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HEALTH, FINANCIAL INCENTIVES AND RETIREMENT IN SPAIN

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Abstract

We estimate the impact of health and financial incentives on the retirement transitions of older workers in Spain. Individual measures of pension wealth, peak and accrual values are constructed using labor market histories and health shocks are derived as changes in a composite health stock measure over time. We examine labour market exits into both old age retirement and a broader definition of retirement including inactivity, while controlling for unobserved heterogeneity. We find that pension wealth, accrual and peak value are significant determinants of retirement decisions, although their effect is weaker in the case of the broad definition of retirement. Initial health stock shows a significant impact on both definitions of retirement. Only large negative health shocks have a significant effect on the probability of entering the broader definition of retirement. Unlike previous literature, we find that (i) financial incentives, when measured adequately, exert a greater impact on retirement behaviour than health shocks, and (ii) initial health stock plays a more important role than health shocks in determining retirement decisions. We also perform simulations of a recently enacted reform of pension incentives and show how its expected effects compare to those of health improvements.

Keywords: Health, Retirement, Social security and public pensions, Spain
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1 Introduction

In Spain, as in most OECD countries, population aging is raising concerns about the sustainability of social security arrangements, in particular the public pension system. Despite substantial increases in longevity − life expectancy in Spain at age 65 is projected to be 83 for men and 87 for women in 2040, OECD, 2007− the average age of retirement has steadily fallen throughout the twentieth century. Lower participation rates of older men contribute to the decline of worker-pensioner ratios which, in turn, fuel concerns about the sustainability of the pay-as-you-go public pension system. The combination of retirement policies encouraging early exit from the labour market and generous health and disability insurance systems appears no longer sustainable. The average retirement age has declined from age 68 to less than 62 in the period 1950 – 1995 (Blondal and Scarpetta, 1998). In 2002, the average age of retirement in Spain was 62.5 years and only 3.7% of new retirees were older than 65 (World Population Aging, Report of United Nations). Spanish policy makers are aware of this problem and have recently approved legislation that aims to encourage employees to work beyond the existing standard retirement age, of 65 years, by increasing state pension benefits for those that opt to do so[4].

There are several factors that can potentially affect the retirement choices of older workers. These include individual health status, along with institutional factors such as the generosity of the social security systems, early retirement programs and disability schemes. Health status is likely to affect the retirement decision in several ways. First, poor health may increase the disutility of work. Second, poor health often has a negative impact on productivity, and can reduce earnings. Health also influences the individual’s remaining time horizon, since some conditions change life expectancy and the expected number of years available for work and retirement (Grossman, 1972).

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[4] Under these proposals, employees that continue working beyond the age of 65 years will have the value of their state pension benefits increased by 2% per full year of work up until the age of 70 years. However, if an employee has contributed to the pension scheme for 40 years by the time they reach the age of 65, they will receive a higher annual increase of 3% of their benefits value (*LEY 40/2007, de 4 de diciembre, de medidas en materia de Seguridad Social*).

In this paper, we investigate the influence of health shocks and economic incentives on retirement behavior of Spanish older workers (50+) by means of microeconometric models for retirement that include both measures of pension wealth and of health and health deteriorations. To our knowledge, no other study has yet considered simultaneously the effects of pension wealth and health in the transitions to retirement of Spanish workers. For our purposes, we construct public pension wealth measures for the workers in the *European Community Household Panel* (ECHP) sample of working Spaniards. This is accomplished by applying the set of pension rules to the labour market histories contained in the data set. The Spanish case is of particular interest because in the considered period (a) the take up of private pensions was marginal, and therefore pension wealth can be estimated from the labour market histories of workers by simply applying the set of rules of the pay-as-you-go public system and (b) reforms enacted in 1997 introduced additional variation in pension rules, and therefore pension wealth and c) our model can provide insights into the likely effects of a recent reform in public pensions through simulations.

As is well known, a recurrent limitation for researchers willing to include health in retirement models is the lack of a good measure of health in suitable datasets. We attempt to overcome this limitation by constructing an index of latent health that combines all the health-related information in the ECHP using multivariate methods. From this health index we are able to derive measures of health shocks. This procedure is similar in spirit to Kapteyn *et al*. (2007) who have shown that a composite health index measure is the best possible estimate of latent health and that, moreover, it has better explanatory power for retirement decisions. Our modeling of the effects of health carefully takes into account the insights from previous literature, namely the desirability of using an indicator of health that reflects more than one dimension, the need to consider the effects of the health stock and its changes and the need to take steps to address the potential endogeneity problem for health in a labour outcomes equation. We use the longitudinal nature of our dataset and exploit the timing of events to both ameliorate the problem of endogeneity of health shocks in a labour transitions equation and to model unobserved heterogeneity. We also use our model estimates to simulate the most important features of a recent reform to the Spanish pension system and improvements in the health status of older workers.

The paper is organized as follows. In section 2 we briefly review some of the recent literature on health and retirement decisions in both the US and Europe. The next section describes our data and modeling strategy of pension incentives and health index. Section 4 describes the econometric model and section 5 presents the estimation results. Finally, section 6 and the last section contain the simulation results and conclusions to be drawn from the empirical findings.

2 Health, Financial Incentives and Retirement

2.1 Relationship between Health and Retirement

Health plays a major role in retirement decisions, although there is no consensus on its relative importance with respect to financial incentives (for surveys, see e.g. Currie and Madrian (1999) and Lindeboom (2006a)). The empirical analysis of the effect of health on labor force participation is hampered by complications regarding the measurement of health status. Often a self-assessed health status (SAH) measure is available in surveys, asking respondents to rate their own health status in an ordinal scale ranging from very good to bad, but this measure has several problems (Bound, 1991; Bound *et al*., 1999).

First, reporting heterogeneity may result in a lack of comparability of SAH across individuals which generates measurement error and leads to an *under*estimation of the effect of health on labor force participation. Secondly, SAH reporting may be endogenous with respect to the participation decision, which might lead to an *over*estimation of the impact of health. Because bad health is a legitimate reason for working-age people to abstain from participation, people may justify their withdrawal from the labor market by overreporting their health problems (see *e.g.* Anderson and Burkhauser, 1985). This is referred to as the 'justification hypothesis', and it causes SAH to be linked to a person's attitude towards work or preferences for leisure, not necessarily capturing actual productive capacity. In addition, government programmes may give individuals strong incentives to underreport their true health, since being identified as disabled can be financially rewarding. As a result, the dependence of SAH on economic or environmental characteristics will bias the impact of economic variables on retirement even if one correctly measures the impact of health itself. Empirical evidence for these issues include Kerkhofs *et al.* (1995), who find evidence for state dependent reporting in SAH and show that the choice of health measure (SAH versus more objective measures) affects the estimated impact of health. Similarly, Lindeboom and Kerkhofs (2002) also find that the choice of health measure does matter and conclude that SAH is endogenous. In contrast, Dwyer and

Mitchell (1999) find little evidence of measurement error or justification bias and show that poor health is associated with earlier retirement plans. Whether these issues are empirically important is unclear, as the available evidence does not seem unequivocal.

The recent health and retirement literature has focused on the relative importance of permanent or temporary health shocks versus a gradual deterioration of health in retirement decisions. (Bound *et a*l. 1999; Disney *et al*. 2006; Roberts *et al*. 2006; Hagan *et al.* 2006). In all of these studies, the potential endogeneity problem is addressed by instrumenting SAH using more objective health indicators such as the prevalence of diseases, or functional limitations. The common finding in these studies is that changes in health play an important role in retirement decisions, with stronger effects for the inactivity route, and that adverse health shocks are an important predictor of retirement. Disney *et al*. (2006) also argue that using health shocks offers a convenient way to eliminate a potential source of endogeneity bias caused by the correlation between individual unobserved characteristics and health. This is so because health shocks are defined by differencing the data over consecutive time periods, thus eliminating unobserved individual effects. Lindeboom *et al.* (2006b) focus on the relationship between the onset of disability and employment outcomes and estimate that health shocks increase the likelihood of the onset of disability by 138 per cent. However, health shocks are relatively rare events and therefore they conclude that the majority of observed disabilities result from gradual health deterioration.

For the specific case of Spain, García-Gómez and López-Nicolas (2006) found that health shocks proxied by a persistent deterioration of self-reported overall health status cause substantial effects on the labour force status of workers below 60 in the European Community Household Panel. Jiménez Martin *et al.* (2006) studied older Spanish workers' labor force transitions following a health/disability shock using cross-section data and found that the probability of remaining in work decreases with both age and the severity of the shock, and that the probability of remaining in employment varies substantially with the type of disability.

2.2 Importance of Health versus Financial Incentives

Another strand of the empirical literature focuses on the relative importance of health versus financial incentives. Kerkhofs *et al*. (1999) investigate the effects of health and financial incentives on three alternative exit routes for the Netherlands: early retirement (ER), disability insurance (DI) and unemployment insurance (UI). In explaining transitions into DI and UI schemes, they show that health is the most important factor, while financial incentives are dominant when explaining transitions into ER schemes.

Other papers that compare the effects of financial variables and subjective health status on retirement are Bound (1991), Dwyer and Mitchell (1999) and McGarry (2004). They find that the effects of health are substantially stronger than those of financial incentives. The most well-known comparative work is the set of studies on financial incentives and retirement decisions directed by Gruber and Wise (2004), which includes recent applications for twelve countries, including Germany, U.K, Netherlands, Spain, and Italy among others. They typically find a strong effect of financial incentives on retirement choices, except for Italy and Spain. Jimenez-Martin *et al.* (2004a)[5] do not consider the effect of health on retirement, but carefully compute financial incentives from Social Security administrative records to study their impact on the probability of retirement for Spain. Surprisingly, they find no significant effects of financial incentives (measured by accrual, peak and option value) on the probability of retirement for self-employed and public sector workers.

In an overview article of mostly US studies, Lumsdaine and Mitchell (1999) conclude that the impact of financial incentives on retirement is important, but can only explain half of the observed variation in retirement rates in the US. A recent paper by Banks *et al.* (2007) presents estimates for the effects of financial incentives and specific health problems (rather than health shocks) for men and women in the U.K using two waves of the English Longitudinal Survey on Aging (ELSA). They find that the impact of pension incentives on retirement is only important for those in good health, and it is only men who are in poor health who are more likely to retire early.

