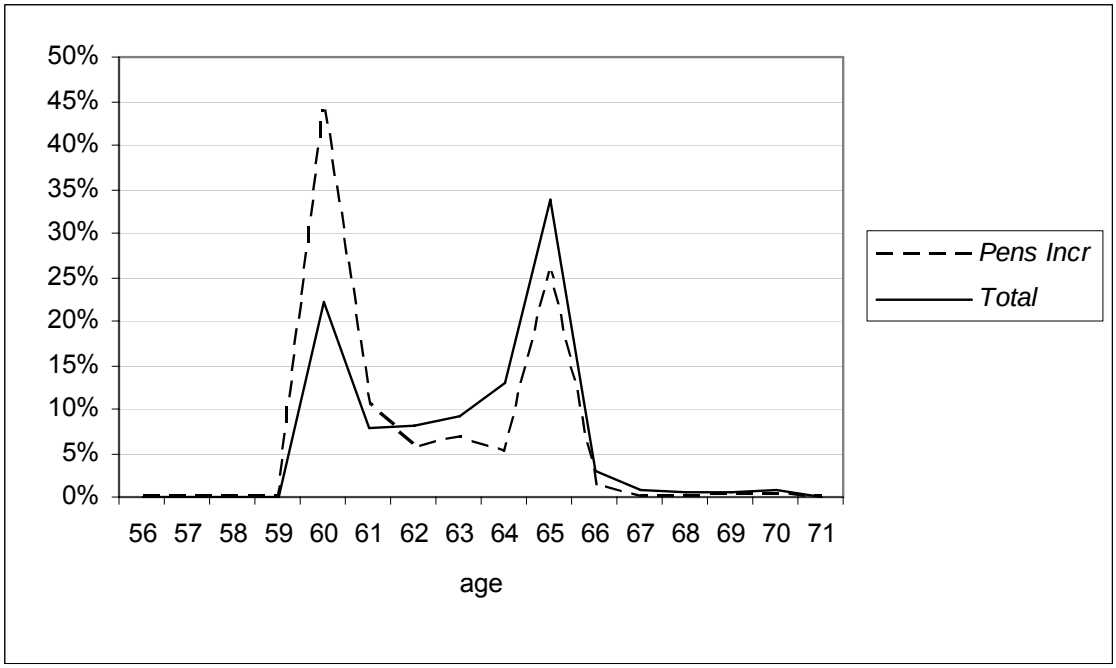
Considering average contribution and pension, the following Figures provide a better description of the effect of income level. Figure 5 shows the value of the ratios as a function of pension deciles, while Figure 6 shows these values as a function of the contribution deciles[14]. In this case we can observe a clear pattern: low income pensioners are less affected by the change in the calculation period to the extent that some contribution deciles even experience an increase in pension.

Interestingly, a substantial proportion of pensioners experience an increase in pension rather than a decrease. In the following, the characteristics of these pensioners are analysed. We select those cases in which one of the three ratios held –ratio 2_8, ratio15_8 or both– is above one, obtaining 988 individuals. The Figures below analyse their characteristics.

[14] Again we needed to take a common reference for all pensioners and so chose the 2003 average contribution and the 2005 pension. In both cases we deal with censored data.

Figure 7

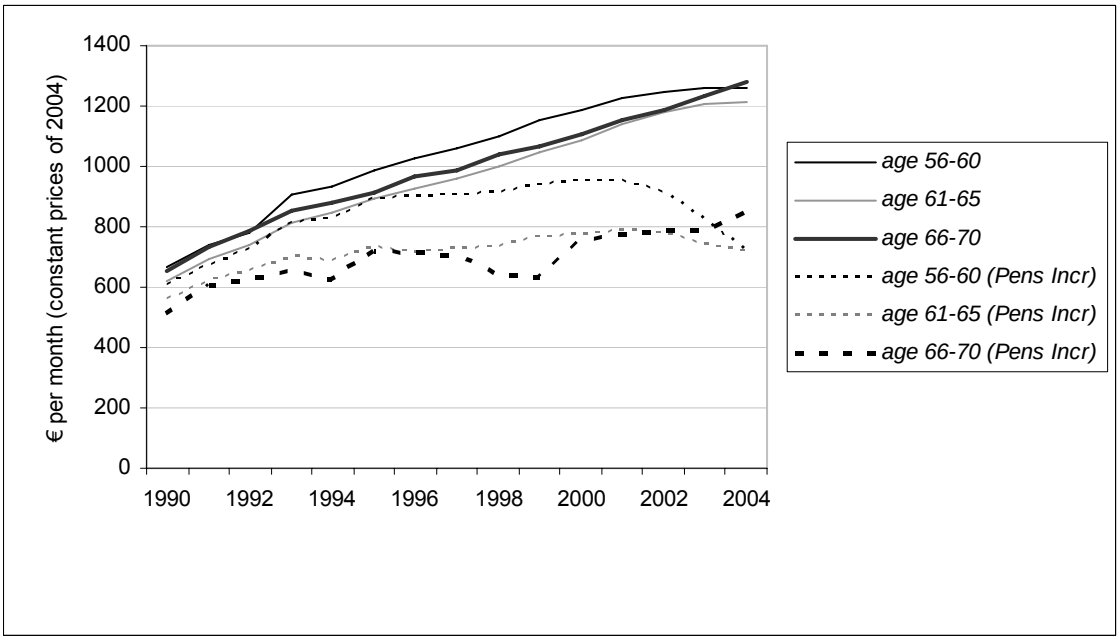
DISTRIBUTION OF INITIAL PENSIONS WITH RESPECT TO RETIREMENT AGE
(total sample versus those affected by an increase in pension)



Source: Authors' calculations using MCVL data.

