

Social Security incentives, exit from the workforce and entry of the young^{*}

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Abstract

In this paper we analyze the relationship between the employment of the young, exit of older people and retirement incentives using data from both the Spanish labor force survey and the Muestra Continua de Vidas Laborales. Contrary to a widespread view, we find some (weak) evidence of positive (negative) relationship between the employment (unemployment) of young and the labor force participation of the older population. However, we are unable to find a clear relationship between the employment of the young and the incentives to retirement created by the Spanish pension system. We believe this is so because retirement incentives have changed very little during the last two decades.

Keywords: Welfare State, Social Security, Retirement, Income Inequality, Poverty.

JEL: I3, H5, J14, J26

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1 Introduction

Beginning in the late 1970s Spain has witnessed dramatic social, economic and demographic changes. Life expectancy has increased substantially and fertility rates have dropped to some of the lowest levels in the European Union. The Spanish public system of social insurance, of which the public pension system (*Seguridad Social*) is the main component, underwent a major reform in the middle 1980s and is now substantially more comprehensive and generous than it used to be. Finally, Spanish per capita income has grown continuously since the middle 1980s, on average at about a percentage point faster than the rest of the EU, and the growth has been comparatively higher since the late 1990s. During the same period, a large share of the older workers population have been dismissed and lead to retire earlier, while the population unemployment rate soared first and then, since 1996, declined steadily to reach average European levels in the last three years.

Quite often during the last three decades policies that favor early retirement are supported and promoted with the justification that they may induce a reduction in youth unemployment rates. The basic idea is that since jobs are a scarce resource available in a fixed number, retiring an older worker would “free” the same job for a younger, most likely unemployed, one. We have found a number of references to this issue in the press during the early eighties. Just as an example¹ we mention the preamble of the National employment agreement of 1981 (Acuerdo nacional sobre empleo. Source: El País, 07/06/1981) describing a special retirement scheme (**Sistema especial de jubilaciones**): *“Las partes firmantes del acuerdo han examinado los posibles efectos sobre el empleo del establecimiento de un sistema que permita la jubilación con el 100% de los derechos pasivos de los trabajadores al cumplir 64 años de edad y la simultánea contratación por parte de las empresas de trabajadores jóvenes o perceptores del Seguro de Desempleo en número igual al de las jubilaciones anticipadas que se pacten con contratos de igual naturaleza que los que se sustituyen. El Gobierno elaborará, en el plazo de 2 meses, una norma estableciendo la regulación de un sistema que, por la vía de los convenios colectivos o del acuerdo entre empresas y trabajadores, permita las sustituciones a que se refiere el párrafo anterior.”*

¹Other mentions of the issue can be found in ILO documents (Medidas de la OIT para luchar contra el desempleo. source: El País, 17/08/1982;http://www.elpais.com/articulo/economia/PAISES_INDUSTRIALIZADOS/ORGANIZACION_INTERNACIONAL_DEL_TRABAJO/_OIT/Mc_didas/OIT/luchar/paro/elpepieco/19820817elpepieco_10/Tes); also in an article on El País (Artículo de opinión en El País 26/11/1983 de Daniel Gil; (http://www.elpais.com/articulo/opinion/edad/jubilaciones/elpepiopi/19831126elpepiopi_10/Tes)). More recently, in 2002, we have found another reference to the issue in Trade unions news: <http://www.ugtrioja.org/web/actualidad/cp/cp219.htm>

In fact, the 1985 pension system reform, which gave shape to the system currently in place², introduced several specific programs to favor the substitution of older by younger workers. Especially relevant are the Jubilación Especial (*Special retirement scheme*) at age 64 and the Jubilación Parcial (*Partial retirement*). The first one has been always very marginal with an incidence varying from 1 to 4 percent of the total number of retirees. The second has not been used until very recent years, after the 2002 reform. In fact, the incidence of this scheme was negligible until 2002. Since then it has increased very rapidly (4.24 percent in 2002 and 13.27 percent in 2007). See Table A1 for recent information about the distribution of the retirement pensions awarded in recent years. Unfortunately a large share of this time period is out of our sample and cannot be taken into consideration.

Our goal is to understand the relationship between the employment (or exit from the labor force) of the old and the employment/unemployment of the young. To do this, we first estimate the statistical impact of the labor force participation of the old on the employment/unemployment of the young, and also of the middle-aged individuals. However, changes in the LFP of the old may be due to factors other than changes in pension incentives, which may also be correlated with the labor conditions of the young, thus giving biased estimates. Therefore, one would like to estimate the direct effect of retirement policies.

More precisely, we would like to estimate at the aggregate level the direct relationship between the incentive for the old to leave the labor force and the employment of the young. In order to do so we need a simple aggregate indicator of the incentive to retire. However, to obtain such an index may be complicated, especially recognizing the need to account for some key aspects of the inducement to retire: the eligibility age, the benefit level given eligibility, and the change in the benefit if the receipt of benefits is delayed (the OV/PV idea, essentially the actuarial adjustment if retirement is delayed); and, the necessity to aggregate them for all the individuals "at risk" in a given year.

Methodologically, our approach is very simple: we collect time series information of the main indicators of the Spanish labor market for the key groups of the population; in parallel we construct synthetic incentive measures for the "at risk" population in a given

²There have been three reforms after 1985: 1997, 2002 and 2007. However, the shape of the system has remained unaltered since the 1985 reform.

year. To do this we combine data from the Spanish Labor Force Survey and the Muestra Continua de Vidas Laborales (MCVL2006).

Previous works on the relationship between employment of the young and exit of older workers in Spain (Jiménez-Martín (1999)) and Europe (Boldrin et al. 1999a) have found no systematic evidence of any significant correlation. Jiménez-Martín (1999) analyzes the relationship between young's entry and older's exit from the labor market in Spain using data from the Panel data version of the Spanish Labor Force Survey in the 1987-97 period. He analyzes the individual decision to enter the labor market (transitions into the "market") while controlling for individual and household characteristics as well as local market indicators. Among the latter he highlights the fraction/amount of exit from the labor market on the part of older individuals, especially those aged 55-64. He finds little evidence of any relationship between entry of the young and exit of older individuals.

Boldrin et al (1999a) collected various labor market observations for a sample of 260 NUTS II and NUTS III European regions³ over the years 1986, 1991 and 1996. They expect that, if any effect is visible, it should be detectable at this level of geographical disaggregation. Figures 2 and 3 in Boldrin et al (1999a) plot, separately for men and women, the relationship between the exit rates from the labor force of people born between 1931 and 1940 and the changes in the unemployment rates over 1991-96 of people aged between 21 and 30. Under the substitution hypothesis we should expect a negative relationship. Neither for men nor for women, the estimated regression lines turn out to be significantly negatively sloped. For alternative specifications, controlling for cohort effects or using different lags, the results hardly change. Thus, they conclude that early retirement of older workers does not come together with a reduction of unemployment among younger people.

The rest of this document goes as follows. In section 2 we document the main macroeconomic facts of the last decades. In section 3 we describe the Social Security background. Data and sources are commented in section 4. In section 5 we discuss the trends of the labor force during the period of study. In section 6 we present the methodology and the construction of the inducement-to-retain measure, and in section 7

³ They represent relatively small areas, which happen to be the territorial units at which the European Commission targets its employment policies and for which national governments tend to devise the early retirement plans we mentioned earlier.

the empirical framework used to test the relevant hypothesis. The empirical results are described in section 8. Finally, section 9 offers some concluding remarks.

2 The Facts

2.1 Macroeconomic context

Table 1 summarizes the Spanish macroeconomic evolution, in relation to the EU's average, since 1975. The basic facts for Spain are as follows⁴. In the period immediately after the oil shock, 1975-1985, which coincides with the death of Francisco Franco and the beginning of the democratic transition, both the GDP growth rate and the level of employment were well below the European average. This period corresponds to a dramatic “structural transition” in which few million jobs were eliminated and the unemployment rate skyrocketed to levels substantially above twenty percent. This was only partially a consequence of the two oil shocks; the collapse of the Franco regime led to a spontaneous and unplanned “opening” of the economy, which preceded and anticipated the entrance into the EU of almost a decade. As a consequence of this broad restructuring process, productivity growth in Spain was by far more intense than the European average until the second half of the 1980s. In the period since 1985, the opposite happened: productivity growth in Spain is slightly but persistently below the EU average, while GDP and employment grow, on average, faster than in the rest of Europe. The last thirteen years, in particular, have seen a spectacular increase in Spanish employment (more than eight million additional jobs out of a total employment, in 1995, of about twelve millions) which has, nevertheless, come together with a very slow rate of growth in labor productivity. Inflation, on the other hand, has been slightly above the European average during the whole period, although the differential has been reduced in recent years, following the implementation first of the Maastricht pact and then of the Euro. Finally, real unit labor costs have been decreasing at about the EU average during the whole period.