The studies summarized above generally suggest that financial incentives matter a great deal in explaining retirement patterns. However, the comparability of those results is impaired by differences in samples, statistical methods and dependent variables. The estimates of the effects of health on retirement are very sensitive to the measures of health used, to the way in which the econometric procedure takes account of potential endogeneity or measurement

[5] Jimenez-Martin et al. (2004a) provide a thorough description of the functioning and historical evolution of the Spanish Social Security system, from which we draw when describing and modelling the pension arrangements.

error and whether the model can control for both health and financial incentives. We contribute to this literature by modeling the effects of both health and financial incentives on retirement, thus adding to the papers that consider these two sets of factors simultaneously.

3 Data and Modelling Approach

3.1 Data and Stock Sampling

Our data are taken from the public users files of the *European Community Household Panel (ECHP)*. The ECHP was designed and coordinated by Eurostat, the European Statistical Office and consists of a longitudinal survey based on a standardised questionnaire that involves annual interviewing of a representative panel of households and individuals 16 years and older in each EU member state. It includes respondents' demographic background, employment status, income, health status, social transfers etc. We make use of all eight waves available (1994-2001) for Spain. We have used the variable "self-defined main activity status" to construct labour market status as follows. A binary variable 'employed' indicates that the respondent is working full-time or part-time in paid employment. 'Self-employed' indicates self-employment or working in a family enterprise. Retirement status is also based on individual self-reports. A number of studies have adopted a broader measure of retirement defined as the transition from economic activity into economic inactivity (Bound *et al.* 1999; Disney *et al.* 2006; Hagan *et al*. 2006). We also use, in addition to the narrow, self-reported status, an expanded definition including retirement, being economically inactive and doing housework, but excluding those reporting themselves as unemployed. Retirement is taken as an absorbing or permanent state and any subsequent transitions back to work are ignored.

We apply the stock sample method, as proposed by Lancaster (1990), and follow all individuals who are in employment (either employed or self employed) and in the age group 50-64 in the first wave, over a period when they are at a risk of retiring. These individuals can stay in the labor force, retire or be lost to follow up. Transitions into other states as well as attrition are summarized in Table 1. The initial stock sample consists of 1449 employed individuals, 74% male, and 46.3. %, 32.9% and 20.7% in age groups 50-54, 55-59 and 60-64 respectively. The stock sample gradually reduces to 347 by the eighth wave, while the number of self-reported retired respondents increases from 42 in wave 2 to 302 in wave 8.

The main income variable used is the individual total earnings from work −employment plus self-employment *(income from work)* in the year prior to the survey. When total earnings from work are reported as zero for respondents reporting to be employed or self employed, this was mostly due to the fact that their previous year labour status was unemployed /inactive. Although the percentage of those individuals are low, we replaced total earnings from work for these cases with the average of total earnings over the years when total earnings were positive, and included a dummy to signal the use of an imputed value *(income form work-imputed)*.

Other socio-demographic variables used in the analysis include: a dummy indicating whether the individual is a house owner; educational attainment graded using the highest grade of education achieved on the 3 level ISCED scale - completed third level secondary education; completed second stage of secondary education; completed less than second stage of secondary education; quadratic function of age variable; whether children under 12 living in the household; and whether the individual is married. Names and definitions of variables in the analysis are presented in Table 2.

3.2 Modelling pension incentives for the Spanish sample of the ECHP

3.2.1 Retirement in the Option Value model

We follow the insights provided by the option Value retirement model of Stock and Wise (1990), which assumes that individuals compare the expected present value of retiring immediately (in utility terms) to the expected present value of continuing to work and holding the option of retiring in the future. Thus, for each period the individual continues working, this decision is re-evaluated. Applications of this model involve the computation of the option value variable *(*or some close counterpart) and estimating its effect on retirement. As shown by Stock and Wise in their original and subsequent work, and by Coile and Gruber (2004) and Asch *et al*. (2005), the option value is a comprehensive measure of future retirement incentives. One version of the option value model we consider in this paper is the accrual value model in which individuals compare expected utility gain of retirement in the current period with the retirement in the next period. We also consider a second measure of marginal incentives, the "peak value" model, in which individuals simply compare the total discounted income that they receive today, to the total discounted income that they would receive from retiring at all possible points in the future. In the peak value model the worker is assumed to be more forward looking than in the accrual model because more than one possible future retirement age is compared with the current one. We will compute pension wealth at the individual level and estimate a reduced form version of the retirement model with marginal incentives measured by accrual and peak value separately, while including health and other individual characteristics. Unlike crude measures such as replacement rates or income from work, pension wealth and its accrual are able to accurately reflect the impact of policy changes geared towards delaying retirement.

3.2.2 Basic institutional features of the Spanish system

Spain has a mandatory pay-as-you go public pension system run by the Social Security. For the average Spanish person, receiving a pension usually means receiving a public pension, as less than 1% percent of Spanish retirees draw more than 10% percent of their annual income from a private pension plan. In addition, the Social Security system offers unemployment benefits, disability benefits and some non-contributory benefits. We will focus on contributory public pension benefits which are *not* directly observable in the ECHP. However, we are able to construct these by exploiting information on individual labour histories, upon which we apply the set of rules governing benefits, penalizations for early retirement etc. The measures of pension wealth thus obtained will incorporate variation from several sources. First, there are several Social Security regimes, each with different rules. Secondly, there is individual variation in the length and size of contributions to the corresponding regime. Finally, in 1997, a year covered by our data set, there was a reform in pension rules that affected some of the Social Security regimes.[6] While the first two sources of variation cannot be considered strictly exogenous to retirement, the dependence of contemporaneous pension wealth on decisions taken long ago (i.e. which Social Security regime) and on the history of contributions over a relatively long period guarantee that pension wealth is predetermined. The additional variation afforded by the 1997 reform can be considered exogenous.[7]
Public contributory pensions are provided by the following programs in Spain.

1. The "General Social Security Scheme" (*Regimen General de la Seguridad Social*, or RGSS). This is the "default" regime for private sector employees but it also covers the

[6] The detailed description of this reform and changes in the rules which effects eligibility and amounts can be found in the Appendix-Part 1.
[7] See Euwals et al. (2007) for a similar application of a reform in Dutch pension rules in a model of early retirement behaviour of older workers in The Netherlands.

members of cooperative firms, the employees of most public administrations other than the central governments and all unemployed individuals complying with the minimum number of contributory years when reaching 65 and

2. The "Special Social Security Schemes" (*Regimenes Especiales de la Seguridad Social*, or RESS) covering the self-employed and professionals plus some groups of workers in certain occupations. The RESS includes five special schemes[8]. Among these, by far the most important in number of affiliates is the one for the self employed (RETA), while the others are relatively marginal.
3. The scheme for government employees (*Regimen de Clases Pasivas, or* RCP) includes public servants employed by the central government and its local branches.

In this study, we are only able to derive whether a worker belongs to the General Social Security Regime (RGSS), the Regime for the Self Employed (RETA), or the Regime for Government Employees (RCP). Workers participating in any of the other special regimes are assumed to be in the general regime. As the rules for the pension benefits do not differ substantially between the RGSS and the four special regimes other than RETA, this imputation will not generate much measurement error.

3.2.3 Calculating pension financial incentives[9]

Our basic measure of pension related financial incentives is "pension wealth", defined as the expected present value of a worker's stream of pension benefits at year t, should he retire at age h,

$$PW(h,t) = \sum_{s=h}^{100} \rho_s E_t B(s,h) \qquad (1)$$

Here, $\rho_s = \beta^{s-t}\pi_s$ with β denoting the pure time discount factor[10] and π_s the survival probability at age s, and $E_t B(s,h)$ the pension expected at age $s \geq h$ in case of retirement at age *h*. We have computed the pension wealth for each year, for each individual, and for each possible retirement age.[11]

[8] These include: (1) self-employed, *Regimen Especial de Trabajadores Autonomos* or RETA, (2) agricultural workers and small farmers, *Regimen Especial Agrario* or REA, (3) domestic workers, *Regimen Especial de Empleados de Hogar* or REEH, (4) sailors, *Regimen Especial de Trabajadores del Mar* or RETM, and (5) coal miners, *Regimen Especial de la Minerıa del Carbon* or REMC.

[9] The steps in the computation of pension wealth and incentive measures can be found in the Appendix –Part 1.

[10] This is assumed to be 0.95238 (discount rate of 5 percent)

[11] Main assumptions in the computation of pension wealth can be found in Appendix-Part 1.

Given pension wealth, we can define the two incentive variables for each worker of age "a":

1. Pension accrual (PA) is defined as the difference in PW from postponing retirement from year t to year t + 1

   $PA_t = PW_{t+1} - PW_t$ (2)

2. Peak value (PV) is the maximum difference in pension wealth between retiring at any future age and retiring at age a. Rather than taking the difference between PW today and next year, the peak value takes the difference between PW today and in the year in which the expected value of PW is maximized.

   $PV_t = max_h\{PW_h - PW_t\},\ h = t+1,...,R$ (3)

   where R is a mandatory retirement age (which does not exist in Spain, but we have assumed that R=70). This measure therefore captures the tradeoff between retiring today and working until a year with a much higher PW.

The retirement incentives for these three groups differ considerably. This is illustrated for three prototypical individuals in Figure 1 (In addition, Table 1 in the Appendix-Part 2 presents the estimates of pension incentives by age). Figure 1 presents pension wealth profiles for a man who is fifty years old in 1994 and has the following characteristics: a) Profile *pwrgss50:* affiliated to RGSS regime, has worked since age 15, earns 12000 Euros a year, receives salary increases in line with inflation, has normal retirement age at 65, but can retire at age 60 with a penalty (b) Profile *pwreta50:* affiliated to RETA regime, same characteristics as the individual in Profile *pwrgss50*, (c) Profile *pwrgcp50:* RCP regime, same characteristics as the other two profiles, but early retirement is possible at age 60 without any penalty since he has been working more than 30 years.