Figure 8

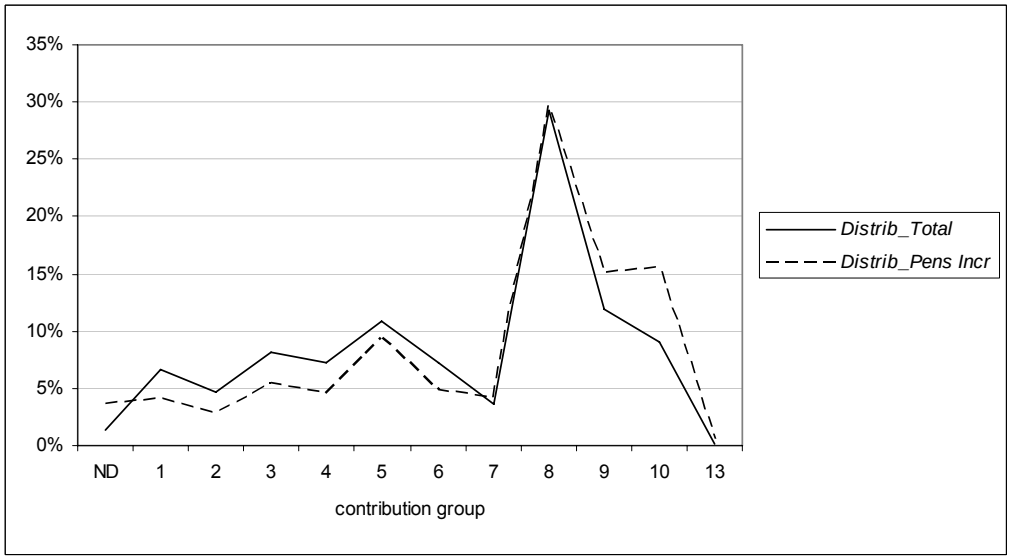
AVERAGE CONTRIBUTION BY AGE COHORT (2005 initial pensions: total sample versus those affected by an increase in pension)



Source: Authors' calculations using MCVL data.

Figure 9

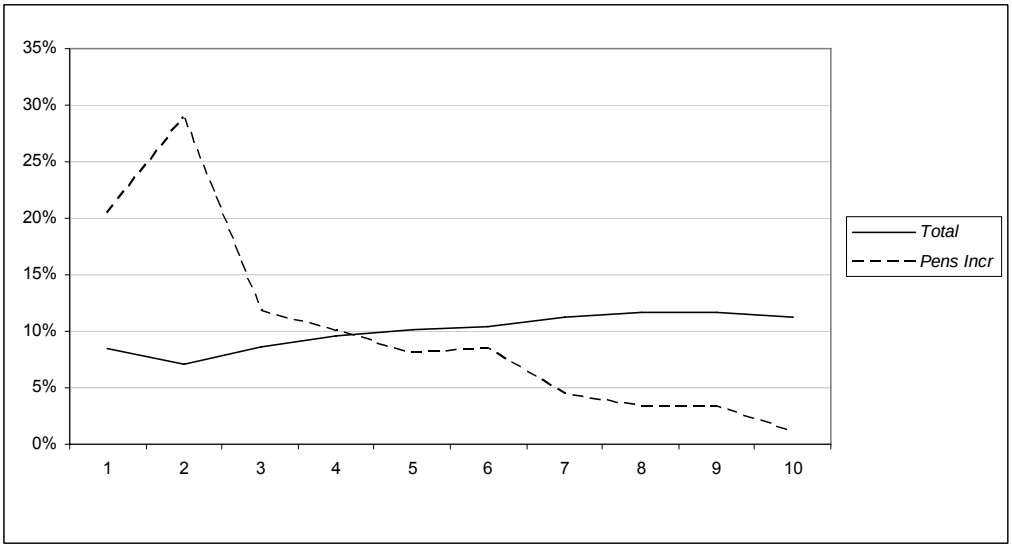
DISTRIBUTION OF INITIAL PENSIONS WITH RESPECT TO CONTRIBUTION GROUP (total sample versus those affected by an increase in pension)



Source: Authors' calculations using MCVL data.

Figure 10

DISTRIBUTION OF INITIAL PENSIONS WITH RESPECT TO 2003 CONTRIBUTION DECILES (total sample versus those affected by an increase in pension)



Source: Authors' calculations using MCVL data.