Table 1. The Macroeconomic Scenario (Annual percentage growth rates)

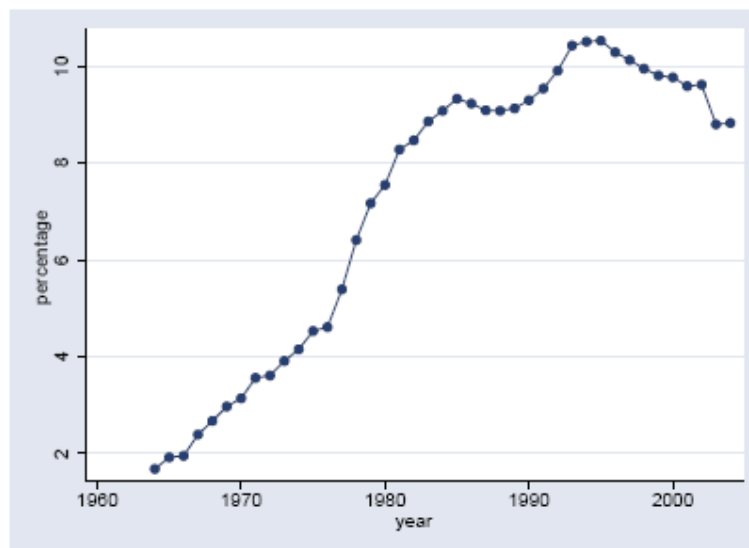
	Spain				EU			
	75-85	85-90	90-99	99-04	75-85	85-90	90-99	99-04
GDP real growth	1.7	4.5	2.3	2.9	2.3	3.2	1.8	2.2

⁴ Source: Eurostat.

Number employed	-1.6	3.3	1.0	2.2	0.1	1.4	0.2	1.0
Average hours worked	-	-0.2	-0.2	-1.2	-	-0.4	-0.3	-0.9
GDP/number emp.	3.3	1.2	1.3	-	2.2	1.7	1.6	-
GDP/total hours worked	-	1.4	1.6	-	-	2.1	1.9	-
Consumer prices	15.4	6.5	3.9	3.1	10.3	4.4	3.0	2.2
Average earnings	17.2	7.9	4.9	2.6	11.6	6.4	4.1	2.4
Average real earnings	1.6	1.4	0.9	-	1.2	1.9	1.1	-
Average real labor costs	2.1	0.5	0.6	3.2	1.5	1.4	1.1	2.8
Real unit labor costs	-1.1	-0.7	-0.7	-1.0	-1.1	-0.8	-0.7	-0.1

What are the implications of these macroeconomic facts for our purposes? Basically, that the relative economic position of Spain, and of the average Spaniard, has improved substantially, vis-à-vis that of the average European, during the last thirty years. The natural question to ask, therefore, is: did this improvement in the economic well being of the average Spaniard translates also into an improvement of the economic conditions of the elderly? Figure 1 reports the ratio of pension expenditure to GDP since 1965. It is apparent that this ratio has grown substantially for about thirty years and has flattened out and then slightly decreased during the last ten years or so.

Figure 1. Pension expenditure to GDP ratio



2.2 Labor market reforms since the 1970's

There have been substantial changes in employment protection legislation over the last three decades. The following chronology describes the major ones

- 1978: Following the transition to democracy, Spain introduced labor legislation restricting dismissals and adding high dismissal costs⁵.
- 1980: The parliament passed the Workers' Statute including the Strike and Collective Bargaining regulation. At the same time early retirement provisions and the notion of "disability due to economic reasons" are introduced.
- 1984: First reform of the labor market with the objective of reducing dismissal cost. Temporary contracts are introduced that became very popular since. As a result of the 1984 reform, the proportion of employees under temporary contracts increased from 10% during the 1980's to over 30% in the early 1990's. The temporary contracts generated a dual labor market: unstable low-paying jobs and stable high-paying jobs under the old regulation. It did not reduce unemployment until the recovery of 1994 (Kugler et al. (2002)). Not surprisingly, reducing firing costs has been one of the recurrent recommendations of national and international organizations, although actual reforms had only a limited scope (OECD(2005)).
- 1994: Second major reform of the labor market, with the objective of introducing limitations to the use of temporary contracts.
- 1997: Third important reform of the labor market (actualized in 2001). The purpose of this reform was to further limiting the incentive to use temporary contracts by reducing dismissal cost of certain groups of workers. The most noted aspect of the reform was the introduction of a new permanent contract, with reduced severance payments. This contract was targeted to two groups: the population most exposed to unemployment (i.e. the youth, the long term unemployed, and women and men above age 45), and workers on a temporary

⁵ This legislation established that firms could dismiss workers for "personal reasons," in which case the firm had to prove the worker's incompetence or absenteeism; and "economic reasons," in which case the firm had to prove its need to reduce employment due to technological, organizational, or productive causes. Dismissals justified by "economic reasons" required advance notice. Workers dismissed for "personal reasons" could appeal to labor courts. The severance payment awarded depended on whether judges ruled the dismissal as "fair" or "unfair." A dismissal was ruled as "fair" if the employer was able to prove the worker's incompetence or absenteeism and "unfair" otherwise. In case of fair dismissals, firms had to pay 20 days out of the salary per year of seniority, with a maximum of 12 months. In the case of unfair dismissals, firms had to pay 45 days per year of seniority out of the salary, with a maximum of 42 months. Severance payments for "economic reasons" were the same as for fair dismissals under "personal reasons". In practice, this legislation turned out to be very stringent because judges ruled dismissals as unfair in the majority of cases. Moreover, approval for dismissals under "economic reasons" was often granted only when there was an agreement between employers and workers, which was achieved in most cases by raising severance payments above the legally established amounts. The Spanish government introduced the first reform designed to reduce dismissal costs in 1984. Since an across-the-board reduction of dismissal costs was politically impossible, the reform liberalized the use of temporary contracts. [from Kugler, Herranz, Jimeno (2002)].

contract who converted to an indefinite one during the one-year period following the approval of the new legislation.

Table 2: Distribution of the share of temporary employment in total employment

	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
EU-15..	9.0	10.2	10.4	10.9	10.6	11.0	11.5	11.8	12.2	12.8	13.2	13.4
Belgium	6.9	5.3	5.1	4.9	5.1	5.1	5.3	5.9	6.3	7.8	10.3	9.0
Denmark	12.3	10.8	11.9	11.0	10.7	12.0	12.1	11.2	11.1	10.1	10.2	10.2
Germany	10.0	10.5	10.1	10.5	10.3	10.3	10.4	11.1	11.7	12.3	13.1	12.7
Greece	21.1	16.5	14.7	10.2	10.4	10.3	10.2	11.0	10.9	13.0	13.0	13.1
Spain	15.6	29.8	32.2	33.5	32.2	33.7	35.0	33.6	33.6	32.9	32.7	32.1
France	4.7	10.5	10.2	10.5	10.9	11.0	12.3	12.6	13.1	13.9	14.0	15.0
Ireland	7.3	8.5	8.3	8.7	9.4	9.5	10.2	9.2	9.4	9.4	9.4	4.6
Italy	4.8	5.2	5.4	7.5	6.0	7.3	7.2	7.5	8.2	8.6	9.8	10.1
Luxem.	4.7	3.4	3.3	2.9	3.0	2.9	..	2.6	2.1	2.9	3.4	3.4
Nether	7.5	7.6	7.7	9.7	10.0	10.9	10.9	12.0	11.4	12.7	12.0	14.0
Austria	..	..	..	..	..	..	6.0	8.0	7.8	7.8	7.5	7.9
Portugal	14.4	18.3	16.4	11.0	9.8	9.4	10.0	10.6	12.2	17.3	18.6	20.4
Finland	10.5	11.5	12.0	13.1	12.7	12.9	16.5	17.3	17.1	17.7	18.2	17.7
Sweden	11.9	10.0	9.8	10.5	11.5	11.5	12.5	11.8	12.1	12.9	13.9	14.7
UK	7.0	5.2	5.3	5.5	5.9	6.5	7.0	7.1	7.4	7.1	6.8	6.7

- 2006: Fourth important labor market reform. Previous reforms had failed to reduce the fraction of temporary contracts; a new attempt was made by introducing strong restrictions on the extension of contracts or replacement of temporary workers.

2.3 Background on the Spanish Social Security System

Mandatory insurance for job related accidents was introduced in 1900, through a bill that also authorized the creation of some funds, for public employees only, paying disability and retirement pensions. In 1919, mandatory retirement insurance (*Retiro Obrero Obligatorio*) was introduced for private sector employees aged 16{65 whose total annual salary was below a certain threshold. In 1926, a universal pension system for public employees (*Régimen de Clases Pasivas*, or RCP) was established, which still exists under the same name. By the late 1930s, most Spanish employees were covered, in one form or another, by some minimal, government mandatory retirement insurance program.

With the end of the Republic and the advent of Franco's regime, a number of changes were implemented. In 1939, Workers' Retirement (*Retiro Obrero*) was replaced by Old Age Insurance (*Seguro de Vejez*). While the former was based upon a capitalization system, the latter was from the beginning a completely unfunded pay-as-you-go scheme. By 1950, the

system had acquired its basic organization in two pillars, which remained essentially unchanged until the mid 1970s. Public servants were all covered by the RCP, while private sector employees with annual earnings below a certain ceiling were covered by the Old Age Insurance. The 1963 reform created a very large number of special funds (*Régimenes Especiales*) next to the general scheme (*Régimen General*), generating a jungle of special treatments which is still being dismantled.

In 1977, a reform bill made a first attempt at harmonizing the many existing funds, by reducing the differences in the treatment they offered and by putting (in 1979) the administration of the whole system under the newly created National Social Security Institute (*Instituto Nacional de la Seguridad Social*, or INSS). Overall, this process increased the percentage of workers covered by the public SS system.

The key rules before the 1985 reform (see Barrada (1999) or Boldrin et al (1999b) for a complete description) were the following:

1. The Normal Retirement Age is set at 65 and the Early Retirement Age, for those that started contributing before 1967, at 60.
2. Eligibility: 10 years of contributions, of which 2 years should be in the last seven years preceding the date of retirement.
3. Amount of pension: 50% of the "benefit base" with 10 years of contributions, plus 2% for each additional year of contributions, up to 100% with 35 years.