Before the age of 65 (age 60 for RCP), pension wealth increases because both the benefit base and replacement rate are rising (while the total number of periods that the worker receives a pension in the computation of pension wealth falls, the increase in benefit base and replacement rate is sufficient to compensate for this decrease). However, after age 65, the replacement rate is constant and although the benefit base is increasing, this does not suffice to compensate for the decrease in the remaining expected life span. Moreover, additional years of work add nothing to the expected pension amount and, as a result, pension wealth after age 65 decreases. Whether or not pension wealth increases depends on whether the rise in pension income from delaying retirement is sufficient to outweigh the fact that the pension would be received for one fewer year. In all three schemes, individuals are financially penalized for leaving prior to normal retirement age. There is typically no bonus for remaining in the scheme beyond the normal retirement age.[12]

The patterns of pension wealth for RETA and RGSS schemes are similar since the rules for these two schemes are the same. The individual who is in the RCP regime is 60 in 2004, and has worked for more that 30 years, so he can retire with full pension in 2004. As a result, his profile peaks at age of 60. Pension wealth in the RCP scheme is higher than in the private sector. This discrepancy is due to different rules applicable to civil servants. Their benefit base is higher compared to other regimes and the replacement rate increases irregularly with seniority. While the rules are the same for RETA and the RGSS, covered earnings are computed differently for these regimes. The pension wealth profile for RETA is higher than for RGSS, reflecting the fact that the legislated minimum earnings applicable to workers in the RETA in pension formulae are higher than the legislated minimum earnings for RGSS workers. This is a measure that attempts to neutralise the tendency for self employed workers to under declare their income.

In addition to the computed pension wealth and financial incentives measures, we created three dummy variables indicating when the person could start drawing pension benefits. The first dummy variable "public pension entitled after two periods" indicates that the person will not be able to draw pension benefits until at least two periods [$B(s,h)=0$ & $B(s+2,h)>0$]; "public pension entitled in next period" indicates that the respondent will be able to draw a pension from the next year [$B(s,h)=0$ & $B(s+1,h)>0$]. Finally, the dummy variable "public pension entitled this period" represents the person is able to draw benefits currently or at some point during the current year [$B(s,h)>0$].

3.3 Measuring health stock and health shocks

The relationship between observed measures of health and "true" health has been a permanent concern for researchers. For want of objective data on health, most previous studies have used

[12] Note that the recent 2007 reform that we have mentioned in the introduction is targeted precisely at this lack of incentives to extend working years to ages beyond 65.

self-assessed health or other subjective reports of health limitations. As discussed earlier, this entails obvious potential problems of accuracy, endogeneity and justification bias in retirement and labour market transition models. Most of the recent studies have attempted to deal with these problems by constructing an underlying "health stock" for each individual and tracking longitudinal changes in this measure as a proxy for individual "health shocks". (Bound *et al.* 1999, Disney *et al*. 2006, Hagan *et al.* 2006, Roberts *et al.* 2006). The latent health measures are obtained as the predicted values of SAH, using supposedly more objective self-reported health indicators related to specific medical conditions and functional limitations as predictors. This is analogous to using the health indicators as instruments to 'purge' the measurement error from the SAH variable. This, of course, implicitly assumes that (i) SAH is the true variable belonging in the labor model and that (ii) the instruments can be legitimately excluded from such equation. While these "instruments" can be argued to be more objective self-reported measures of health than the usual five category SAH ranging from excellent to very poor, it is not clear that they are valid instruments, in the sense that they cannot be argued to be entirely free from justification bias themselves or measurement error, for instance.

Our approach departs from the recognition that while some self reported variables might be more objective than others, there is no single health variable in the ECHP (or other similar surveys) that can be considered to be the true health variable belonging in a labour outcomes model. These variables can be considered indicators of true health, each capturing a different dimension of underlying unobservable health. In this sense, there is an argument for not dismissing potentially useful information by opting for one or another variable as the "right" one for the model. For this reason we use a multivariate analysis method that produces a single health indicator combining information from all the health related variables included in the ECHP. This indicator can be thought of as a proxy for true unobservable health.

In our approach, we simply assume that true health and our proxy measure are positively and close to perfectly correlated. Even if we were imperfectly proxying true health, the magnitude of the bias on the other explanatory variables in the retirement equation is smaller than if observed health were omitted. In addition, we still obtain the right sign on the effect of health (Wooldridge, 2002). Nothing prevents this proxy, of course, from being correlated with the error term in a labour transitions equation. In particular, there could be justification bias (an unobservable preference for leisure might be correlated with our index) or simultaneity bias.

Fortunately, the longitudinal nature of our dataset allows us to both address the issue of simultaneity (by using predetermined values for health) and to model unobserved fixed effects.

The choice of health indicators from the ECHP is limited to a set of self reported health measures relating to limitation in daily activities, recent illness or mental problems and the history of in-patient hospital episodes. The definitions of the five variables used in the analysis are: (i) How do you rate your health in general? (SAH) (5 categories, very good to very bad); (ii) Are you hampered in your daily activities by any physical or mental problem, illness or disability? (3 categories; severely, to some extent, no); (iii) During the past two weeks, have you had to cut down things you usually do about the house, at work or free time because of illness or injury? (Yes/No); (iv) During the past two weeks, have you had to cut down things you usually do about the house, at work or free time because of an emotional or mental problem? (Yes/no); (v) During the past 12 months, have you stayed at least one night in a hospital? (Yes/no).

Because the health indicators from health surveys are mostly measured on ordinal or binary scales, which violate the standard multivariate normality assumptions, we use *polychoric* principal components analysis (PCA).[13] The resulting index of latent health is a linear combination of the observable health-related variables. Table 3 presents the coefficients – loadings– for each of the observed variables used in the construction of our synthetic indicator–which is to be interpreted as an index of "ill health". It can be seen that the index is mostly driven by the "very poor" and "poor" categories of self-assessed health, by the "severe" and "some" categories of health limitations, by the reporting of an illness or a mental health problem, and by the reporting of an inpatient hospital episode. Most health variables contribute substantially to the constructed health index, with the highest scores for self-reported health and limitations in daily activities.

The identification of negative health shocks potentially offers a convenient way to eliminate a potential source of endogeneity bias caused by the correlation between individual-specific unobserved characteristics and health when the decision to retire may be related to"health

[13] Kolenikov and Angeles (2004) have used a Monte Carlo simulation to show that failure to control for discreteness in the variables leads to significantly inferior results in PCA. The standard PCA approach, (especially when dummy variables are constructed from ordinal variables) produces estimates of the proportion of the explained variance that are lower than those obtained using the polychoric approach.

shock" i.e. sudden sharp health deterioration (Disney *et al*., 2006). Our two measures of health shock are based on the differences between two consecutive waves in an individual's latent health index value. We created binary indicators "small health shock" for a small ill-health shock representing an increment of less than one standard deviation and "large health shock" for a large ill-health shock representing an increment of one or more standard deviations. Table 4 shows that deterioration in health is accompanied by the occurrence of both types of health shocks but their prevalence did not increase across the waves (i.e. occurring in 31.8 % of individual's in wave 2 and in 31.8 % in wave 8). [14]

4 Models and Estimation Methods

Stock samples are sometimes used to estimate models of duration, because the start of the observation period usually coincides with the start of some natural measure of time at risk. In the case of transitions to retirement, this event can be interpreted as a "failure" in the jargon of duration models. Recent examples with time discrete data include the work by Disney *et al*. (2006), Hagan *et al.* (2006), and Roberts *et al*. (2006). An advantage of the stock sampling approach with time discrete data, like ours, is that retirement decisions can be modelled as the probability that an individual reports "failure" in the next period, with time dependence captured by a series of period dummies. While we follow the modelling strategy of these papers, it should be noted that, in our case, the start of the observation period does not coincide with the start of any natural measure of time at risk. In these circumstances it is more intuitive to think of our model as a binary choice process that models transitions, rather than a duration model.

For each year, we create an indicator for transitions into retirement (and into extended retirement), where unity represents a move from working in year t to retirement in year $t+1$. The empirical estimation involves a random effects probit regression of this transition indicator on a number of independent variables including the initial value of the health index in wave 1, health shocks, financial incentives, age (in quadratic form), indicators for educational attainment and type of job, labor earnings, and other individual characteristics.We condition on the initial value of the health index to account for any other aspects of health potentially correlated with retirement and/or unobserved effects as well as health shocks to

[14] Pre and post retirement descriptive statistics can be found in Table 2 in Appendix- Part 2.

ensure that all the health variables in the retirement transition equation are predetermined. Formally, we adopt the following binary outcome panel data model for the two definitions of retirement considered in this paper.

$$\begin{aligned} & r_{it+1}{*} = \alpha_i + \lambda h_{it} + \eta s_{it} + \beta x_{it} + \varepsilon_{it} \quad i = 1,\ldots,n\ , t = 1,\ldots,T \\ & r_{it+1} = 1 \qquad \text{if } r_{it+1}{*} > 0\ , \quad \text{and } 0 \ \ \text{otherwise} \end{aligned} \qquad (4)$$

Where $r_{it+1}*$ is the latent propensity for individual *i* to report retirement in the next year, h_{it} is a vector of health components (including initial health and health shocks prior to the retirement), s_{it} is a vector of financial incentives and pension wealth, x_{it} is a vector of predictors which include socio-demographic and socio-economic characteristics and α_{i} is an individual specific, time-invariant random component. ε_{it} is a time and individual-specific error term which is assumed to be normally distributed and uncorrelated across individuals and waves and uncorrelated with *i*. ε_{it} is assumed to be strictly exogenous; that is, the x_{it}, h_{it} and s_{it} are uncorrelated with ε_{is} for all t and s. α_{i} and ε_{it} are assumed to be independent of all the explanatory variables.

This is a standard random effects probit model. A well known shortcoming of this model is the maintained assumption of no correlation between the individual effect and the explanatory variables. There are grounds to suspect that this assumption may not hold. For instance, the individual effect could be picking up a preference for leisure, and we can expect this to be correlated with reported health indicators (justification bias). We address this limitation by parameterizing the individual effect as a function of the time means of a subset of the regressors (Mundlak, 1978; Chamberlain, 1984; Wooldridge, 2002). We implement the so-called Mundlak specification by parameterizing the distribution of the individual effects as:

$$\alpha_i = \bar{x}_i + u_i \qquad u_i \sim N(0,\sigma^2) \qquad (5)$$

where $\bar{x}_i$ is the within individual mean or a combination of leads and lags of the regressors (health and income were chosen after sensitivity checks). In terms of implementation, this simply has the effect of adding time means or lags and leads to the set of explanatory variables. u_i is assumed to be distributed $N(0,\sigma^2)$ independent of the x variables and the idiosyncratic error term ε_{it}. Substituting equation (5) into equation (4) gives a model that maintains a random effects structure, in the sense that the composite error term is the sum of an individual time-invariant term (u_i) plus a pure white noise term (ε_{it}), but where the maintained assumption of independence between the former and the regressors is more reasonable.