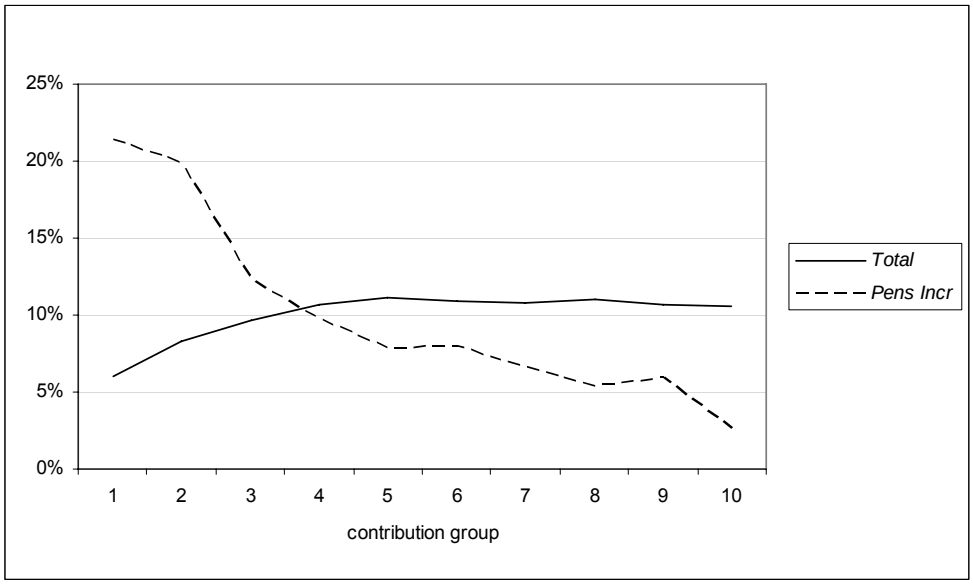
First, although sex seems not to be relevant, the average retirement age of those individuals is below the total average, as shown in Figure 7. Probably those individuals opt for early retirement due to a non stable situation in the labour market. In fact this is quite apparent in Figure 8, which illustrates the longitudinal contribution profiles of this group in relation to the whole sample. Clearly though earnings grow for the whole sample, those who experience a cut in pension show relatively constant or even decreasing wage profiles.

If we examine the income level of individuals, we find that those pensioners affected by a cut in pensions are mainly low income individuals. Again this is not so clear when looking at the contribution group but it is more evident for different contribution and pension deciles.

Figure 11

DISTRIBUTION OF INITIAL PENSIONS WITH RESPECT TO 2005 PENSION DECILES

(total sample versus those affected by an increase in pension)



Source: Authors' calculations using MCVL data.

In short, even though 15.4% of individuals experience an increase in their *BR*, our results show that extending the time period considered when computing the *BR* reduces average pensions between 0.98 points per year –when going from two to eight years– and 1.7 points per year –when going from eight to fifteen. We might infer from this that an extension beyond 15 years, in line with proposals contained in the Toledo Agreement, could result in a decrease that is more in line with the latter or even higher. This would, indeed, be in line with the prediction of classical human capital theory, i.e., that longitudinal earnings profiles increase more during the first decades of the working careers and become flatter afterward (Mincer, 1974).

As mentioned in the introduction, besides the direct effect of this measure, an indirect behavioural response can be expected. In this case, in face of a sizeable cut in pension rights, one can expect that agents will react by postponing retirement age. In fact, Boldrin *et al* (2004) obtain a very small impact of the abovementioned reform measures when both the change in incentives and the some personal characteristics are considered to obtain the probability of retirement. Nevertheless, contrary to most of the countries involved in the international comparison, retirement incentives turn out to be not significant and in many specifications showed the wrong sign. It is not clear, to what extent it might be due to the small sample size of the data set used –a pilot version of the MCVL– or to special features of the Spanish pension system. Clearly this issue requires more investigation.

Finally, in order to contrast simultaneously the relevance of all the characteristics considered we ran a regression analysis. Table 3 shows the results of the regression model that gave the best fit. As expected from the above analysis, the overall explanatory power of all the variables considered above was not very high –the R square reaching just 18.51%. Nevertheless, this analysis allows us to contrast the significance of each variable while controlling for the effect of the rest of the variables. The original model also included a categorical variable indicating the economic activity (CNAE classification) of the last contract held by each pensioner, which proved not to be significant. In order to eliminate the dependency of residuals for some variables various strategies were employed. On the one hand, given that the sample size was sufficiently large, the contribution group was included as ten dummy variables. This option improved the specification, eliminating the effects of residuals and giving a significant effect for each contribution group with respect to the first –corresponding to graduate students and engineers– which was omitted. On the other hand the contribution level and the average non working days in the last 15 years (unemp.) are transformed in logarithms. In this way, both variables prove to be stationary in variance eliminating heteroskedasticity.