The reform process, which came to shape the current regime, introduced a few important changes: Eligibility criteria for disability pensions were tightened; the minimum number of years of contributions required to obtain an old-age pension was increased from 8 to 15; and the number of years entering the computation of the benefit base was increased from 2 to 8. On June 26, 1997, many of the parameters used for the computation of benefit bases and pensions were modified. The number of contributory years over which the benefit base is computed was increased from 8 to 15 (by year 2001). The formula for the computation of the replacement rate α (see below) was also made less generous, whereas

the 8% per-year penalty applied to early retirees between the ages of 60 and 65 was reduced to 7% for those individuals with 40 or more contributory years at the time of retirement.

Currently, the Spanish Social Security offers two pathways to regular retirement⁶: early retirement and normal retirement. Early retirement is possible starting at age 60, while the normal retirement age is 65, although some professional groups have lower normal retirement ages (miners, military personnel, policemen and fishermen are the main ones). Collective wage settlements often impose mandatory retirement at age 65, facilitate retirement at 64 with full benefits, or encourage retirement between 60 and 63 through lump sum payments.

Public pensions are provided by the following programs:

- The "General Social Security Scheme" (*Régimen General de la Seguridad Social*, or RGSS) and the "Special Social Security Schemes for Self-employed" (*Régimen Especial de Trabajadores Autónomos* or RETA). They cover, respectively, the private sector employees and the self-employed workers and professionals. The RGSS covers also the 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.
- The scheme for government employees (*Régimen de Clases Pasivas*, or RCP) includes public servants employed by the central government and its local branches.

In what follows we provide a brief summary of key regulatory changes in the Spanish Social Security system.

- 1973: SS Act: Introduction of the tax base (not linked to wages) but to categories.
- 1974: SS bill: Effectively linked the tax base to wages. Loosened significantly the eligibility criteria. Common replacement rates.
- 1977 Harmonization process: Caused a significant increase of coverage.
- 1985: First major Pension system reform. It included restrictions in the access to invalidity very frequent in the period 1980-1985. It introduced several Early

⁶ That is to say, in the absence of disability or long term unemployment in late age.

Retirement programs: *Jubilación Parcial*, *Jubilación Flexible*, and *Jubilación Especial a los 64*. Consistent increase of the Minimum Pension to the Minimum Wage since then.

- 1997: Second Pension Reform. Following the Toledo Pact (1995). Very little effects on either incentives or pension expenditure.
- 2002: Third Pension Reform. Early Retirement up to 61 (but not affecting current workers). Very little effects on either incentives or pension expenditure on the short run. It is very important the impulse to the partial retirement program, which has been increasingly used as an exit route.
- 2006: Fourth Pension Reform (Ley 40/2007). Marginal changes on eligibility for retirement options. Important changes on eligibility (change to 15 years or 5.475 days of effective contributions), conditions for allowing for partial retirement, and formula for DI benefits.

See the Appendix for a detailed description of the system rules from 1985 onwards.

3 Description of data and sources

We start by providing an index of the data sets that are currently available. One important limitation should be noticed: there is no single data set covering the whole period 1975-2005. Most time series, therefore, will be constructed by splining data from different sources, creating obvious problems of consistency, which, while less dramatic than one might expect, are nevertheless substantial.

3.1 Data Sources

Employment.

Data about employment and labor force participation come from the *Encuesta de Población Activa* (EPA). The EPA is a rotating quarterly survey carried out by the Spanish National Statistical Institute (*Instituto Nacional de Estadística*, INE). The planned sample size consists of about 64,000 households with approximately 150,000 adult individuals. Although the survey has been conducted since 1964, publicly released cross-sectional files are available only from 1976. The 1976 questionnaire was modified in 1987 (when a set of retrospective questions was introduced) and again in the first quarter of 1992. In both cases, the

lengthening of the questionnaire led to increased nonresponse rates. Further modifications have been introduced in 1999 and 2004.

The EPA provides fairly detailed information on labor force status, education and family background variables but, as with most European-style labor force surveys, no information on earnings and other sources of income. The reference period for most questions is the week before the interview.

Wage profiles and incentive variables.

Both wage profiles and monetary incentive variables are constructed using data from: i) *Historiales Laborales de la Seguridad Social, 1998* (old version), a sample of about 250,000 of working careers (SS numbers) taken at the end of 1997 [See Boldrin et al (2001, 2004) for a description]. Complete working histories up to 1998 and monthly covered wages for employees in the 1986-1995, which allows us to construct year of birth x gender x region wage profiles and, thus, incentives. ii) *Muestra Continua de Vidas Laborales (MCVL2006)*: A sample of about 1,000,000 of working careers (SS numbers) taken at the end of 2005. Complete working histories up to 2006 and monthly covered wages for employees in the 1980-2005 period which allows us to construct year of birth x gender x region wage profiles and, thus, incentives.

3.2. Labor force trends in 1976-2005

In this section we present some descriptive and graphical evidence on labor force trends by gender for the groups under study. We also show a first glimpse of the relationship between the labor status of the different groups and the different labor and social security reforms. Figure 2 shows the evolution of the labor force participation, the employment rate and the unemployment rate for the population aged 16 to 69 by gender. It can be seen that there has been an important increase in the female labor force participation since the mid 80s, while the employment and unemployment rate of both males and females have been moved in parallel, decreasing (increasing) the employment (unemployment)rate during the mid 80s, and an increase (decrease) in employment (unemployment) rates after the mid 90s.

Figures 3 and 4 present some data to set the stage. They show how the employment and unemployment rate of the youth and the prime age individuals relate to the labor force participation of the older group (55 to 69), and whether the labor market or social security reforms can play any role. The employment and unemployment figures of young and prime age individuals behave similarly during the observational period independently on whether we define young individuals to be younger than 25 or 30. However, the unemployment rate of young individuals is always higher. At the same time, the figures show that there is no clear association between the labor force participation of the older group and the employment or unemployment of the other two groups. Moreover, the observed changes in this association are hard to relate with any specific policy change.

Figure 2. Labor market trends by gender

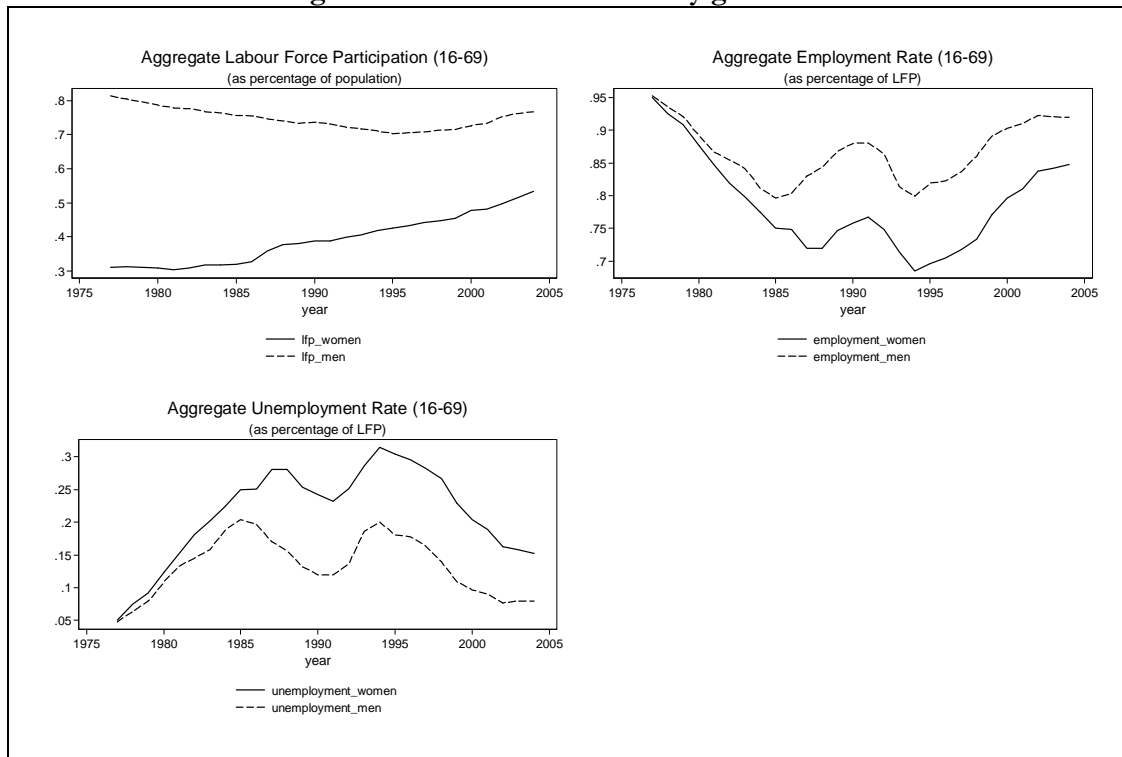
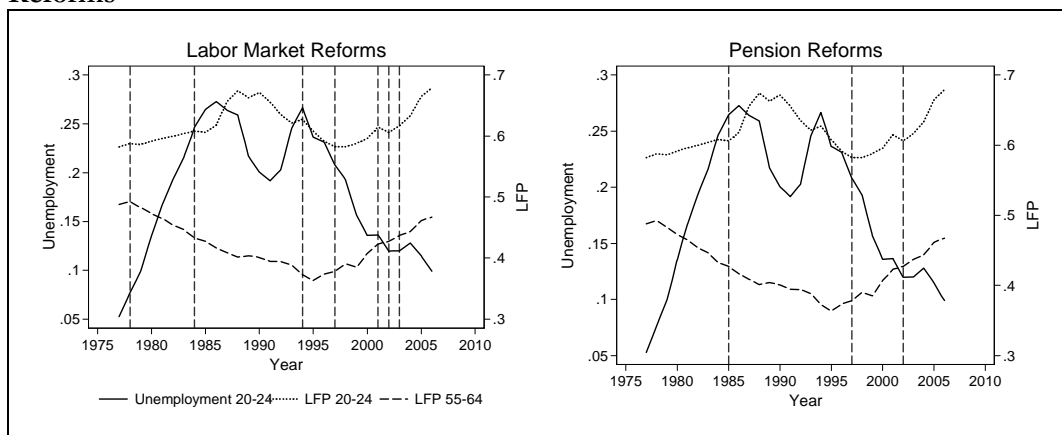
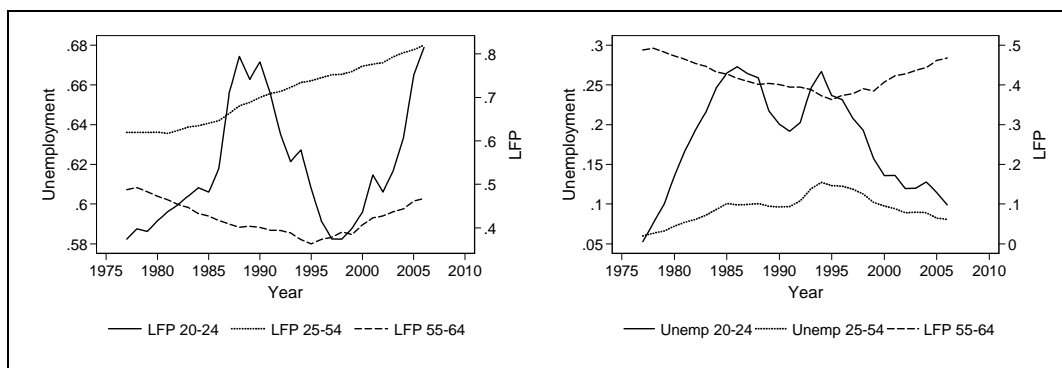