5 Estimation Results

Tables 5 and 6 present the coefficient estimates for the standard random effects probit models and for the Mundlak specification for the accrual model. (Table 3 and 4 in Appendix 2 present the corresponding results for the peak value model). We present results separately for both definitions of retirement and for both the coefficients and marginal effects of the probit models. Marginal effects of the dummy variables are calculated as the discrete change in retirement as the dummy variable changes from 0 to 1. The models were estimated by maximum likelihood using Gauss–Hermite quadrature with 12 evaluation points.

We focus on the accrual model in interpreting the results, since the peak value model yields very similar estimates. The initial level of ill health has a positive and significant effect on the probability of retirement in both models. As expected, the marginal effect is larger for the extended definition of retirement, including inactivity, which may be due to work disability. The health shocks effects also differ between the two definitions of retirement. While a small health shock is associated with an increase in the probability of retirement, a large health shock does not show any significant effect on retirement. In the extended definition of retirement, however, the occurrence of a large health shock increases the probability of retiring by 6 percentage points. The results consistently show a larger health effect in the extended retirement models, especially for the large health shocks.

The effects of pension wealth and financial incentives also differ between the two definitions of retirement. First of all, both specifications of the model yield a clear positive wealth effect (except for the peak value model). In the retirement model the effect of pension wealth is significantly positive, whereas for the extended retirement it has the expected sign, but is not significant. So, greater expected pension wealth does induce workers to retire at a younger age. Both models show a clear "price" effect as well. The parameters for the accrual value and peak value are significantly negative, which is consistent with theory. A financial reward to delaying retirement, in the form of a higher benefit level, does induce Spanish workers to continue working longer.

The two variables indicating the time of entitlement to a public pension are significant in the retirement model, but not in the extended retirement model. These results confirm that, even when controlling for pension wealth, people closer to the age of being able to obtain pension benefits are more likely to retire than those who will not be able to draw such benefits for at least two more years. This raises some interesting questions about the potential presence of liquidity constraints (or illiquidity aversion at the very least).

Higher income from work reduces the likelihood of both types of retirement, but not significantly so. This is consistent with the idea expressed in Jimenez-Martin *et al*. (2004a) about the bias of the Spanish Social security system toward forcing out low-wage earners. They argue that while the Spanish system does not pay a particularly generous average pension relative to GDP per-capita, its generosity concentrates on providing minimum pensions to individuals with below average working histories and/or low wages. Interestingly, the dummy representing zero reported income in the previous period has a significant and positive effect on retirement for both definitions. This may imply that those with zero income in the previous period were already in a sort of pre-retirement transition.

For the effects of the other covariates, there are some notable differences between the two definitions of retirement. The quadratic function of age we use shows that the rise in the probability of retirement increases with age[15], for both measures of retirement. Our only measure of non-pension wealth used in the analyses, house ownership, has a positive effect, which is significant for the probability of retirement, but insignificant for expanded retirement. Men are significantly less likely to move into inactivity in the labor market. In contrast, having completed the third level of secondary education is associated with a significant decrease in the probability of retirement in comparison to having only completed the first stage of secondary education, but a smaller decrease in the expanded definition models.

[15] We have tried a cubic polynomial in age in some specifications and the cubed term was not significant.

Labor status dummies also show significant effects on both definitions of retirement. The self-employed are less likely to retire, ceteris paribus, whereas unemployed are more likely to retire in comparison to those employed in the private sector, while the dummy for public sector individuals is not significant in either of the models. The remaining covariates were all insignificant and consistently so within and across the two classes of retirement models.

Table 6 presents the coefficient estimates for the Mundlak specification for the accrual model. The random effects models are now augmented to allow for individual effects that are modeled as linear functions of the within individual means of the health and income status in all periods (in particular income from work, imputed income from work and large and small health shocks). The augmented Mundlak specification of the random effects model does not change the log-likelihood substantially. However, approximately 41% of the latent error variance is attributable to unobserved heterogeneity (as measured by the intra-class correlation coefficient) in the random effects probit model with accrual (with self-report retirement) and this ratio falls to 39 % in the Mundlak specification. This implies that the remaining individual effect in the Mundlak specification (u) has a smaller weight in the composite error term. While this is not proof that u is not correlated with the regressors, it lends support to our choice of parameterization for the original individual effect (α). In this specification, health shock variables themselves are not significant, but note that the within individual means of both small and large health shocks are significant determinants of retirement. In the expanded retirement, both current large health shocks and their time averages are significant. The effects of the within-individual averaged means of health shock are larger than the effects of the health shocks. Thus, there are health aspects affecting retirement that are not properly captured by our measures of health stock and health shocks, but they are nevertheless proxied by the health components in the Mundlak parameterization of individual heterogeneity. In particular, to the extent that these components reflect long term or “permanent” health status, our results would suggest that transitory variations in health are not significant explanations of old age retirement once “permanent” health status is controlled for. In contrast, both transitory variations in health and “permanent” health explain transitions into our broader definition of retirement including inactivity.

In the Mundlak specification the dummy for individuals with zero income in the previous period and its time average are significant. In contrast, the level of income from work and its’ within individual time average remain not significant. Considering current income as a measure of transitory income and its time average as a measure of long-term or 'permanent' income (see e.g. Contoyannis *et al*., 2004; Frijters *et al*., 2003 who adopt this interpretation), we find that neither transitory nor "permanent" income are significant explanations for retirement.

Table 7 reports the elasticities of health stock, health shocks and financial incentives for the accrual and peak value model for the two definitions of retirement. Elasticities give us the approximate change in retirement probabilities when the variable of interest increases by 1 percent. One percentage increase in initial bad health stock increases the probability of retirement (extended retirement) by 0.40 percent (0.48 percent) in the accrual value model, holding else all constant. One percent increase in pension wealth increases the probability of retirement by 0.97% percent whereas a percentage increase in accrual decreases the probability of retirement by 0.46 %. The elasticities of pension wealth and financial incentives are larger in the narrow than in the extended retirement model. The interpretations of the elasticities on the peak value model are similar to the accrual model elasticities.

6 Simulations: the 2007 reform vis-à-vis health improvements

Our empirical models allow us to generate evidence on the likely effects of a recent policy reform in Spain, and to compare the latter with the effects of some hypothetical change in the distribution of health in the population. As in many economies, pension rules in Spain penalize –in the actuarial sense- delaying retirement beyond 65. In 2007 the Spanish Parliament approved a Social Security reform aimed at easing such penalization and therefore encourages the extension of working lives beyond 65 years. With the new rules, employees who continue working beyond 65 will have their state pension benefits increased by 2% per full year of work up until the age of 70. For workers with 40 or more years of contributions, the bonus is 3%.

Our data set only covers the period 1994-2001. Therefore we can not use a sample dated 2007 for the simulations. In this sense, our results are to be interpreted as the following counterfactual: what would have happened if these new rules had already been enacted in 2001? While these effects may bear little or no resemblance to the effects of the actual reform –due to both changes in the composition of the working force between these dates and different macroeconomic stances- they still provide a useful gauge of the importance of financial incentives and their relative impact vis-à-vis changes in health.

We consider two simulated scenarios. In the first, we consider the pension reforms exclusively. The new rules alter workers' pension wealth, and therefore, the sequence of accrual and peak value measures after the reform. The expected effect of these changes is a drop in the probability of retirement for the affected workers. In our second scenario, we consider a reduction in the prevalence of reported illness and limitations in daily activities for those older than 55. In particular we use a hypothetical scenario where there are no reports of illness or limitations. This amounts to driving down the prevalence of these events from 6.5 % and 9.6 %, respectively, to zero. These hypothetical health improvements are then mapped into new values for the health index, resulting in a reduction of 1.23 standard deviations in mean ill health and a reduction of the incidence of health shocks of 11%.

Figures 2 - 4 present the results for these simulations in terms of changes in the age specific mean probabilities of retirement for scenarios. All figures also plot the baseline scenario for comparison. It is useful to show the effect of the pension reform with both the accrual model and the peak value model, because the former can only pick up changes in accrual after 65 and therefore it restricts the changes in the likelihood of retirement to ages 65 or over. By contrast, the peak value model is able to reflect changes in the likelihood of retirement at ages earlier than 65. Nonetheless, the simulated effects of this reform are very small with both models. These results are in line with the previous theoretical evaluations of reforms for the Spanish system by Jimenez Martin *et al.* (2004b).

Figure 4 presents the simulation results for the health improvements scenario using the peak value model and the comparison of reform effects with the health improvement effects. These simulated health improvements reduce the average retirement probabilities, particularly between ages 60 and 65 (the early retirement period). For instance, at age 63, there is a reduction in the likelihood of retirement of 5.5% (absolute drop). This is 3.3% greater than the change induced by the pension reform. The mean of aggregate average transition probabilities for the 60-65 age group are reduced by 2.2% in scenario 1 (pension reform) and by 3.6 % in scenario 2 (health improvements).[16] Of course, these figures are not directly comparable in the

[16] Kapteyn and Andreyeva (2008) examine effects of health and replacement rates on the labour force participation in U.S and Europe using SHARE data pooled across countries. For Spain they find that increasing

sense that there is no straightforward policy lever that would achieve a health improvement of the magnitude that we have simulated. Nevertheless, these results are useful in that they highlight an important point: marginal changes to the incentives in pension systems might achieve very little in terms of keeping older workers at work. Notwithstanding the possibility that a gradual rolling out of consecutive marginal changes generates substantial effects, our results suggest that there are possibilities for health policies to contribute to the target of keeping older workers active for longer.

7 Conclusion and discussion

In this paper we examined the role played by health and public pensions in the retirement decisions of Spanish workers. This is accomplished by using panel data from the Spanish sample in the ECHP to model transitions into retirement —both old age and an extended definition including inactivity— as a function of measures of health stock, health shocks and financial incentives as measured by pension wealth, accrual and peak value. As neither health stocks and shocks, nor pension wealth are directly observable in the ECHP data, these are estimated by i) exploiting labour market histories in the ECHP and detailed information on the Spanish public pension to construct pension entitlements and ii) combining all the available variables reflecting different aspects of health into a single index of health status and deriving measures of health shocks thereof.

We find that the initial health stock explains transitions into both definitions of retirement, and that large health shocks explain transitions into the extended definition of retirement. Our results confirm a greater magnitude of the effect of health shocks, especially large shocks, when the expanded definition of retirement is used. A difference in the effects of health shocks for these two definitions is not unexpected, as the disability benefit programs offer an alternative route to early retirement.