Table 3

RESULTS FOR THE REGRESSION ANALYSIS FOR R15_2

Variable	Coefficient	Std. Error	t-Statistic
C	-121.8350	11.40667	-10.68103
Birth year	0.030986	0.001695	18.27829
Retirement year	0.031942	0.005939	5.378464
LOG(C03)	-0.144424	0.009123	-15.83104
Sex	-0.022777	0.009998	-2.278255
LOG (Unemp.)	0.022894	0.002922	7.835416
CG_2	-0.066918	0.022927	-2.918792
CG_3	-0.045799	0.025170	-1.819611
CG_4	-0.115991	0.024079	-4.817000
CG_5	-0.122271	0.023176	-5.275762
CG_6	-0.167708	0.025773	-6.507150
CG_7	-0.215288	0.027655	-7.784737
CG_8	-0.213115	0.022808	-9.343941
CG_9	-0.186576	0.024187	-7.713994
CG_10	-0.286899	0.025703	-11.16222
CG_13	-0.152611	0.047123	-3.238573
R-squared	0.185110		
Adjusted R-squared	0.183037		
F-statistic	89.30376		

Source: Authors' calculations using MCVL data.

Note: *C03*=2003 Contributions; *CG* Contribution Group.

The dependent variable is the total increase in pensions due to reform in the computation period –the ratio of pensions when considering fifteen years to those when considering two years. Hence, a positive coefficient implies a higher ratio and, therefore, a higher increase –in most cases a smaller reduction– in pensions due to the increase in the computation period of the *BR*.

Hence, the variables producing a lower pension cut are a higher number of days in unemployment and the more recent birth year of the retiree[15]. This might indicate that the effect of the cut in pensions was greater when the reform was introduced, but we cannot be totally certain of this.

By contrast, a higher pension cut is recorded the higher is the contribution level and for females. Interestingly, the positive effect of the later, shown by the positive coefficient in the regression once all the other factors are considered, presents the opposite effect to that of the results shown in Table 2 a). With respect to the former, these results seem to confirm one of the most interesting conclusions in the analysis: an increase in the computation period for the *BR* equation has a redistributive effect. The reason for this is that those with a higher contribution level also experience greater contribution growth during their lifecycle and this makes them more sensitive to this reform. This interpretation can also be applied to the value of the coefficients of the dummies indicating the contribution group, which is negative. As expected, though the value of coefficients does not evolve exactly monotonically for the last groups – from 8 to 13, all of them show a lower effect than the first[16].

In short, the increase in the computation period for the *BR* has the greatest effect on females, those cohorts born or entering retirement earliest and those individuals with lower than average numbers of unemployment days. Similarly, it affects most those individuals with higher contributions, probably due to the fact that their earning profiles tend to increase more. This implies that besides containing pension expenditure, the measure analyzed has a collateral positive effect on income redistribution.

3.2. Changes in the weight attached to the total number of years contributed

In this section we focus on the second term in the r.h.s. of Equation [1], i.e. the weight attached to the number of contribution years, so as to compute the share of the BR received as a pension. Specifically, the share of the BR received

[15] The result for the average number of days spent unemployed seems to indicate that the increase in the computation period of the *BR* enhances the possibilities of recovering periods of employment and, as a result, of greater bases. This shows that the probability of being unemployed increases with age.

[16] Group 3 alone is not significant at the 5% level.

as a pension depends on two factors: 100% is received if the worker has been contributing for 35 years and retires when he becomes 65 years old, while a reduction is applied if those circumstances are not fulfilled. On the one hand, a maximum of 8% a year penalty –depending on the number of contribution years– is applied for early retirement[17]. On the other hand, a non linear reduction is applied if the number of contribution years is lower than 35. As shown in Table 5, according to the present scale fixed by the 24/1997 Act, *p(n)* is decreasing, so that the weight attached to the first years is higher –which results in a redistributive effect. In order to evaluate the impact of this scale the effect of recovering the former scale, which gave a lower weight to the initial years, is simulated in the following[18]. In addition, further reforms in line with the Toledo Agreement proposal fostering the contributory nature of the system are simulated: specifically, full proportionality considering the present maximum of 35 years –that is 2.86% a year– or a maximum of 40 years –that is 2.5% a year.

As shown in Table 5, for the various scales considered, the weight attached to one particular year oscillates between 5% in the first ten years prior to the 1997 reform, to 2% during the last years of the current legislation.

Table 4

WEIGHT ATTACHED TO CONTRIBUTION YEARS IN THE SHARE OF *BR* (several legal scenarios)

	Prior to 1985	**26/1985 Act**	**24/1997 Act (Current legislation)**	**Total Proportionality**
Minimum eligibility condition	10 years	15 years	15 years	–
Contribution years	Total *p(n)* (per year)			
10	50% (5,0%)	–	–	–
15	(2.0%)	60% (*) (5.0%) (2.0%)	50% (3.3%)	In 35 years (2.86%)
16-25		(2.0%)	(3.0%	In 40 years (2.50%)
26-35			(2.0%)	

(*) 60%: according to the same previous scale, 50% from the first 10 years (5% a year) plus a 10% from the next 5 years (2% a year).

[17] In particular the 8% affects those that only reach the minim eligibility requirement of 15 contribution years. This penalty is minored gradually for those crediting enough years to move the next contribution years scale: 31-34 (7,5), 35-37(7), 38-39 (6,5) and 40 plus (6).

[18] It is not possible to evaluate the impact of reforms introduced by the 26/1985 Act, which only altered the minimum eligibility requirement. Due to the lack of data on the total number of contribution years for all workers, we are unable to ascertain how many individuals were affected by this change.