Figure 3: Labor market trends of old and young individuals and Labor and Pension Reforms



To highlight the importance of employment and unemployment for the labor force participation of older workers, figures 5, 6 and 7 show the labor force participation, the employment rate and the unemployment rate for four different age groups by gender. The behavior of both the labor force participation and the employment rate is more stable during the period than the unemployment rate. We observe a decrease in both the LFP and the employment rate of individuals aged older than 60, while an slightly increase of the same measures for women aged 50 to 54

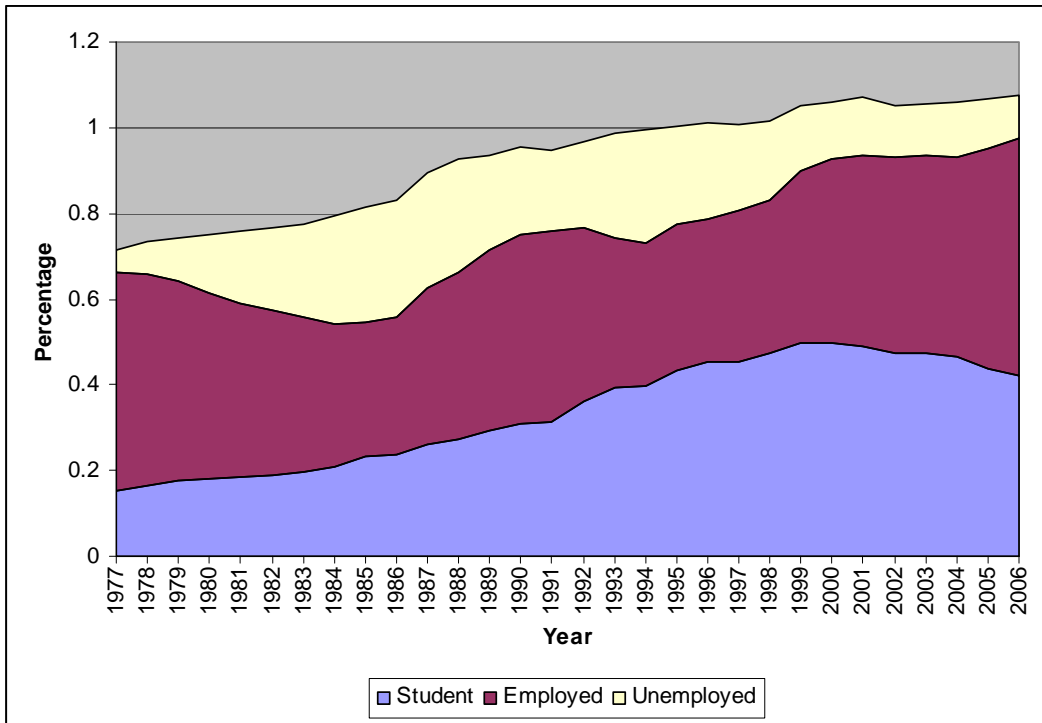
Figure 4. Relationship of young and prime age individuals labor market outcomes and labor force participation of the old



On the other hand, there has also been an important increase on the schooling rates of the Spanish population during the period under study. Figure 5 shows the percentage of individuals aged 20 to 24 who are unemployed, employed or in school. First notice that the total amount can exceed 100% as there can be some individuals who are either employed or unemployed while in school. It can be appreciate that while there have been a decrease

in the percentage of young individuals in unemployment and an increase in the percentage in employment, the biggest change can be seen in the percentage of individuals who declare being still at school, as it increases from less than 20% at the beginning of the period to over 40% in the last years.

Figure 5. Labour and Schooling trends of young individuals in Spain 1977-2006



4. Regressions

As stated before the main purpose of this paper is to analyze the link between employment for the young and retirement from the labor force of the elderly population, and, in particular, the link between employment of the young and Pension system regulations. Following an IV approach we want to establish whether Social Security reforms have been set with the purpose to increase availability of jobs for the young and, of course whether they have been successful.

We begin with OLS regressions of labor market outcomes for non-elderly on labor market outcomes of the "old." With the purpose to examine as broadly as possible the relationship between LFP of the old and employment of the non old fraction of the population we consider the following five dependent variables: Unemployment and Employment for

prime age (individuals aged 25-54) and Unemployment, Employment and Schooling for the youth (individuals aged 20-24). The independent variable is the LFP of the old workers (individuals aged 56-64). And all the variables are expressed as rates over total population of the relevant age group. We consider two versions of such regressions: levels and differences of order 5. Let us first introduce the levels regression:

$$Y_t = \alpha + \beta LFPO_t + \delta X_t + \varepsilon_t$$

where Y denotes either Employment, Unemployment, or Schooling and X is a set of economic controls (per capita GDP, GDP growth and share of manufacturing in GDP) in order to control for labor market characteristics associated with both LFP of the old and employment or unemployment of either young or prime age individuals. The 5-year differences equation to be estimated is analogous, but both independent and dependent variables are expressed as a five-year difference.

In summary, for each dependent variable we carry out the following exercises: levels and differences; two age groups (young and prime-age); with and without the selected covariates.

5. Measures of retirement incentives

However, as stated in the introduction, there can be some further labor market conditions beyond social security incentives that can affect both the labor force participation of the older workers and the employment and unemployment situation of either young or prime age workers. In order to solve this limitation we construct a synthetic measure of the incentives faced by older workers.

The purpose of this section is to present the methodology and the assumptions made to construct a synthetic measure of the (monetary or financial) inducement to retirement that the population at retirement risk faces. That is we want to have an aggregate measure of the strength with which the Social Security spells out representative workers from the labor force. We want this index to account for the various factors influencing retirement decisions: the eligibility age, the benefit level given eligibility, and the change in the benefit

if the receipt of benefits is delayed (the idea of the Option Value (Stock and Wise (1990) and the Peak Value (Coile and Gruber, 2000), essentially the actuarial adjustment if retirement is delayed). In order to do so we first present the standard monetary incentives measures (Gruber and Wise (1999)). Then we present the synthetic indicator(s) and the assumptions made in computations.

5.1 SS incentives measures

For a (representative) worker of age a , following Gruber and Wise (1999), we define social security wealth (SSW) in case of retirement at age $h \geq a$ as the expected present value of future pension benefits

$$SSW_h = \sum_{s=h+1}^S \rho_s B_s(h).$$

Here S is the age of certain death, $\rho_s = \beta^{s-a} \pi_s$, with β denoting the pure time discount factor and π_s the conditional survival probability at age s for an individual alive at age a , and $B_s(h)$ the pension expected at age $s \geq h+1$ in case of retirement at age s .

Given SSW, we define three incentive variables for a worker of age a : the accrual at horizon 1 (SSA), the implicit tax/subsidi rate (TAX), the optimal horizontal peak value (PV) and the Option Value (OV). The definition of these incentive measures, for an individual of age $t=55, \dots, 69$ are as follows:

- Accrual at horizon 1: $SSA_t = ssw_{t+1} - ssw_t$.
- Implicit tax/subsidi rate: $TAX_t = -SSA_t / E_t(w_{t+1})$ where E_t is the expectation operator based upon the information available up to time t .
- Accrual at the optimal horizon h^* or peak value: $PV_t = \max_h [ssw_{t+h}] - ssw_t$, $h=1, \dots, R-t$, where R is the mandatory retirement age (the latter does not exist in Spain, but given the retirement evidence we find it reasonable to assume that $R=70$).
- Option Value $OV_a = \max_h \{V_h - V_a\}$, $h = a+1, \dots, R$, where

$$V_h = \sum_{s=a+1}^h \rho_s W_s^\gamma + \sum_{s=h+1}^S \rho_s [kB_s(h)]^\gamma$$

and p_s is the survival probability, S is age of (certain) death, W stands for earnings and B stands for pension benefits.