In accordance with the general findings in Gruber and Wise (2004), our results also confirm the significance of financial incentives for the timing of retirement decisions. These effects

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the early and normal retirement age by 2 years had the same effect as assuming that no one is in fair or poor health: both simulations increase the probability of labor force participation by 4.5 % for 60-64 year olds. Note however that this result is not directly comparable to our study since they used average national replacement rates, not individual measures of financial incentives.

have the expected sign: when employees become eligible for drawing pension benefits, their retirement probability increases considerably. Pension wealth explains old age retirement, but does not have a significant effect extended retirement. Insofar as the effect of pension wealth –the discounted present value of future pension benefits up to living expectancy- measures can be interpreted as an income effect, this is consistent with the idea that leisure is a normal good. Pension accrual (peak value) are sometimes interpreted as “price effects”, as they reflect the relative cost, in terms of pension wealth, of not delaying retirement by one year (any time into the future), and our estimates show a significant effect in the expected direction for both of these measures of pension incentives.

Our results can be compared with previous findings in Disney *et al.* (2006) or Hagan *et al*. (2006) since they also examined the effects of health shocks, albeit without controlling for financial measures other than total personal income. For instance, Hagan *et al.* (2006) found that for Spanish workers the hazard ratios for medium health shocks differed by 21% between the two definitions of retirement. This was the largest difference of all countries examined, and our findings are consistent with this result. Our findings are also in line with the results in Banks *et al.* (2007), who show that both pension wealth and its accrual are important determinants of transitions into retirement in the UK, while poor health only affects movements out of work into other types of inactivity. In contrast with Disney *et al*. (2006) who showed that the lagged health stock, as well as current health shocks, affects labour transitions, we find that the initial health stock affects both old age retirement and extended retirement including inactivity, but health shocks are more important explanations of transitions into inactivity.

Our findings also go beyond earlier work by explicitly modeling unobserved heterogeneity using a Mundlak-type parameterization for individual fixed effects. The estimates for these model specifications suggest that transitory variations in health are not significant explanations of old age retirement once “permanent” health status is controlled for. In contrast, both transitory variations in health and “permanent” health explain transitions into our broader definition of retirement including inactivity.

Finally, our results have interesting implications for the recent reforms of public pensions in Spain, where measures aimed at reducing early retirement were enacted in 2007. These operate through increases in the pension accrual after age 65. Our estimates for the elasticity of the likelihood of retirement with respect to pension accrual are around -0.4. This means that retirement is quite inelastic with respect to the accrual of pension wealth, and that it would take more than proportional increases (by an order of magnitude of 2) in accrual to reduce the probability of retirement, *ceteris paribus*, by any desired percentage. This raises doubts about the success to be expected of the recently enacted reform. The results from the simulations of this reform suggest that the changes in the economic incentives caused by this reform have very little impact on retirement behavior.

To sum up, our results confirm that the health of older workers is a relevant factor in the decision to leave the labor market and enter either retirement or inactivity. This suggests that a potentially fruitful avenue for delaying retirement decisions would be to minimize the direct costs of working for individuals with some health deterioration. Technological advances that offer the possibility to work flexible hours and/or work from home should be exploited to their maximum potential in this sense. There is, finally, a positive message for the sustainability of the public pension system coming from the estimated effect of ill health. At face value our results suggest that a better health level does, *ceteris paribus*, reduce the likelihood of retirement as illustrated by the simulation exercise of the health improvement for older workers. If technological progress and rising living conditions are to improve the average level of health, we should, *ceteris paribus* again, expect a reduction in the odds of retirement at any age. Of course, these gains –as far as sustainability is concerned- may be countered by other factors. An increase in the value of leisure, perhaps induced by higher levels of income, could well have larger effects than the likely effect of health improvement. We leave these issues for the future research agenda.

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Table 1: Labor market status by wave in stock sample

Wave	Employed	Self-employed	Retired	Unemployed	Inactive	Housework	Attrition	Total
1	937	512						1449
2	663	359	42	49	58	33	245	1204
3	544	310	121	71	46	36	321	1128
4	447	251	154	61	62	43	431	1018
5	352	225	201	53	62	40	516	933
6	288	200	233	38	82	41	567	882
7	240	183	262	24	74	41	625	824
8	197	150	302	20	90	35	655	794

Note: Verbeek and Nijman (1992) tests for attrition bias did not reject the null hypothesis of no attrition bias. Results can be obtained upon request.

Table 2: Variable labels and definitions

Variable	Description
Retired	=1 if individual reports to be retired,0 o.w.
Ext-Retired	=1 if individual reports to be retired or inactive doing housework,0 o.w
Ageminus50	Age variable minus 50
Ageminus50 squared	Square of age variable minus 50
Married	=1 if married, 0 o.w
Male	=1 if male, 0 o.w
High Education	=1 if completed third level of secondary education, 0 o.w
Middle Education	=1 if completed second stage of secondary education, 0 o.w
Low Education	=1 if less than second stage of secondary education, 0 o.w
House Owner	=1 if respondent owns a house with/without mortgage, 0 o.w
Has Children	=1 if there are children under 12 in the household, 0 o.w
Initial Ill Health Stock	Initial value of the health index in wave 1
Small Heath Shock	Small acute health shock, binary dummy=1 if individual has <1 standard deviation increment in health index value between waves,0 o.w
Large Health Shock	Large acute health shock, binary dummy=1 if individual has >=1 standard deviation increment in health index value between waves,0 o.w
Pension Wealth	Pension wealth computed (ten thousands of Euros)
Accrual Value	Accrual Value
Peak Value	Peak Value
Income from Work	Personal net income from work (net wage and salary earnings+ self employment income)
Income from Work-imputed	Dummy signalling that we have used an imputed value for the corresponding individual
Public pension entitled two periods later	Dummy signalling B(s,h)==0 & B(s+2,h)>0
Public pension entitled next period	Dummy signalling B(s,h)==0 & B(s+1,h)>0
Public pension entitled this period	Dummy signalling B(s,h)>0
Public sector employee	=1 if respondent's sector of employment is a civil servant, 0 o.w
Private Sector employee	=1 if respondent's sector of employment is within the private sector, 0o.w
Self-employed	=1 if respondent is self-employed, 0 o.w
Housework	=1 if respondent is in housework category, o.w
Unemployed	=1 if respondent is unemployed , o.w
Inactive	=1 if respondent is inactive, o.w

Table 3: Result of polychoric principal component analysis

Factor	Eigenvalue	Proportion of Variance Explained
Health	**3.003197**	**0.600639**
	FACT0R LOADINGS	
	Variable	**Size**
	SAH	
	1.Very Bad	1.285003
	2.Bad	0.800464
	3.Fair	0.352537
	4.Good	-0.18942
	5.Very Good	-0.84097
	Illness	
	0.No	-0.09376
	1.Yes	0.787659
	Mental prob.	
	0.No	-0.02009
	1.Yes	0.922086
	Inpatient	
	0.No	-0.05995
	1.Yes	0.640787
	Limitation	
	1.Severe	1.087229
	2.Some	0.676073
	3.None	-0.14628

Table 4: Occurrence of small and large health shocks per wave

		Health Shocks (decrements)		
	better or equal health	Somewhat lower latent health	much lower latent health	Total
Wave				
2	792 (68.15)	247 (21.25)	123 (10.58)	1162
3	699 (69.69)	225 (22.43)	79 (7.87)	1003
4	558 (66.34)	205 (24.37)	78 (9.27)	841
5	507 (71.20)	137 (19.24)	68 (9.55)	712
6	417 (67.14)	144 (23.18)	60 (9.66)	621
7	365 (68.22)	118 (22.05)	52 (9.71)	535
8	306 (68.15)	92 (20.48)	51 (11.35)	449

Notes: Number of health changes & % of total are reported.

Table 5: Random effects probit -Accrual value model

	Self Reported Retirement			Extended Definition of Retirement		
	Coef.	**S.E.**	**Marginal Effects**	**Coef.**	**S.E.**	**Marginal Effects**
Initial ill-health stock	0.1320**	0.0535	0.0028	0.2247**	0.0462	0.0212
Small health shock (increase)	0.2072**	0.0965	0.0051	0.0640	0.0867	0.0063
Large health shock (increase)	0.1653	0.1291	0.0041	0.4586**	0.0960	0.0586
Income from work	-0.0095	0.0081	-0.0002	-0.0079	0.0061	-0.0007
Income from work imputed	0.2575**	0.1261	0.0068	0.3345**	0.1226	0.0401
Pension wealth	0.0212**	0.0088	0.0004	0.0061	0.0067	0.0006
Accrual value	-0.1499**	0.0547	-0.0032	-0.1147**	0.0422	-0.0108
High education	-0.5437**	0.2032	-0.0078	-0.3120**	0.1486	-0.0250
Middle education	-0.0068	0.1764	-0.0001	-0.1724	0.1421	-0.0145
Male	0.2326	0.1409	0.0044	-0.2738**	0.1052	-0.0295
Age minus 50	-0.0130	0.0735	-0.0003	-0.0569	0.0440	-0.0054
Age minus 50 squared	0.0153**	0.0041	0.0003	0.0136**	0.0027	0.0013
House owner	0.3992**	0.1918	0.0058	0.2257	0.1370	0.0183
Has children	0.2618	0.1989	0.0073	-0.1263	0.1663	-0.0109
Public pension entitled next period	0.6207**	0.1551	0.0234	-0.0729	0.1208	-0.0066
Public pension entitled this period	0.3998**	0.1894	0.0105	-0.0959	0.1451	-0.0088
Public sector employee	-0.3019	0.1727	-0.0051	-0.1673	0.1359	-0.0145
Self-employed	-0.6582**	0.1429	-0.0112	-0.4147**	0.1035	-0.0357
Unemployed	0.5162**	0.1664	0.0193	0.7248**	0.1402	0.1145
Housework	-0.9530**	0.2909	-0.0081			
Married	-0.0117	0.1451	-0.0002	0.1065	0.1141	0.0095
Number of Observations (NT)		4886			4221	
Log-Likelihood		-884.87101			-1077.8051	
Intra-class coeff.		0.4164598			0.2628528	

Notes: ** $p<0.05$. Marginal effects are calculated at mean values.