Table 5

EARLY RETIREMENT PENALTY (ERP) BY RETIREMENT AGE: RECORDED VERSUS ESTIMATED

Retirement age	Recorded ERP	Estimated ERP	n.º cases	CR estimated/real
50	0.00%	90.00%	1	
54	0.00%	66.00%	1	
55	0.00%	70.00%	1	
56	0.00%	67.50%	1	
57	0.00%	51.43%	7	
58	4.00%	49.00%	6	1,225.00%
59	3.00%	39.00%	6	1,300.00%
60	31.84%	32.58%	2,144	102.33%
61	25.40%	26.24%	649	103.30%
62	18.85%	19.21%	634	101.92%
63	13.30%	12.70%	689	95.45%
64	3.54%	6.32%	978	178.43%

Source: Authors' calculations using MCVL data.

Obtaining the early retirement penalty –term $1-\rho(n,65-RA)$ in Equation [1]– is in principle straightforward, as the MCVL records its value[19]. Nevertheless, it is interesting to note that the estimated value, obtained using the general early retirement rule explained above, can deviate greatly from the reported value. Table 6 compares these values showing that the estimated value only resembles the true value for the standard early retirement ages (from 60 to 64), highlighting the existence of legal exceptions to the general rule. Specifically, the penalty is not active for special regimes and certain risky activities for which early retirement before 60 is permitted with a reduced penalty.

Hence, we take the registered value for this variable, while $p(n)$ is estimated according to the options given in Table 4. The product of both terms, the final share of the BR received as a pension (%BR as indicated in Equation [1], is shown in Table 6. The first two columns give the registered and estimated values. The adjustment in this case is much better than when estimating the value of *BR*. The % *BR* is only overestimated by 0.5% and the adjustment is perfect in 83.9% of cases –8,575 cases. In this section we obtain results for the whole sample as well as for this reduced sample.

[19] However, such data have only been collected since 2002. This is one reason why we focus on pensions created since 2003.

Table 6

ESTIMATED SHARE OF *BR* (% *BR*) AND EFFECT OF LEGAL CHANGES

	Present (24/1997 Act)		Simulated reforms			
	Registered % *BR*	Estimated % *BR*	% *BR* (26/1985 Act)	% *BR* Prop35	% *BR* Prop40	n.º Cases
Total sample	83.33%	83.70%	83.99%	82.60%	79.37%	8,575
Change		100.53%	99.51%	98.36%	94.23%	
Exact adjustment	85.21%	85.21%	85.48%	84.24%	81.32%	7,194
Change		100.00%	99.58%	98.66%	95.16%	

Source: Authors' calculations using MCVL data.

Notes: Change measures the ratio of estimated to registered % *BR* (Column 3) and the ratio of each column to estimated % *BR*. Prop35 and Prop40 represents total proportionality in 35 and 40 years respectively.

Columns four to six show the effect of the change in weight given the number of contribution years, with respect to the estimated value under status quo. Somewhat surprisingly the effect of the change introduced by the act is almost negligible as it only reduced average new pensions by less than 1%, both for the whole sample and for the reduced sample.

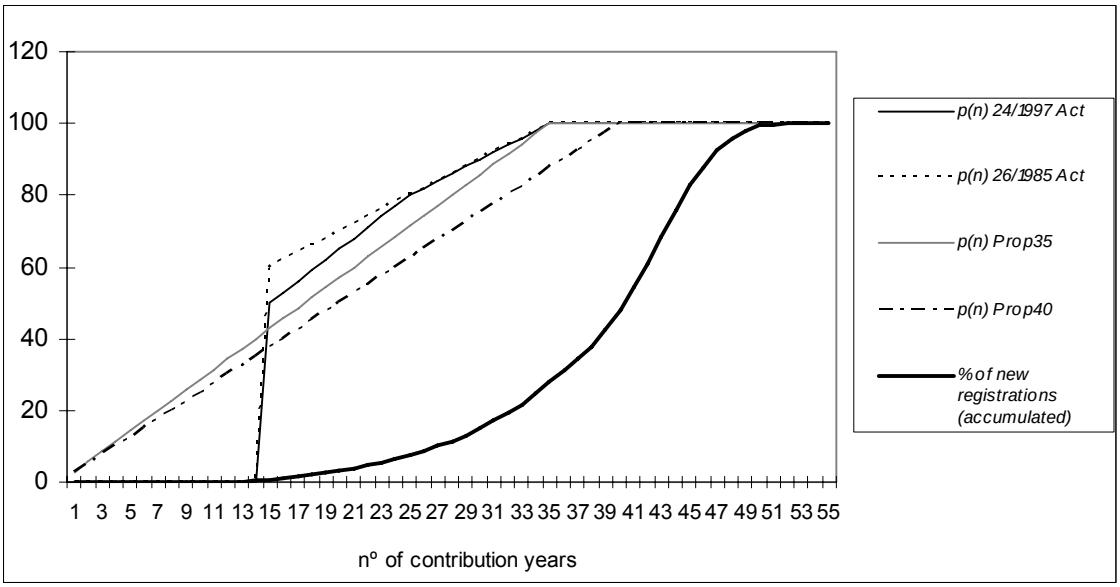
Similarly, moving to full proportionality does not result in a sizable pension cut, unless the maximum contribution years considered are increased from 35 to 40. The pension cut is around 1.5% in the first case though it reaches almost 5% in the second case.