We have imposed that $\beta = .97$, $\gamma = 1$ and $k = 1.25$. Note that under these assumptions

$$V_h = \sum_{s=a+1}^h \rho_s W_s + 1.25 S S W_h.$$

5.2 *A summary measure of the incentive to retire*

To obtain such an index can become somewhat complicated, especially recognizing the need to account for the key aspects of the inducement to retire: the age of eligibility, the benefit level given eligibility, and the change in the benefit if the receipt of benefits is delayed (the OV/PV idea, essentially the actuarial adjustment if retirement is delayed). Here, we consider the development of a summary measure of the inducement to retire. We begin with a suggested summary measure of the inducement implicit in the present value of social security benefits. Then we discuss how this sort of measure might be extended to develop a single summary measure that incorporates each of the three aspects of the inducement to retire.

We will be using the incentive measure in time series regressions, so we need to think about the inducement to retire with respect to all older persons who are out of the labor force in a given year. We will consider several alternatives.

First, we want to summarize the SSW faced by persons who are out of the labor force in year t . For simplicity we assume a rather narrow age range for illustration, but the actual age range could be much broader. Assume the first eligibility age is 55. Consider the "average" social security wealth W of all persons aged 55 to R ($R=70$, for example) retired in 1980. Those 55 in 1980 must have retired in 1980 and we want the W of 55 year olds in 1980. Those 56 in 1980 could have retired at 55 in 1979 or at 56 in 1980, so we need $W(55, 1979)$ and $W(56, 1980)$. And we need to weight these wealth numbers by $q(55, 1979)$ and $q(56, 1980)$, where q measures the odds of exposure to those retirement incentives at each age/year. Those 57 in 1980 could have retired at 55 in 1978, or 56 in 1979, or at 57 in 1980.

So we need $W(55, 1978)$, $W(56, 1979)$, and $W(57, 1980)$. And we need to weight these wealth numbers by $q(55, 1978)$, $q(56, 1979)$, and $q(57, 1980)$ respectively.

So in general, when we consider all feasible retirement ages,

$$\bar{W}(y) = \left\{ \frac{\sum_{a=55}^R P(a, y)}{\sum_{b=55}^R P(b, y)} \right\} \left\{ \frac{\sum_{t=0}^{a-55} W(a-t, y-t)q(a-t, a-t)}{\sum_{t=0}^{a-55} q(a-t, a-t)} \right\}$$

where $R = 64$, $P(a; y)$ is the proportion of retired persons at age a in year y and $q(a; y)$ is the labor force participation of person of age a in year y ; 1.

5.3 A more general inducement measure

The disadvantage of the approach laid out above is that it captures only one of the three aspects of the inducement to retire (the benefit level), while ignoring two others (the 1st eligibility age and the PV/OV). We would like to consider a more inclusive index that captures all three aspects of how Social Security systems affect retirement as well as discounting of future benefits. The generalized inducement to retirement measure, \bar{I} is constructed by replacing $W(a; y)$ in the formula above by:

$$I(a, y, \alpha) = W(a, y) + \alpha[W(a, y) - PV(a, y)]$$

where $0 \leq \alpha \leq 1$ is a discounting factor that may vary with age. Note that when $\alpha = 1$ the same weights are given to the terms $W(a, y)$ and $W(a, y) - PV(a, y)$; and, when $\alpha = 0$ we get the W index. Note the eligibility is taken into account, under borrowing constraints, by setting $W(a; y)$ equal to zero for those ages in which the individual is not eligible to retirement. So, finally we get the following formula:

$$\bar{I}(y) = \left\{ \frac{\sum_{a=55}^R P(a, y)}{\sum_{b=55}^R P(b, y)} \right\} \left\{ \frac{\sum_{t=0}^{a-55} I(a-t, y-t)q(a-t, a-t)}{\sum_{t=0}^{a-55} q(a-t, a-t)} \right\}$$

5.4 Assumptions made in incentives calculus

We compute social security incentives for stylized individuals representing cohorts born between 1910 (age 70 in 1980) and 1970 (age 35 in 2005). In order to compute the above incentives we need several ingredients: wage and contributions history and family characteristics.

As regards wage and contributions history we proceed as follows:

- From every year-of-birth and gender cohort in the ECVL2006 sample we construct (when available) the median wage distribution in the period 1981-2005. For example for the group of individuals born in 1940, we recover covered wages from age 41 to 65. In general for individuals born in year j we recover wages from ages 1981- j to 2005- j .
- Given this information, we regress the observed data against age and its square and region.
- Then we predict backwards and forwards in order to obtain a complete year of birth-gender-region wage profiles in the 20-70 age range.
- We consider that the representative individual have contributed for 30 year at age 55, that is they have contributed for 35 year at 60 (the early retirement age) and 40 by age 65 (the normal retirement age).

Regarding the family and other characteristics, we assume:

1. For the male cohorts in sample we initially assume that: (i) they are married with a non working spouse, (ii) their wife is three years younger, and (iii) their mortality corresponds to the baseline male mortality from the official data (INE, 1995).
2. For every female cohort in sample we initially assume that: they are married with a retiree or a worker entitled to retirement benefits, (ii) their husband is four years older, and (iii) their mortality is the baseline female mortality from official data (INE, 1995).
3. In addition, for both men and women, we assume that: (iv) starting at age 55 and until a person reaches 65, there are three pathways into retirement: unemployment benefits for individuals older aged at least 52 (UB52+), disability insurance (DI) and early retirement (ER). At each particular age, the individual has an age-specific probability of going into retirement using any of these three programs. However, we have to take into account the following restrictions:

As for eligibility, we assume:

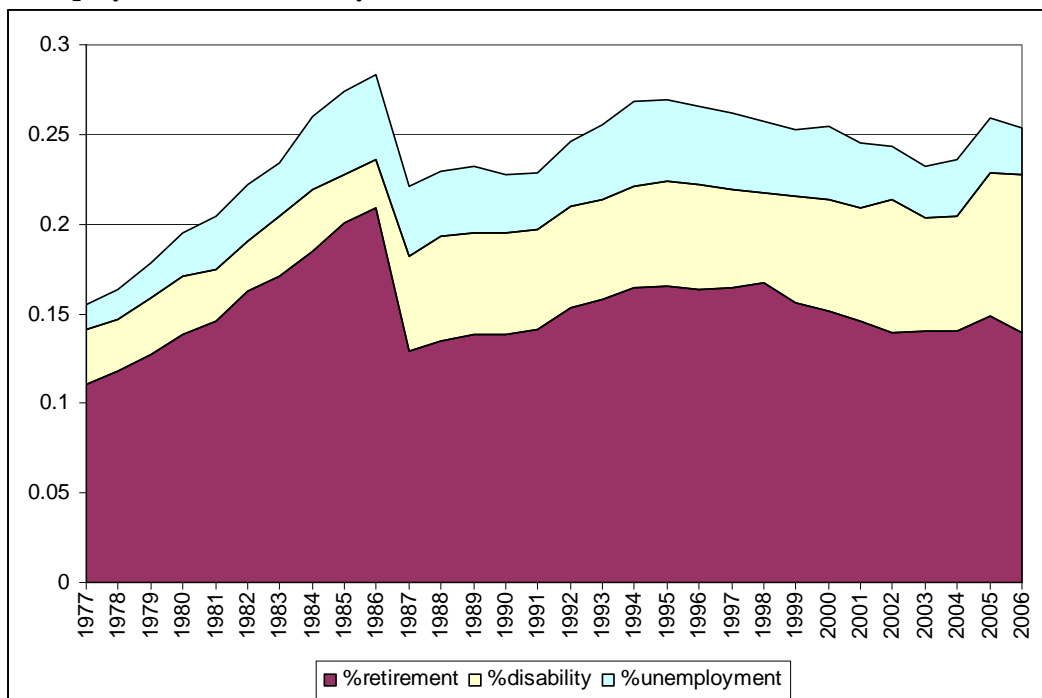
1. A person has no access to the ER program before age 60.
2. After age 60, a person cannot claim UB52+ and can only claim ER or DI benefits.

Finally, the participation and employment rates, as well as the fraction of retirees, are obtained from the Encuesta de Población Activa (EPA) in the period 1977-2006. Moreover, we have used the relative male/female employment rates to build up gender-aggregated incentive measures.

Combining several programs

Figure 6 shows the percentage of individuals aged 55 to 64 that have most likely exit from the labour force, either through normal retirement, disability or unemployment schemes. It can be seen that the percentage that exits through other routes rather than normal retirement is non-negligible, thus in order to estimate a summary measure of the incentives faced by older workers in order to exit their employment, we should also include the incentives that come from other sources.

Figure 6. Percentage of individuals aged 55 to 64 that declare to be retired, unemployed or in a disability scheme.



We would like to weigh the incentives to exit through the different routes using the actual taking rates. Unfortunately, we can only observe the percentage of individuals that are at each state each year, so we have approximated the corresponding weights as follows. We have first selected those individuals who are either employed, unemployed or on a disability scheme. Then, the weight assigned to SSW (normal retirement) is equal to the percentage that employed individuals represent on this selected population. Accordingly, the weight assigned to SSW (unemployment) has been approximated by the proportion that unemployed individuals represent on that population and the weight assigned to SSW (disability) as the proportion that individuals on a disability scheme represent on this selected population. We have further restricted the probability of receiving unemployment SSW to zero for individuals older than 60, and calculate two different indices depending on whether retirement wealth was assumed to be zero earlier than the retirement age.