Table 6: Mundlak specification-Accrual value Model

	Self Reported Retirement			Extended Definition of Retirement		
	Coef.	**S.E.**	**Marginal effects**	**Coef.**	**S.E.**	**Marginal Effects**
Initial ill-health stock	0.1856**	0.0565	0.0038	0.2272**	0.0467	0.0216
Small health shock (increase)	0.1105	0.1061	0.0024	0.0264	0.0959	0.0025
Large health shock (increase)	-0.0774	0.1529	0.0014	0.2413**	0.1148	0.0269
Mean large health shock	0.6165**	0.2683	0.0127	0.2346	0.2208	0.0223
Mean small health shock	1.0657**	0.3181	0.0221	0.8143**	0.2327	0.0774
Income from work	-0.0019	0.0106	-0.0000	-0.0052	0.0082	-0.0005
Income from work imputed	0.6017**	0.1556	0.0216	0.3829**	0.1429	0.0477
Mean income from work	-0.0162	0.0156	-0.0003	-0.0042	0.0102	-0.0004
Mean income from work imputed	-1.3972**	0.3539	-0.0289	-0.1662	0.2977	-0.0158
Pension wealth	0.0222**	0.0093	0.0004	0.0073	0.0070	0.0007
Accrual value	-0.1472**	0.0536	-0.0030	-0.1132**	0.0417	-0.0107
High education	-0.4214**	0.1983	-0.0064	-0.2502	0.1481	-0.0208
Middle education	0.0180	0.1747	0.0003	-0.1510	0.1411	-0.0129
Male	0.1791	0.1395	0.0033	-0.2600**	0.1046	-0.0279
Age minus 50	-0.0147	0.0734	-0.0003	-0.0547	0.0440	-0.0052
Age minus 50 squared	0.0153**	0.0040	0.0003	0.0133**	0.0027	0.0012
House owner	0.3759**	0.1881	0.0054	0.2050	0.1356	0.0169
Has children	0.2775	0.1969	0.0077	-0.1292	0.1655	-0.0111
Public pension entitled next period	0.5622**	0.1537	0.0196	-0.0895	0.1212	-0.0080
Public pension entitled this period	0.3511	0.1873	0.0088	-0.0851	0.1445	-0.0078
Public sector employee	-0.3526**	0.1729	-0.0056	-0.1816	0.1360	-0.0157
Self-employed	-0.5707**	0.1386	-0.0097	-0.3910**	0.1056	-0.0340
Unemployed	0.5829**	0.1681	0.0230	0.7202**	0.1410	0.1139
Housework	-0.7771**	0.2887	-0.0074			
Married	0.0468	0.1441	0.0009	0.1041	0.1131	0.0093
Number of Observations (NT)		4886			4221	
Log-Likelihood		-868.601			-1071.3063	
Intra-class coeff.		0.392947			0.2492938	

Notes: ** p<0.05. Marginal effects are calculated at mean values.

Table 7: Retirement elasticities of financial incentives and initial health stock and partial effects of health shocks

Random effects probit - Accrual value model

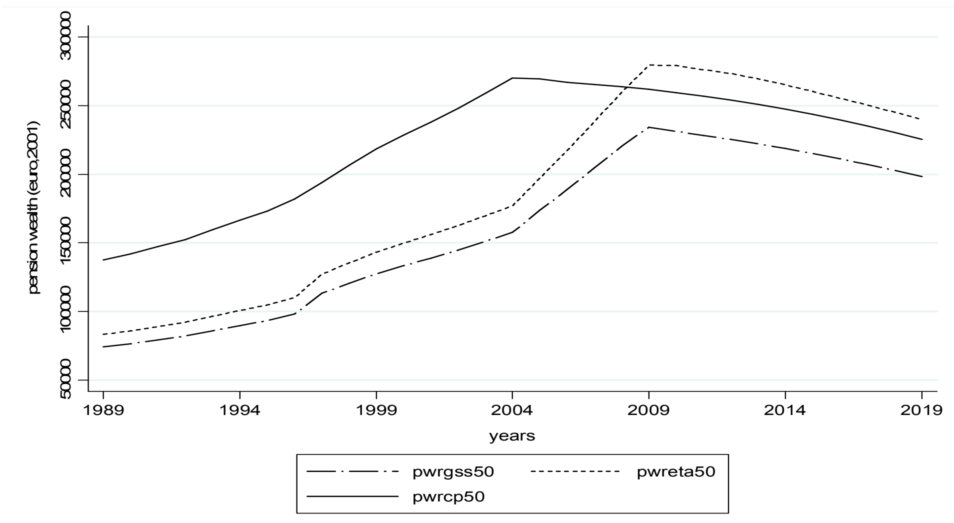
	Retirement		Extended Retirement	
	Elasticity	**S.E**	**Elasticity**	**S.E**
Initial ill-health stock	0.401**	0.171	0.482**	0.105
Small health shock (increase) *	0.005	0.003	0.006	0.009
Large health shock (increase) *	0.004	0.004	0.059**	0.016
Pension wealth	0.971**	0.427	0.223	0.248
Accrual value	-0.468**	0.185	-0.290**	0.109

Random effects probit - Peak value model

	Retirement		Extended Retirement	
	Elasticity	**S.E**	**Elasticity**	**S.E**
Initial ill-health stock	0.333**	0.152	0.411**	0.098
Small health shock (increase) *	0.006	0.004	0.006	0.009
Large health shock (increase) *	0.005	0.005	0.056**	0.016
Pension wealth	0.565**	0.395	-0.229	0.245
Peak value	-0.773**	0.346	-0.865**	0.200

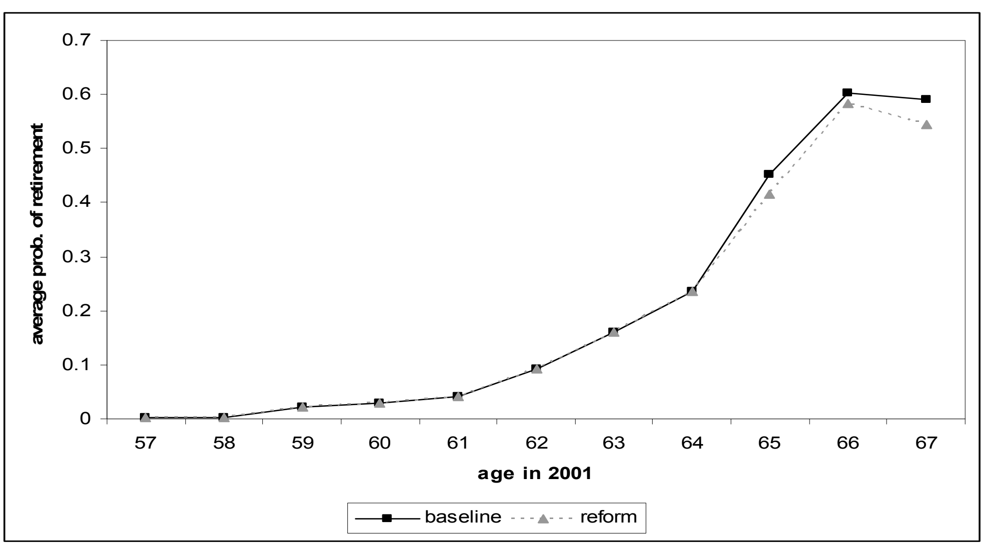
Notes: Elasticities reported at sample means. *For health shocks, the partial effects at the mean are reported.** Significant at 5 % level.

Figure 1: Pension wealth for stylized example, by pension scheme in 2001 euro[17]



Notes: *pwrgss50* -Pension Wealth Profile for an individual that belongs to the RGSS regime. *pwreta50* - Pension Wealth Profile for an individual that belongs to the RETA regime. *pwrcp50* - Pension Wealth Profile for an individual that belongs to the RCP regime.

Figure 2: Simulation of 2007 reform -Accrual value model



[17] Detailed descriptives of the pension wealth and incentive measures can be found in the Table 1 Appendix Part 2.

Figure 3: Simulation of 2007 reform -Peak Value Model

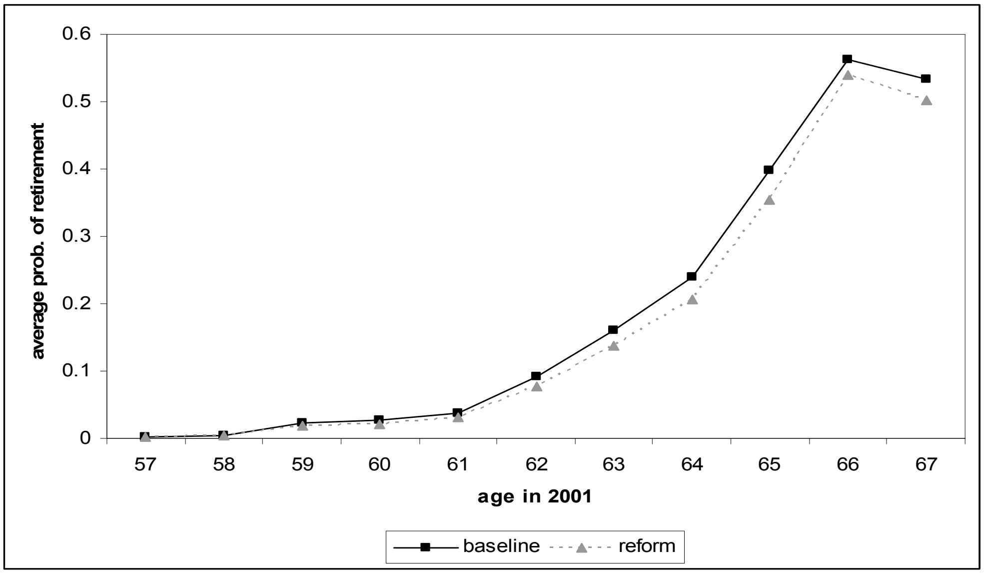
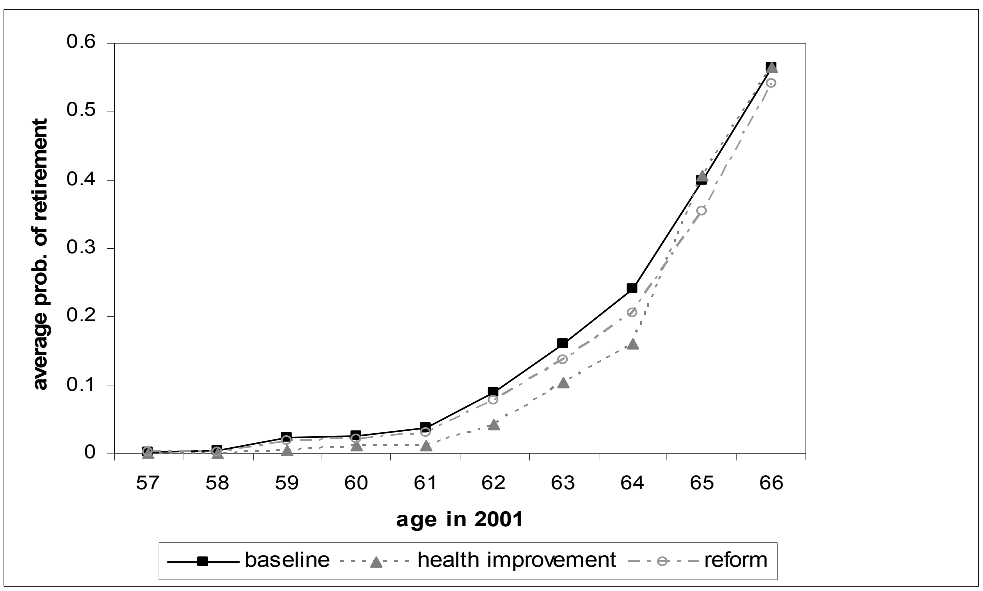