Figure 12 illustrates why these measures have such a limited effect. On the one hand, the function $p(n)$ is plotted for each of the legal scales considered. It is worth noting, first, that individuals who do not meet the minimum eligibility requirement would clearly benefit from a proportional rule. Second, it is clear that for those crediting between 15 and 35 years, both the previous and the present rules (26/1985 and 24/1997 Acts respectively) are more generous than the two proportional rules.

On the other hand, the cumulative distribution of new registration with respect to the number of contribution years is also shown. This highlights the share of individuals affected by each legal scale and hence its specific effect. First, note that most individuals –72%– credit 35 contribution years and, as such, are affected neither by the legal changes already enacted nor by moving to a system of full proportionality with a maximum of 35 years. Second, we can see that the legal change introduced in 1997 only affected 6% of new pensions. Finally, it is interesting to note that an eventual change to full proportionality would affect almost 50% of individuals, which accounts for the higher effect obtained for this simulated legal change.

Figure 12

AVERAGE EFFECT ON PENSIONS FROM FIXING DIFFERENT FUNCTIONS OF *P(N)*



Source: Authors' calculations using MCVL data.

Given that the effect of changes in function *p(n)* depends exclusively on *n*, in the following a regression analysis is derived for this variable. All a priori relevant and available variables have been included as regressors. The pension amount has been excluded as it has a linear relationship with the explained variable. Both the economic activity and the contribution group are excluded as they are shown not to be significant. In order to capture the effect of an increasing earning path on *n*, the relation between the last contribution and the *BR* is included (*C/BR*). Table 8 shows the results of the model that provides greatest explanatory power, while in the following the main technical adjustments are summarized.

First, controlling for atypical values of *C/BR* improves the model[20]. As shown in Table 7, the resulting coefficient proves to be significantly different for several variables. Second, we control for heteroskedasticity. White's test indicates the need to include transformations of several variables: specifically the contribution is transformed in logs and for the number of unemployment days and the *C/BR* ratio, also the square value is included.

The results indicate that the number of years worked is positively dependent on birth year and last year's contributions. By contrast, the number is negatively dependent on the retirement year, the average number of unemployment days and the ratio between the last contribution and the *BR*. The first effect indicates that newer pensions tend to show a longer working career. The second effect

[20] Specifically we consider 81 individuals with a *C/BR* value higher than 1.63. Furthermore, 456 observations with exceedingly high values were eliminated. Note that in this instance we are working with the whole sample and that for a considerable part of it the PIA was approximated by an average of 5%.

should be linear, but is decreasing because the variable only considers unemployment over the last 15 years. Third, it might be thought that a higher ratio and, hence, an increasing working career is an incentive to continue working and, hence, to attain a higher *n*. However, it is also true that increasing earning profiles correspond to more highly educated workers whose working careers are inevitably shorter. The latter effect seems to predominate giving an overall negative effect of the ratio on *n*. Furthermore, this effect is increasing. Finally, the fact of being a woman means working 6.58 years less, once all the other factors under consideration have been controlled for.

Table 7

RESULTS FOR THE REGRESSION ANALYSIS FOR YEARS CONTRIBUTED

Variable	Coefficient	Std. Error	t-Statistic
C	3122.165	206.2619	15.13690
Birth year	0.065872	0.038716	1.701391
Birth year*Atypical	1.210223	0.469614	2.577058
Retirement Year	-1.607986	0.104836	-15.33817
Retirement Year*Atypical	-1.169313	0.453905	-2.576117
LOG(C03)	2.657334	0.144825	18.34855
Sex	-6.574661	0.216348	-30.38923
Unemp	-0.032032	0.003058	-10.47454
$(Unemp)^2$	0.000082	0.000009	9.089392
C/BR	-4.107929	0.364210	-11.27902
$(C/BR)^2$*Atypical	-25.43657	23.02413	-1.104779
$(C/BR)^2$	0.216068	0.033144	6.519124
R-squared	0.272088		
Adjusted R-squared	0.271083		
F-statistic	270.6259		

Source: Authors' calculations using MCVL data.

3.3. Measuring the overall impact on the Spanish Pension system

In this Section the effect of the reforms discussed above on the sustainability and redistribution of a contributory pension system is discussed. In principle, it might be thought that fostering the Bismarckian nature of the system would directly imply a reduction in the redistributive nature of the system and indirectly lead to a positive effect on sustainability. However, such conclusions are not clear in either of the two measures analysed, which show somewhat mixed effects for both dimensions.

Consider first the effect of a change to the *p(n)* scale. Here, we would expect Bismarckianism to mean full proportionality provided that we have a maximum number of years coherent with the average number of years of contribution of the average worker. Should this condition hold, a minimum eligibility requirement would act as a saving expenditure device, while all other deviations from full proportionality would benefit those with incomplete working careers, and increase expenditure. Hence the total effect on expenditure is not easy to predict. In our case we obtained a small reduction in the average pension by moving to full proportionality, but the effect could have been just the opposite.