5.5 Description of Variation

Figure 7. Trends of IBAR under different assumptions on routes into retirement

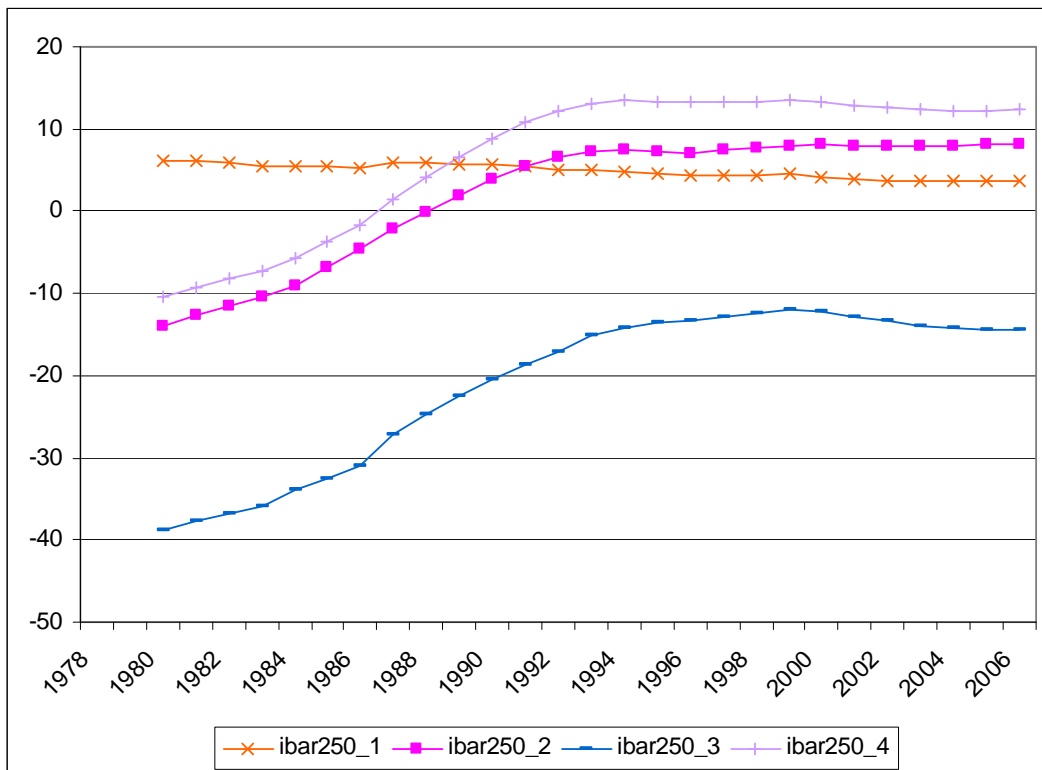


Figure 7 presents the time trend of the incentive variable \bar{I} assuming that alpha equals 2.5 under different assumptions regarding on one hand the effects of different routes into retirement and on the other the value of pension social security wealth before the legal retirement age of 60. The first index (Ibar250_1) assumes that pension social security wealth before the age of 60 equals 0 and that there is only normal retirement as a route into retirement. The different assumption in the second index (Ibar250_2) is that wealth before age of 60 is different from zero. Both the third (Ibar250_3) and the fourth (Ibar250_4) indices include different routes into retirement, but while the third assumes that social security wealth before the age of 60 is equal to 0, the fourth doesn't.

5.6 Incentives regression

In addition to the relationship between the employment of the old and the unemployment of the young, as described above, we would like to estimate the direct relationship between the inducement for the old to leave the labor force and the employment of the young. So we add to the regressions the synthetic measure of the inducement to retirement. In this case, the model to be estimated is the following

$$Y_t = \alpha + \beta \bar{I}_t + \delta X_t + \varepsilon_t$$

6. Results

We finally come to the empirical findings. In order to test whether the old and young Spanish workers are complement or substitute we follow a two-step procedure. In the first step, we test if there is any direct relationship between the labor force participation of the old and the employment and unemployment levels of the young. We estimate both sets of regressions in levels and in 5-year differences, with and without covariates to control for the economic cycle. In the second step, we analyze how the incentives to retire faced by the old directly influence the employment outcomes of the young. However, before obtaining the second set of estimates we compute empirically the value of alpha to be used to weigh the two components of the I-index. The analysis is carried out using data aggregated to the cells in the period 1977 to 2006 (N=30).

6.1 Direct effects of LFP of the old

Table 3 reports the results about the direct effect of the labor supply of older workers on the employment outcomes of the young; the models have been estimated in levels and in fifth differences. The evidence is mixed, although it mostly rejects the substitutability hypothesis. On the other hand, the complementarity hypothesis is also rejected in some specifications, especially when the full set of economic covariates is included. Regarding whether it is more appropriate to use first or higher order differences, comparison of the results shown in tables 4 and 5 suggests that, should any relationship exists, it would be observed using first rather than higher order differences.

Table 3. Estimates of the direct effect (older workers LFP).
Definition of population groups: Young 20-24; prime 25-54; older 55+

	Levels			5-year differences		
	Coef	SE	R ²	Coef	SE	R ²
Covariates: GDP per capita, GDP growth, %manufactures						
Employment young	0.809	0.301	0.738	-0.477	0.284	0.338
Unemployment young	0.298	0.329	0.888	0.618	0.292	0.325
Students	-1.981	0.350	0.964	-0.171	0.365	0.287
Employment prime	0.437	0.077	0.988	-0.271	0.077	0.679
Unemployment prime	-0.609	0.127	0.918	0.422	0.063	0.6346
No covariates						
Employment young	1.061	0.194	0.378	-0.378	0.282	0.058
Unemployment young	-1.176	0.168	0.477	0.391	0.314	0.048
Students	-1.736	0.370	0.311	0.108	0.346	0.006
Employment prime	0.195	0.265	0.014	-0.272	0.083	0.283
Unemployment prime	-0.900	0.052	0.911	0.354	0.084	0.289

On the basis of this evidence one could argue that there exists a positive relationship between the Labor Force Participation of older workers and the employment rate of prime-age individuals, while the association between unemployment and Labor Force Participation is negative. Moreover, there is no evidence supporting the hypothesis that old and young workers are substitute, if anything they are complement.

One may argue that, in Spain, the entry into active labor market participation takes place later than in most countries, hence individuals aged 25 to 29 should be treated as “young” and not considered within the prime age group. In order to test the sensitivity of our results to age grouping, we have replicated the analysis treating people from 20 to 29 as young and

redefining the prime age group accordingly (30-54). The results are shown in table 4, and are consistent with those in Table 3.

**Table 4. Estimates of the direct effect (older workers LFP)
Definition of population groups: Young 20-29; prime 30-54; older 55+**

	Levels			5-year differences		
	Coef	SE	R ²	Coef	SE	R ²
Covariates: GDP per capita, GDP growth, %manufactures						
Employment young	0.734	0.194	0.896	-0.456	0.170	0.674
Unemployment young	-0.143	0.260	0.905	0.611	0.190	0.517
Students	-1.653	0.300	0.953	-0.359	0.397	0.146
Employment prime	0.425	0.074	0.991	-0.221	0.087	0.434
Unemployment prime	-0.603	0.112	0.910	0.413	0.066	0.651
No covariates						
Employment young	0.828	0.251	0.199	-0.548	0.178	0.220
Unemployment young	-1.296	0.129	0.652	0.493	0.224	0.121
Students	-1.271	0.261	0.324	-0.034	0.398	0.001
Employment prime	0.134	0.266	0.007	-0.184	0.088	0.131
Unemployment prime	-0.783	0.051	0.890	0.319	0.082	0.282

The results shown in table 5 exploit the regional variations available in Spain. We estimate the previous models (in levels and in five-year differences, with and without covariates) using information at the Autonomous Communities level. The results are consistent with the evidence reported previously. Once again the evidence differs depending on the set of results analyzed (levels vs 5-year differences), but the R² values suggest a better fit from the equation in levels. In this case, we can see that, regardless of the use of covariates, the evidence suggests a positive association between employment of the young and of prime age individuals and the labor force participation of the old. The same is true for the unemployment rates of these two age groups. Moreover, the percentage of students in the young group is also negatively associated with the labour force participation of the old.

**Table 5. Estimates of the direct effect (older workers LFP) exploiting regional variation
Definition of population groups: Young 20-24; prime 25-54; older 55+**

	Levels			5-year differences		
	Coef	SE	R ²	Coef	SE	R ²
Covariates: GDP per capita, GDP growth, %manufactures						
Employment young	0.541	0.238	0.290	0.017	0.134	0.073
Unemployment young	-0.460	0.093	0.541	0.044	0.120	0.047
Students	-0.403	0.245	0.709	-0.150	0.127	0.042
Employment prime	0.534	0.063	0.889	0.060	0.044	0.035
Unemployment prime	-0.343	0.099	0.486	-0.029	0.036	0.041

No covariates						
Employment young	0.682	0.231	0.217	0.061	0.083	0.002
Unemployment young	-0.618	0.139	0.280	-0.051	0.092	0.002
Students	-0.737	0.174	0.127	-0.025	0.078	0.000
Employment prime	0.444	0.099	0.130	0.051	0.045	0.009
Unemployment prime	-0.434	0.101	0.429	-0.010	0.032	0.001

6.3. Effects from the incentives to retire

Table 6 presents the key result from the analysis both in levels and five-year differences. First, results vary substantially depending of the specification (levels or five years differences). Second, the Ibar variable is much more significant in the specification in levels (with and without covariates). Third, in the specification with covariates the incentive variable works in the correct direction for the LFP of the old, and it is insignificant for the behavior of the young. On the other hand, in the specification with no covariates, the effect of the incentive variable indicates substitutability between the young and the old workers.

Table 6. Estimates of the indirect effect (coefficients of the incentive variable \bar{I}).