Figure 4: Comparison of 2007 reform effect with improvements in health status (Peak value model)



APPENDIX 1: COMPUTING PENSION WEALTH

Rules of the RGSS (General Social Security Regime)

The RGGS is a pure pay-as-you-go scheme. Contributions are a fixed proportion of covered earnings, defined as total earnings, excluding payments for overtime work, between a floor and a ceiling that vary by broadly defined professional categories. Entitlement to an old-age pension requires at least 15 years of contributions. As a general rule, recipiency is conditional on having reached age 65 and is incompatible with income from any kind of employment requiring affiliation to the Social Security system. Unless there are collective arrangements which prescribe mandatory retirement, individuals may continue working after age 65.

Computation of Pensions

In the computation of the pension benefits, we were somewhat constrained by the information available in the ECHP data (cf below). This forced us to make the following simplifying assumptions: (i) As data set covers private sector employees, self-employed workers and government employees, we simply assume that agricultural and domestic workers, sailors and coal miners also belong to the RGSS regime since the numbers of those individuals in these occupations are small in our sample. (ii) We only observe for each individual the age of the entry into the labor market and assume a continuous uninterrupted working career thereafter and compute seniority as the difference between age and the age of entry in to the labor market (this may be a strong assumption for females in our sample, but because of the minimum pension rules in Spain, for those who have interrupted career this assumption should not generate measurement error) (iii) we assume that the individual's occupational status (whether private sector, self-employed or civil servant) does not change over time and remains as it is in year 1994; (iv) we observe the actual earnings from employment and self-employment in the ECHP. Contributions are a fixed proportion of "Covered earnings", excluding payments from overtime work, between a floor and a ceiling that vary by broadly defined professional categories. Thus, covered earnings are computed by using the actual earnings (v) we only compute the retirement benefits in this study (not disability or unemployment)

Earnings Projections

For the RGSS, first we divide the individuals into two groups: high skilled versus semi and non-skilled based on the variable "Occupation in current job" in the ECHP. High skilled individuals belong to the following occupations: Legislators, senior officials, Corporate managers, Managers of small enterprises, Physical, mathematical and engineering science professionals, Life science and health professionals ,Teaching professionals , Other professionals, Physical and engineering science professionals ,Life science and health associate professionals, Teaching associate professionals ,Other associate professionals. Semi and non skilled individuals are: Office clerks and Customer services clerks, Personal and protective services workers, Models, salespersons and demonstrators, Skilled agricultural and fishery workers, Extraction and building trades workers and Other craft and related trades workers, Metal, machinery and related trades workers and Precision, handicraft, printing and related trades workers, Stationary-plant and related operators and Drivers and mobile-plant operators, Machine operators and assemblers, Sales and services elementary occupations, Agricultural, fishery and related laborers, Laborers in mining, construction, manufacturing and transport.

The specification of the model for earnings projection represents an essential step in the estimation of pension wealth at the individual level. For the backwards projection of earnings (earnings before the year 1994), we have used the following formula by assuming that individual earnings grow at the annual average growth rate of aggregate earnings until 1994 (Spanish National Institute of Statistics).

$$Earn_{t-1} = Earn_t*(1 - Rate\ \ of\ \ Earnings\ \ Growth_t) \qquad (1)$$

Similarly, we projected (expected) earnings forward (i.e. after 2001) as follows:

$$Earn_{t+1} = Earn_t*(1 + \Delta CPI_{t+1}) \qquad (2)$$

We have assumed zero real earnings growth (i.e. earnings growth equal to CPI growth) in the forward projection of earnings.

Covered Earnings:

Covered earnings are defined as actual earnings only if they lie within a legally specified interval. In other words, if actual earnings exceed (or fall below) the specified intervals, then covered earnings are set equal to the upper (lower) value of the interval. The legal intervals vary by year and professional category. We have used the following floor and ceiling categories in the computation of covered earnings: (i) Minimum earnings for the RGSS; (ii) minimum earnings for self-employed (RETA) differentiated for individuals younger and older than 51; (iii) maximum earnings for two categories in RGSS, high skilled versus semi and non skilled workers; actual earnings are replaced by the legal limits, if they are higher or lower. By this way, we obtain an estimate of the covered earnings of each individual, in each regime.

Benefit Computation

In order to compute the yearly pension for our sample, we have to define the benefit base *(base reguladora)* in the first step. Benefit base BR_t is a weighted average of covered yearly earnings over a reference period that consists of the last 8 years before retirement;

$$BR_t = 0.125[\sum_{j=1}^{2} W_{t-j}] + 0.125[\sum_{j=3}^{8} W_{t-j}\ \ (I_{t-2} / I_{t-j})] \qquad (3)$$

where W_{t-j} and I_{t-j} are earnings and the consumer price index in the j-th year before retirement.

If the eligibility conditions are met, the individual who retires at age 65 receives the initial yearly pension P_t : $P_t = \alpha_n BR_t$, where α_n is the replacement rate. It depends on the number of years of contribution "*n" and* on the age of the retirees and equals :

$$\alpha_n = \begin{Bmatrix} 0, & if\ n < 15, \\ 0.6 + 0.02(n-15), & if\ 15 < n < 35, \\ 1, & if\ n > 35 \end{Bmatrix}, \qquad (4)$$

for age equal or larger than 65 until 1997.As of 1997, a pension reform was implemented as follows. From 1997 onwards, the number of reference years was increased by one every year until 2001, to reach a total of 15 years. Moreover, the replacement rate rules were changed to the following:

$$\alpha_n = \begin{Bmatrix} 0, & if\ n < 15, \\ 0.5 + 0.03(n-15), & if\ 15 < n < 25, \\ 0.8 + 0.02(n-25), & if\ 25 < n < 35, \\ 1, & if\ n > 35 \end{Bmatrix} \qquad (5)$$

Early retirement

The normal retirement age in Spain is 65, but early retirement at the age of 60 is permitted as a general rule for individuals that became affiliated to the Social Security System before 1967. However, a financial penalty is incurred by those who retire early between the age of 60 and 65; the replacement rate is reduced by 8 percentage points for each year under age 65. This means that the replacement rate rules for early retirees are as follows depending on age and the year which the individual started working:

$$\alpha_n = \begin{cases} 0, & \text{if } age < 60, \\ 0, & \text{if } 60 \leq age < 65 \text{ and start working after } 1967 \\ 1 - 0.08(age - 60), & \text{if } 60 \leq age < 65 \text{ and start working before } 1967 \\ 1, & \text{if } age \geq 65 \end{cases} \quad (6)$$

As of 1997, workers who retire after the age of 60 with forty or more contributive years are charged a penalty of only 7 percent for each year under age 65.We have made the following assumption in the computation of incentives before the age of 60. When a person stops working between 55 and 59, his/her pension is computed considering earnings until that age, even if he/she starts receiving the pension at age 60.

Regime for Government Employees (RCP)

In this section we describe the main differences with the RGSS scheme. Public servants are divided into five categories by their schooling level, age and skills.A. High skilled, high educated, older than 23 (for collage graduates). B. High skilled, high educated, younger than 23 (for people holding certain kinds of college diplomas). C. High skilled, middle educated (for high school graduates). D. Semi or non skilled, middle educated (for junior high school diplomas). E. Semi or non skilled, low educated (for lower education levels). For each of these categories, the budget law defines every year a theoretical SS wage *(haber regulador)* which is used to compute the pension wealth.

The basic yearly pension of a civil servant is computed using the same formula as for the RGSS, $P_t = \alpha_n BR_t$, but the replacement rate for the RCP depends (approximately, since the number of years worked has changed frequently over time) on the age and number of years on work as follows:

$$\alpha_n = \begin{cases} 0, & \text{if } age < 60 \\ 0, & \text{if } n < 15 \text{ and } age \geq 60 \\ \min(1, 1 - 0.0366(35 - n)), & \text{if } 15 < n < 30 \text{ and } age \geq 60 \\ 1, & \text{if } n > 30 \text{ and } age \geq 60 \end{cases} \quad (7)$$

The differences with respect to the general scheme are various. The entitlement to a pension requires at least fifteen years of contributions, the replacement increases irregularly with seniority. RCP allows for early retirement at age 60, without any penalty for public servants with at least 30 years of service. Unlike the general scheme, the RCP imposes mandatory retirement age at age 65. The rules of the RCP scheme were not affected by the 1997 reform.

Regime for the Self – Employed (RETA)

While the social security tax rate is the same for RGSS and RETA covered earnings are computed differently, as the self-employed are essentially free to choose their covered earnings between a floor and a ceiling legislated annually. As mentioned in Jimenez-Martin et al. (2004), because of the strong progressivity of Spanish personal income taxes, a suspiciously large proportion of self-employed workers report earnings equal to the legislated floor. For individuals reporting earnings below these legal limits we simply assume that covered earnings are equal to the legal minimum (separately for those over and under 51). For all others, we have equated covered to reported earnings. Pension benefits computation for self-employed then uses the same formulae as for the general regime. A crucial difference with respect to the RGSS is that, under RETA, recipiency of an old age pension is compatible with maintaining the self-employed status. Current Spanish legislation allows the self-employed to begin drawing retirement pensions without retiring, at least as long as they keep managing their own business. As a result, the opportunity cost of retiring for the self-employed is not measured by the loss of future earnings but instead, by the fact that contributions cannot longer be accumulated to increase future pensions and that marginal income taxes much be paid on pensions. This means that the maximization of the social security payoff is a very reasonable objective function for the self-employed.