If we focus on its redistributive effect, then the present Spanish *p(n)* scale acts in a "regressive" manner, penalising short and rewarding long working careers. This is a clear reflection of the nature of the pension system, but it also implies that a move to full proportionality would also have ambiguous effects on redistribution.

Second, it is clear from our results that the effect of extending the contributory history used in computing the *BR* is to reduce, on average, expenditure by cutting the initial replacement rate. However, interestingly, the redistributive effects of extending the computation period for the *BR* are the opposite of what we would expect. In this case, it might be thought that Bismarckianism means considering the whole contribution history. Yet, our results show that this measure affects low wage earners positively and high wage earners negatively due to the longitudinal shape of wage profiles: high wage earners usually present wage profiles that increase over their lifecycle.

In order to evaluate the impact on sustainability of the average pension cuts introduced by the reform measures analysed above, we start from the estimations developed by Moral-Arce *et al*. (2008). Those are based on a simulation model for pension expenditure, which uses the MCVL to disaggregate new pensions by age, sex and number of contribution years. In the baseline scenario, based on the macroeconomic scenarios developed by EPC (2005), they obtain an increase in pension expenditure ranging from 5.16% of 2005 GDP to 12.33% of 2050 GDP. Table 8 breaks this change down into its four main causes: the pure demographic effect measured by the dependency ratio –the ratio of population 65+ to working age population; the changes in the labour market measured by the inverse of employment rate –the product between participation and employment rate; and institutional factors summarized by the coverage ratio –share of pensioners in population 65+ – and the replacement ratio –average pensions to average labour productivity. Clearly the driving force behind the changes observed over the projection period is the pure demographic effect, which more than doubles the dependency ratio from 27.49% to 65.58%. The negative impact of this change is reinforced in the long run by an increase in the coverage rate due to the increase in female

participation, which, nevertheless, has a positive short run effect on the labour market. Finally, the replacement rate increases slightly in the initial years, but falls afterwards improving the prospects of sustainability[21].

We use this decomposition to have a tentative measure of the aggregate effect of the abovementioned reforms. Note that this will give us a maximum threshold for the effect of the reform, as we are measuring only the direct cut in pension ignoring any agent's behavioural responses. The last two columns in table 8 measure the overall impact of the two reform measures analysed. Note that they only affect expenditure through changes in the replacement ratio. As indicated in the above analysis, these measures reduced the average pension by 16.3% and 1.5% respectively. If the measures had not been introduced, the 2005 ratio of expenditure to GDP would have been 1.03% higher. More importantly, in the long term, once the retirement of the baby boomers is complete, the reforms will represent a 2.5% saving of GPD.

Table 8

MAXIMUM EFFECTS OF THE 26/1985 AND 24/1997 ACTS PENSION CUTS ON THE SUSTAINABILITY OF THE PENSION SYSTEM

	BASELINE SCENARIO					NO REFORM SCENARIO	
	D	1/(part·employm)	C	R	G/PIB	R'	G'/PIB
2005	24.49%	160.59%	64.02%	20.51%	5.16%	24.62%	6.20%
2010	25.33%	150.66%	64.41%	21.64%	5.32%	25.98%	6.38%
2015	27.55%	143.75%	65.71%	21.99%	5.72%	26.39%	6.87%
2020	29.77%	142.41%	68.04%	21.75%	6.27%	26.11%	7.53%
2025	33.16%	142.31%	71.10%	21.19%	7.11%	25.43%	8.53%
2030	38.17%	142.24%	74.57%	20.55%	8.32%	24.67%	9.99%
2035	44.65%	142.12%	77.15%	19.76%	9.67%	23.72%	11.61%
2040	52.53%	141.96%	78.93%	18.99%	11.18%	22.79%	13.42%
2045	61.08%	140.88%	79.92%	17.81%	12.25%	21.38%	14.70%
2050	65.58%	140.03%	80.38%	16.70%	12.33%	20.27%	14.86%

Source: Moral-Arce *et al*. (2008) and authors' calculations using MCVL data.

[21] As observed in Moral-Arce *et al*. (2008), the increase in replacement rate is explained by the consideration of the longitudinal earning profiles obtained from the MCVL. Interestingly, the relatively low productivity of the baby boomers has a positive short-term impact on the present replacement rate and a negative long-run impact on their own replacement rates, when this generation reaches retirement age.

4. CONCLUSIONS

This paper has undertaken an analysis of the impact of the main measures adopted in fostering the Bismarckian nature of the Spanish retirement pension system, as introduced by the 26/1985 and 24/1997 Acts. The main innovation made by our paper is the use of a Spanish micro data set extracted from the Social Security's Administrative data.

This data set allows us to analyze the effect of these measures on new registrations between 2003 and 2005. Our results show the extent to which those measures could have produced a direct reduction in pensions and, hence, the system's generosity. First, extending the contribution history used in computing the *BR* could result in a pension cut that ranging from 0.98 points a year –when shifting from the last two to the last eight years– to 1.7 points – when shifting from the last eight to the last 15 years. Our data set does not allow us to extend this measure any further, but our results indicate that a further extension beyond fifteen years would have similar or even higher effects on the initial pensions. These average changes correspond to the whole sample, while 15.4% of individuals would experience an increase in their pensions ranging from 0.88 to 1 point during the same intervals. In the latter cases it becomes apparent that this reform would allow low income earners in unstable employment situations prior to retirement to recover relatively higher contributions.