	Levels			5-year differences		
	Coef	SE	R ²	Coef	SE	R ²
Covariates: GDP per capita, GDP growth, %manufactures						
LFP old	-0.005	0.000	0.984	-0.006	0.004	0.228
Employment young	-0.001	0.002	0.723	0.019	0.003	0.670
Unemployment young	-0.002	0.002	0.888	-0.025	0.003	0.750
Students	0.010	0.002	0.953	0.003	0.004	0.2875
Employment prime	-0.002	0.001	0.987	0.004	0.001	0.565
Unemployment prime	0.003	0.001	0.910	-0.004	0.002	0.398
No covariates						
LFP old	-0.002	0.000	0.286	-0.002	0.003	0.020
Employment young	0.002	0.001	0.104	0.011	0.004	0.214
Unemployment young	-0.002	0.001	0.100	-0.012	0.005	0.207
Students	0.011	0.001	0.9176	0.008	0.003	0.138
Employment prime	0.005	0.001	0.462	0.001	0.001	0.010
Unemployment prime	0.002	0.000	0.269	-0.001	0.002	0.010

Assumptions: $\alpha=2.5$ and $\gamma=1$, pre-ERA wealth is set to zero and combining exit routes

7 Conclusions

The Spanish pension system has witnessed relatively few changes during the period 1975-2005. In fact, only the changes in the pension formula introduced in 1985 are of some relevance. The recent reform (2002, further modified in 2007) introduced some important changes but the key ones are to be phased out during several years, and a very large fraction of the active workers can still retire under the 1997 rules. This is particularly true for the change in the ERA (from 60 to 61).

The most important changes have been the increase in the generosity of both the minimum and survival pensions, and the introduction (in 1990) of non-contributive pensions. However, these changes only affect the low skilled workers, which are, in practice, scarcely substitutable by younger, and usually much more educated, workers. The pension incentives faced by the average and high earners, who are relatively more substitutable by the educated young, have remained relatively stable since 1985.

This defines a context of "unimportant" reforms (except, perhaps, for the 2006/2007 changes that we cannot study), which severely limits the variation in data. Either for this reason or because there is actually no correlation whatsoever between the two variables, we have found only some (very weak) evidence of a positive relationship between the employment level of the young and the exit from the labor force of older workers.

An interesting potential avenue for further analysis may be the consideration of the regional dimension of the Spanish labor market, which is likely to introduce substantial additional variation in the data.

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APPENDIX

Table A.1. Distribution of retirement pension awards in the 2002-2007 period.

	2002		2003		2004		2005		2006		2007	
	Núm	%	Núm	%	Núm	%	Núm	%	Núm	%	Núm	%
BEFORE 65	68486	40,49	76292	43,83	86265	49,58	89667	42,00	98350	46,47	51371	45,43
WITH PENALTIES	53786	31,8	57228	32,87	58740	33,76	57609	26,98	59655	28,18	30178	26,69
=<60 years	28668	16,95	30504	17,52	28767	16,54	27727	12,99	25588	12,09	11643	10,30
61 years	6092	3,6	6419	3,69	7850	4,51	8145	3,81	9217	4,35	4823	4,27
62 years	8192	4,84	7226	4,15	7098	4,08	8058	3,77	8964	4,24	4682	4,14
63 years	5238	3,1	8171	4,69	7273	4,18	7190	3,37	8789	4,15	4699	4,16
64 years	5596	3,31	4908	2,82	7752	4,46	6489	3,04	7097	3,35	4331	3,83
Without penalty	2836	1,68	3398	1,95	4491	2,58	4943	2,32	4834	2,28	2598	2,30
SPECIAL 64	5045	2,98	4799	2,76	7294	4,19	6187	2,90	6052	2,86	3590	3,17
PARTIAL	6819	4,03	10867	6,24	15740	9,05	20928	9,80	27809	13,14	15005	13,27
65+	100653	59,51	97788	56,17	87710	50,42	123839	58,00	113311	53,53	61710	54,57
TOTAL	169139	100,00	174080	100,00	173975	100,00	213506	100,00	211661	100,00	113081	100,00

Source: Seguridad Social Española (www.seg-social.es)

The Spanish Pension System since 1985

The rules governing since 1985 the old-age and survivors pensions in the RGSS are described below. The changes introduced by the 1997 reform (R97) and the 2002 (A02) amendment will be illustrated as we go along. A summary of the basic technical aspects of the pre- and post-1997 systems can be found in Table 3.

Financing and Eligibility

The RGSS 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. Currently, eleven categories are distinguished, each one with its own ceiling and floor for covered earnings. The current RGSS contribution rate is 28.3 percent, of which 23.6 percent is attributed to the employer and the remaining 4.7 percent to the employee. A tax rate of 14 percent is levied on earnings from overtime work.

Entitlement to an old-age pension requires at least 15 years of contributions. As a general rule, reciprocity is conditional on having reached age 65 and is incompatible with income from any kind of employment requiring affiliation to the Social Security system.

Benefit computation

When eligibility conditions are met, a retiring worker receives an initial monthly pension P_t equal to

$$P_t = \alpha_n BR_t,$$

where the benefit base (*base reguladora*) BR_t is a weighted average of covered monthly earnings over a reference period that consists of the last 8 years before retirement until the 1997 reform. Therefore, the BR_t using 8 years as the number of contributed years is calculated as:

where W_{t-j} and I_{t-j} are earnings and the consumer price index in the j th month before retirement. Pensions are paid in fourteen annual installments, hence the division by 112 in the previous formula. The replacement rate α_n depends on the age of the retirees and on the number of years of contribution. When age is below 60, $\alpha_n = 0$ for all n . For age equal or larger than 65, α_n is equal to

$$\alpha_n = \begin{cases} 0, & \text{if } n < 15, \\ .6 + .02(n - 15), & \text{if } 15 \leq n < 35, \\ 1, & \text{if } 35 \leq n. \end{cases}$$

In the case of early retirement, i.e. for ages between 60 and 65, α_n is determined by the previous formula multiplied by a penalization factor. The latter is equal to 0.60 at 60, and increases of .08 each year, until reaching the value of 1.0 at age 65.

$$BR_t = \frac{1}{112} \left(\sum_{j=1}^{24} W_{t-j} \sum_{j=25}^{96} W_{t-j} \frac{I_{t-25}}{I_{t-j}} \right),$$

Table A2. Technical aspects of the system before and after the 1997-reform

Institutions	RGSS System 1985–1996	RGSS System after 1997
Provisions Affecting All Individuals		
A. Basic ingredients		
A1. The benefit base formula	$\frac{1}{96} \left(\sum_{j=1}^{24} BC_{t-j} + \sum_{j=25}^{96} BC_{t-j} \frac{I_{t-25}}{I_{t-j}} \right)$	$\frac{1}{180} \left(\sum_{j=1}^{24} BC_{t-j} + \sum_{j=25}^{180} BC_{t-j} \frac{I_{t-25}}{I_{t-j}} \right)$
- Contribution period	8 years	15
- Fraction actualized	6 years	13
A2. Fiscal system		
- Income tax	[progressive]	id.
- Labor tax	linear (regime and group specific)	id.
B. Replacement rates		
- Function of contributive years	$\begin{cases} 0, & \text{if } n < 15, \\ .6 + .02(n - 15), & \text{if } 15 \leq n < 35, \\ 1, & \text{if } 35 \leq n. \end{cases}$	$\begin{cases} 0, & \text{if } n < 15, \\ .5 + .03(n - 15), & \text{if } 15 \leq n < 25, \\ .8 + .02(n - 25), & \text{if } 25 \leq n < 35, \\ 1, & \text{if } 35 \leq n. \end{cases}$
- Function of age	$\begin{cases} 0, & \text{if } a < 60, \\ .6 + .8(a - 60), & \text{if } 60 \leq a < 65, \\ 1, & \text{if } 65 \leq a. \end{cases}$	exception for $n \geq 40$: $\begin{cases} 0, & \text{if } a < 60, \\ .65 + .07(a - 60), & \text{if } 60 \leq a < 65, \\ 1, & \text{if } 65 < a. \end{cases}$
Provisions Affecting Particular Individuals		
C. Income tax exemptions		
- Max pension exempted	∞ Minimum wages	id.
- Max income exempted	∞ Minimum wages	id.
D. Min/Max contributions		
- Min level of contribution	(specific for 12 group)	id.
- Max level of contribution	(specific for 12 group)	id.
E. Min and Max pensions		
- Min pension	∞ minimum wages and family specific	id.
- Max pension	4.3 minimum wage (in 1995)	id.
F. Age bonuses		
- Age bonuses	YES (occupation specific)	id.
G. Survivor benefits		
- Survivor benefits	0.45 × (benefit base)	id.
H. Dependant benefits		
- Dependant benefits	18, 22 (means tested)	18, 23 (means tested)
Eligibility		
- Eligibility	2 years contrib. last 10 years	2 out of last 15 years
Pension Computation		
- Pension Computation	$b_t = \max \{ \min \{ \bar{b}_t [n, e, BR(BC, I)], \bar{b}_t \}, \underline{b}_t \}$ where \bar{b}_t is the pension in A + B and \bar{b}_t and \underline{b}_t are respectively the maximum and minimum pension.	
2002 Amendment		
- Scheme for early retirement	$\alpha_n = \begin{cases} 0, & \text{if } a < 61, \\ 1 - \kappa(a - 60) & \text{if } 61 \leq a < 65, \text{ where } \kappa = \begin{cases} 0.08 & \text{if } n = 30 \\ 0.075 & \text{if } 31 \leq n \leq 34 \\ 0.07 & \text{if } 35 \leq n \leq 37 \\ 0.065 & \text{if } 38 \leq n \leq 39 \\ 0.06 & \text{if } 40 < n. \end{cases} \\ 1 & \text{if } 65 \leq a. \end{cases}$	
- Premium for late retirement	$\alpha_n = 1 + 0.02(a - 65)$ iff $n \geq 30$	
- Social Security contributions	No contributions for workers 65+, provided $n \geq 35$	
- Survivor benefits	0.46 × (benefit base)	

Beginning in 1997, the number of reference years used for computing BR_t has been increased by one every year until 2003, to reach a total of 15 years. The formula for computing α_n has been changed to the following

$$\alpha_n = \begin{cases} 0, & \text{if } n < 15 \\ .5 + .03(n - 15), & \text{if } 15 \leq n < 25 \\ .8 + .02(n - 25), & \text{if } 25 \leq n < 35, \\ 1, & \text{if } 35 \leq n. \end{cases}$$

The penalization factors have, basically, remained the same, exception made for workers with 40 or more years of contributions (details in the next subsection). The A02 amendment allows for the possibility of α_n being greater than one when people are above 65 years of age, that is

$$\alpha_n = 1 + .02(a - 65), \quad \text{if } 65 \leq a \quad \text{and} \quad n \geq 35,$$

Outstanding pensions are fully indexed to price inflation, as measured by the consumer price index. Until 1986, pensions were also indexed to real wage growth.