Maximum and Minimum Pensions

Pensions are subject to a ceiling set annually and roughly equal to the ceiling on covered earnings. If the computed old age pension is below a minimum, then a person is paid an annually set minimum pension. Minimum pensions are higher for those who are older than 65. In addition, the minimum pension for the RCP regime is higher than the RGSS and RETA regime.

Main assumptions in the computations:

We adopt the following assumptions in the computations: 1. We assume that the individual's pension wealth is unaffected by whether the individual has a spouse or not. 2. We assume that no person has access to early retirement before age 60 if he/she has not filled sufficient year of contributions. The first of these assumptions is largely innocuous. While marital status affects the size of pension benefits in some circumstances, the impact is very modest. The second assumption is forced by data limitations, as workers in some dangerous occupations can retire at earlier ages, but we cannot tell whether the workers qualify for such treatment. In any case, the incidence of such possibility is very small in the population of workers.

In order to compute pension wealth we need estimates of survival probabilities which we have taken (for 1994) from the life tables in the Human Mortality Database[18].

[18] Web Site: http://www.mortality.org

APPENDIX 2: ADDITIONAL TABLES

Descriptives on pension wealth, accrual and peak value

Table 1 shows the median of pension wealth, accrual and peak value incentives, as well as the first and ninth decile of accrual and peak values in our sample.

The median PW starts off at 138,185 Euros and peaks between 64 and 65 years of age at 159,009 Euros. Remember that PW reaches its maximum value just at the age which the worker is allowed to retire (normal retirement age). The median of pension wealth from age 57 to 60 decreases. Median of PW rises again after the age of 60 until 65. A negative accrual can be interpreted as a tax on further labor force participation. The % 10 percentile of accrual value is positive until age 60.Then, it becomes negative after 60. Again this is consistent with the pension wealth can not decrease by postponing retirement one year for ages under 60. The median accrual is positive until age 65 and becomes negative after age 65: the increase in the pension for each additional year is too weak to compensate the loss of one year of pension. The accrual after age 60 is negative in the 10% of the distribution. For those individuals, the implicit tax rate on continuing work can be higher; also these individuals may be the low income individuals, so that the effect on the incentives to early retirement is strong.

The median peak value and accrual value show similar profiles. However, from age 55 to 64, the median peak value is much higher, reinforcing retention incentives in that age range.

Table 1: Pension Wealth, Accrual and Peak Value Incentive Measures for all regimes (in 2001 Euros)

			Accrual Value			Peak Value		
Age	**Obs**	**Median PW**	**P10**	**P50**	**P90**	**P10**	**P50**	**P90**
55	551	138,185	3,667	7,446	17,323	12,934	62,885	161,880
56	578	139,800	3,593	7,906	18,374	17,784	61,763	153,644
57	625	132,891	3,505	7,172	16,628	15,282	57,679	144,002
58	591	130,839	3,411	6,914	15,847	14,581	53,135	137,008
59	550	126,569	3,276	6,684	16,544	12,102	51,420	128,990
60	512	120,014	-694	13,937	32,536	2,629	56,013	123,953
61	496	129,367	-1,373	12,258	30,770	897	41,390	101,909
62	437	137,101	411	11,581	33,015	895	32,058	81,165
63	397	150,824	-1,055	9,906	24,781	390	19,551	60,289
64	388	155,373	-1,294	7,853	22,390	-809	9,152	35,843
65	301	159,009	-6,410	-1,420	6,142	-6,217	-831	14,106
66	227	150,181	-8,032	-1,395	4,760	-8,032	-1,206	10,100
67	159	146,647	-7,058	-2,157	1,994	-7,058	-2,157	2,957
68	118	140,280	-5,658	-2,814	502	-5,658	-2,814	502
69	75	122,982	-6,195	-2,566	455	-6,195	-2,566	455

Table 2: Descriptive statistics

Variable	All	Pre-Retirement	Post-Retirement
Retired	0.152	0	1
Health index	-0.010	-0.036	0.134
Small Health Shock	0.219	0.218	0.223
Large Health Shock	0.102	0.098	0.117
Age	58.5	57.4	64.5
Married	0.838	0.840	0.823
Male	0.733	0.722	0.797
High Education	0.152	0.159	0.114
Middle Education	0.083	0.083	0.082
House Owner	0.906	0.901	0.932
Has Children un. 12	0.065	0.068	0.055
Pension wealth (in € 0000)	16.407	16.218	17.492
Accrual value (in € 0000)	0.915	1.035	0.223
Peak value (in € 0000)	5.944	6.821	0.909
Income from work (in €)	11299	11683	9153
Public sector	0.142	0.168	-
Private Sector	0.569	0.671	-
Self-employed	0.268	0.317	-
Housework	0.033	0.039	-
Unemployed	0.039	0.046	-
Inactive	0.058	0.069	-
# of observations :	8155	6912	1243

Table 3: Random effects probit- Peak value model

	Self Reported Retirement			Extended Definition of Retirement		
	Coef.	**S.E.**	**Marginal Effects**	**Coef.**	**S.E.**	**Marginal Effects**
Initial ill-health stock	0.1122**	0.0493	0.0028	0.1917**	0.0433	0.0181
Small health shock (increase)	0.1973**	0.0930	0.0056	0.0605	0.0847	0.0059
Large health shock (increase)	0.1634	0.1234	0.0048	0.4448**	0.0937	0.0562
Income from work	-0.0077	0.0075	-0.0002	-0.0019	0.0054	-0.0002
Income from work imputed	0.2360	0.1209	0.0072	0.3144**	0.1199	0.0371
Pension wealth	0.0126	0.0086	0.0003	-0.0062	0.0067	-0.0006
Accrual value	-0.0407**	0.0171	-0.0010	-0.0546**	0.0118	-0.0051
High education	-0.4299**	0.1889	-0.0078	-0.1501	0.1416	-0.0130
Middle education	0.0244	0.1668	0.0006	-0.1067	0.1364	-0.0093
Male	0.2295	0.1302	0.0051	-0.2013**	0.0987	-0.0209
Age minus 50	-0.0022	0.0707	-0.0001	-0.0457	0.0431	-0.0043
Age minus 50 squared	0.0135**	0.0040	0.0003	0.0112**	0.0027	0.0011
House owner	0.3974**	0.1800	0.0069	0.2345	0.1309	0.0188
Has children	0.2052	0.1864	0.0063	-0.1589	0.1606	-0.0133
Public pension entitled next period	0.5172**	0.1451	0.0204	-0.1789	0.1180	-0.0151
Public pension entitled this period	0.2303	0.1693	0.0064	-0.2080	0.1375	-0.0183
Public sector employee	-0.2286	0.1561	-0.0048	-0.1302	0.1257	-0.0115
Self-employed	-0.5889**	0.1400	-0.0120	-0.2772**	0.1019	-0.0245
Unemployed	0.4612**	0.1564	0.0187	0.6439**	0.1345	0.0963
Housework	-0.8874**	0.2748	-0.0095			
Married	-0.0028	0.1346	-0.0001	0.0891	0.1078	0.0080
Number of Observations (NT)		4886			4221	
Log-Likelihood		-886.496			-1069.57	
Intra-class coeff.		0.344416			0.202886	

Notes: ** p<0.05. Marginal effects are calculated at mean values.

Table 4: Mundlak specification-Peak value Model

	Self Reported Retirement			Extended Definition of Retirement		
	Coef.	**S.E.**	**Marginal Effects**	**Coef.**	**S.E.**	**Marginal Effect**
Initial ill-health stock	0.1668**	0.0525	0.0040	0.1974**	0.0438	0.0188
Small health shock (increase)	0.1054	0.1033	0.0027	0.0311	0.0946	0.0030
Large health shock (increase)	-0.0661	0.1485	-0.0015	0.2348**	0.1137	0.0262
Mean large health shock	0.5360**	0.2510	0.0129	0.1875	0.2095	0.0179
Mean small health shock	0.9580**	0.2958	0.0231	0.7371**	0.2206	0.0703
Income from work	-0.0056	0.0095	-0.0001	-0.0064	0.0077	-0.0006
Income from work imputed	0.6058**	0.1516	0.0250	0.4019**	0.1410	0.0509
Mean income from work	-0.0054	0.0150	-0.0001	0.0092	0.0102	0.0009
Mean income from work imputed	-1.3895**	0.3375	-0.0335	-0.2852	0.2858	-0.0272
Pension wealth	0.0111	0.0097	0.0003	-0.0085	0.0072	-0.0008
Peak value	-0.0418**	0.0176	-0.0010	-0.0560**	0.0121	-0.0053
High education	-0.3313	0.1856	-0.0063	-0.1142	0.1409	-0.0102
Middle education	0.0391	0.1657	0.0010	-0.1014	0.1352	-0.0090
Male	0.1680	0.1290	0.0037	-0.2036**	0.0981	-0.0214
Age minus 50	-0.0035	0.0710	-0.0001	-0.0433	0.0430	-0.0041
Age minus 50 squared	0.0135**	0.0040	0.0003	0.0108**	0.0027	0.0010
House owner	0.3748	0.1771	0.0064	0.2097	0.1292	0.0173
Has children	0.2204	0.1850	0.0067	-0.1611	0.1593	-0.0137
Public pension entitled next period	0.4693**	0.1445	0.0172	-0.1824	0.1178	-0.0156
Public pension entitled this period	0.1913	0.1687	0.0051	-0.1854	0.1363	-0.0166
Public sector employee	-0.2636	0.1558	-0.0052	-0.1206	0.1249	-0.0108
Self-employed	-0.4999**	0.1372	-0.0101	-0.2346**	0.1048	-0.0212
Unemployed	0.5268**	0.1586	0.0224	0.6396**	0.1350	0.0963
Housework	-0.7075**	0.2737	-0.0085			
Married	0.0496	0.1344	0.0012	0.0853	0.1066	0.0077
Number of Observations (NT)		4886			4221	
Log-Likelihood		- 870.269			-1063.08	
Intra-class coeff.		0.323369			0.184901	

Notes: ** p<0.05.Marginal effects are calculated at mean values.