Second, a change in the weight attributed to the number of contributory years in the share of the *BR* received as a pension would only reduce average pensions by 1.5%. This reflects the fact that the specific rescaling introduced as a result of the reform would only affect a small share of pensioners –those that contributed from between 15 to 24 years. Hence, the effect of shifting from the present scale to full proportionality –as suggested in the Toledo Agreement– is negligible – unless the maximum number of year is increased. Specifically, a fully proportional rule representing 100% for 40 years, instead of the present 35, would cut average pensions by 5%.

In order to test the generality of our results, we analysed the extent to which the effect of the measures simulated was dependent on the characteristics of the pensioners. Our regression analysis showed that an increase in the past earnings included to compute the *BR* affected female workers, those making higher contributions, those who had spent less time in unemployment and those who had retired earlier most markedly. Interestingly, the effect of sex changed its sign when controlling for other characteristics.

It is worth stressing that given the special nature of the Spanish pension system, fostering Bismarckianism does not necessarily lead to a reduction in redistribution. On the one hand, with the present structure in which the scale relates the number of contributory years to the share of the *BR* received as a

pension, it is clear that a change to a proportional rule involving the elimination of the minimum contribution period might have a progressive effect. On the other hand, the results from the regression analysis we conducted indicate that an increase in the *BR* computation period does have redistributive effects. This apparent paradox is explained by the fact that high income earners have steeper income profiles during their lifecycle, which are more severely affected by the replacement rate cutting effect of this reform measure.

Overall, our results indicate that the measures introduced by the 26/1985 and 24/1997 reform Acts had a non-negligible impact on pension expenditure and that there would seem to be scope for extending them further. The impact of changes to the weight given to the number of contributory years has been limited to date –a direct pension cut of 1.5%, because they affect only a small proportion of pensioners. By contrast, the increase in the *BR* computation period has had a substantial direct impact in terms of cutting pensions –by 16.3%– independently of individual pensioner characteristics. The combined impact of applying these measures in 2005 would have been, at the most, a cut in expenditure to GDP starting from 1 point in 2005 and reaching 2.5 points in 2050.

Nevertheless more investigation is needed in order to measure the behavioural response of agents to such a pension cut. If agents react to a pension cut, delaying retirement age in order to recover some of the lost pension rights, the average pension –and hence aggregate expenditure– might be reduced by much less.

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SÍNTESIS

PRINCIPALES IMPLICACIONES DE POLÍTICA ECONÓMICA

Este artículo analiza el efecto de algunas medidas de reforma del sistema de pensiones español que tienen por objeto reforzar el grado de contributividad del mismo, es decir, el vínculo entre las contribuciones y las prestaciones recibidas. Para ello parte de una muestra extraída de una nueva base de datos –la Muestra Continua de Vidas Laborales (MCVL) del Ministerio de Trabajo e Inmigración.

Los resultados indican que las medidas analizadas –introducidas por las leyes 26/1985 and 24/1997– reducirían la pensión media de entrada de los pensionistas que se jubilaron entre 2003 y 2005 y, con ello, la generosidad del sistema, con distinta intensidad. En concreto, en primer lugar, la simulación muestra que el aumento del número de años pasados considerados para calcular la base reguladora (*BR*) de dos a quince reduciría la pensión más del 16%. Asimismo se analiza hasta qué punto los efectos de esta reforma dependen de las características de los jubilados. Si bien algunos factores resultan significativos, el valor explicativo conjunto del análisis de regresión resulta reducido.

En segundo lugar, se obtiene que un refuerzo del vínculo entre años cotizados y porcentaje de la base reguladora recibido como pensión, únicamente reduciría la pensión alrededor de un 1,5%, ya que ello afectaría, en la práctica, a un número muy reducido de pensionistas. Sin embargo, si esta medida se combinara con un aumento del número de años requerido para obtener del 100% de la base reguladora de 35 a 40, la medida tiene un efecto considerable, ya que reduce la pensión casi en un 5%.

Finalmente se obtiene una estimación del posible efecto de ese recorte en la pensión en el gasto agregado. El efecto total de ambas medidas sería una reducción del peso del gasto en pensiones en el PIB que partiría del 1,03 en 2005 y llegaría al 2,47% del PIB en 2050. Ese sería, sin embargo, el efecto máximo ya que la estimación capta únicamente el efecto directo en el recorte de la pensión de entrada. Queda pendiente investigar las posibles reacciones de los agentes a este tipo de reformas. Es de esperar que los agentes reaccionen al recorte de la pensión de entrada retrasando la edad de jubilación para recuperar parte de esa pérdida, lo cual atenuaría el efecto de estas medidas sobre el ahorro de gasto en pensiones.

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Junto al original del Papel de Trabajo se entregará también un resumen de un máximo de dos folios que contenga las principales implicaciones de política económica que se deriven de la investigación realizada.

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