Early retirement

The normal retirement age is 65 but early retirement at age 60 is permitted under fairly common circumstances (61 from the 2002 reform, but phased out to those who have no contributed before January, 1st 1967). The replacement rate for early retirees is reduced by 8 percentage points for each year under age 65. Starting from 1997, workers who retire after the age of 60 with 40 or more contributive years are charged a penalty of only 7 percent for each year under age 65. The 2002 amendment has modified further the rules determining the replacement rate. It now reads as follows

$$\alpha_n = \begin{cases} 0, & \text{if } a < 61, \\ 1 - \kappa(a - 60), & \text{if } 61 \leq a < 65, \\ 1, & \text{if } 65 \leq a. \end{cases}$$

where,

$$\kappa = \begin{cases} 0.08 & \text{if } n = 30, \\ 0.075 & \text{if } 31 \leq n \leq 34, \\ 0.07 & \text{if } 35 \leq n \leq 37, \\ 0.065 & \text{if } 38 \leq n \leq 39, \\ 0.06 & \text{if } 40 \leq n. \end{cases}$$

Unless a collective labor agreement prescribes mandatory retirement, individuals may continue working after age 65. Before 2002 there were no incentives to work past age 65. As mentioned, the 2002 legislation now allows for

$$\alpha_n = 1 + .02(a - 65), \quad \text{if } 65 \leq a \quad \text{and} \quad n \geq 35,$$

and eliminates social security contributions for workers meeting the eligibility criteria for full normal retirement ($a \geq 65$ and $n \geq 35$) and who continue working. About ten percent of the workers enrolled in the RGSS is actually exempt from reduction in the replacement rate in case of early retirement.

Maximum and minimum pension

Pensions are subject to a ceiling, legislated annually and roughly equal to the ceiling on covered earnings. The 2000 ceiling corresponds to about 4.3 times the minimum wage (*salario mínimo interprofesional*, or SMI) and about 1.6 times the average monthly earnings in the manufacturing and service sectors. If the initial old-age pension, computed as above, is below a minimum, then the minimum pension is paid. The latter is also legislated annually. Other things being equal, minimum pensions are higher for those who are older than 65 or have a dependent spouse.

In Spain, the annual value of the minimum guaranteed is discretionarily chosen by the government. In 2005 2.25 millions of contributory pensions topped up (which represents 28.4 % of all pensions (21.7 % in RGSS and 38 of RETA, 28.2 percent of all old-age pensions (36.5 % of widowhood). The percentage of RGSS retirees receiving a minimum pension has been declining steadily, from over 75 percent in the late 1970s to 27 percent in 1995. The ratio between the minimum old-age pension and the minimum wage has been increasing steadily from the late 1970s (it was 75 percent in 1975) until reaching almost 100 percent in the early 1990s. In 2007 the ratio of the minimum benefit for pensioners above +65 (with a dependant spouse) to the Minimum wage was 108, or 92 percent of the average pension. The real rate of growth of the MP in the 1990/2007 was 1.1 percent and 3.86 in the first term of Zapatero, 2004/2007.

Minimum pensions are also very popular for their redistributive properties: “atendiendo al principio de solidaridad que inspira la redistribución de rentas en el sistema

de seguridad social español, los mecanismos establecidos son la garantía de pensión mínima en la esfera contributiva y las pensiones no contributivas.” (informe de estrategia de España, 2005).

Family considerations

A pensioner receives a fixed annual allowance for each dependent child that is younger than 18 or disabled. In 2000, this allowance was equal to 48,420 pesetas for each child under 18, and to 468,720 pesetas (45 percent of the annualized minimum wage) for each disabled child.

Survivors (spouse, children, and other relatives) may receive a fraction of the benefit base of the deceased if the latter was a pensioner or died before retirement after contributing for at least 500 days in the last 5 years. The surviving spouse gets 45 percent of the benefit base of the deceased (46 percent after the 2002 amendment, fraction that will be increased further in the forthcoming years). Such pension is compatible with labor income and any other old-age or disability pension, but is lost if the spouse marries. Each of the surviving children gets 20 percent of the benefit base until the age of 18 (amount raised to 23 percent in 1997). An orphan who is sole beneficiary may receive up to 65 percent of the benefit base. If there are several surviving children, the sum of the pensions to the surviving spouse (if any) and the children cannot exceed 100 percent of the benefit base.

A Spanish peculiarity is the “pension in favor of family members”. This pension entitles other surviving relatives (e.g. parents, grandparents, siblings, nephews, etc.) to 20 percent of the benefit base of the principal if they satisfy certain eligibility conditions (older than 45, do not have a spouse, do not have other means of subsistence, have been living with and depending economically upon the deceased for the last two years). To this pension, one may add the 45 percent survivors pension if there is no surviving spouse or eligible surviving children.

Rules for the Self-employed

In this section we sketch the main differences between the RGSS and the RETA. Beside differences in the SS tax rate and the definition of covered earnings, the people affiliated to RETA and who are not miners or sailors have no early retirement option.

While the SS tax rate is the same for the RETA and the general scheme (28.3 percent in 2000), 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. Not surprisingly in light of the strong progressivity of Spanish personal income taxes, a suspiciously large proportion of self-employed workers report earnings equal to the legislated floor until they reach about age 50 to 55. After that age one observes a sudden increase in reported covered earnings. This behavior exploits the “finite memory” in the formula for the calculation of the initial pension and appears to be fading after the 1997 legislation increased the number of years used in that calculation from eight to fifteen.

A crucial difference with respect to the general scheme is that, under the RETA, reciprocity of an old-age pension is compatible with maintaining the self-employed status. Other important provisions are the following: RETA only requires 5 years of contributions in the 10 years immediately before the death of the principal in order to qualify for survivors pensions. Under RETA, the latter is 50 percent of the benefit base. If the principal was not a pensioner at the time of death, the benefit base is computed as the average of covered earnings over an uninterrupted period of 5 years chosen by the beneficiary among the last 10 years before the death of the principal.

Rules for central government employees (RCP)

We now describe briefly the main differences between the general scheme and the RCP, the pension fund for the employees of the central government. Public servants are divided into 5 categories, labelled from A to E, corresponding loosely to decreasing school levels: A for college graduates, B for people holding certain kinds of college diplomas, C for high school graduates, D for junior high school diplomas, and E for individuals with lower education levels. For each of these categories, the budget law defines every year a theoretical SS wage, which is used to compute SS contributions and pensions. The implied wage scale has remained relatively constant since 1985. The top to bottom ratio never exceeded 2.5.

The basic monthly pension of a public servant who retires in month t after contributing for n years to RCP is computed as $P_t = \alpha_n BR_t$, where the dependence of α_n upon the numbers of years worked has changed frequently over time. For $n \geq 15$, the last table of proportionality factors, legislated in 1990, can be reasonably (but not exactly) approximated by

$$\alpha_n = \min(1, 1 - 0.0366(35 - n))$$

The differences with respect to the general scheme are various. First, while the entitlement to a pension still requires at least 15 years of contributions, the replacement rate (the ratio of the pension to the benefit base) increases somewhat irregularly with seniority up to 100 percent after 35 years. So, for example, 15 years of service give right to a pension equal to only 26.92 percent of the benefit base, against 60 percent of the general scheme. After 30 years the same ratio has increased to 81.73 percent, against 90 percent for the general scheme.

Second, the benefit base is computed as a weighted average of covered earnings upon which the worker paid the contributions, with weights equal to the percentage of the career spent at each level, that is,

$$BR_t = \sum_i p_i H_{it}$$

where p_i is the fraction of the career spent on level i and H_{it} are the covered earnings corresponding to level i , as determined by the current law at time t .

Third, unlike the general scheme, the RCP imposes mandatory retirement at age 65. Exceptions are made for a few special categories, such as university professors and judges. On the other hand, the RCP allows for early retirement at the age of 60, without any penalty for public servants with at least 30 years of service (20 for military personnel).

A fourth important difference with respect to the general scheme is compatibility between RCP pension reciprocity and income from continuing to work. In a number of special cases, RCP pensioners are allowed to keep a public sector occupation, as long as this does not provide them with a “regular flow of income” (for example, this is the case of

members of legislative bodies). More importantly, the legislation allows RCP pensions to be cumulated with earnings from employment in the private sector.