Volume Title: Social Security Programs and Retirement around the World: Reforms and Retirement Incentives

Volume Authors/Editors: Axel Börsch-Supan and Courtney Coile, editors

Volume Publisher: University of Chicago Press

Volume ISBNs: 978-0-226-67410-0 (cloth); 978-0-226-67424-7 (electronic)

Volume URL: https://www.nber.org/books-and-chapters/social-security-programs-and-retirement-around-world-reforms-and-retirement-incentives

Conference Date: December 13-16, 2018

Publication Date: February 2021

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Chapter URL: https://www.nber.org/books-and-chapters/social-security-programs-and-retirement-around-world-reforms-and-retirement-incentives/trends-employment-and-social-security-incentives-spanish-pension-system-1980-2016

Chapter pages in book: (p. 317 – 371)

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# Trends in Employment and Social Security Incentives in the Spanish Pension System, 1980–2016

Pilar García-Gómez, Sílvia Garcia-Mandicó,
Sergi Jiménez-Martín, and Judit Vall-Castelló

## 9.1 Introduction

Labor force participation rates at older ages have been on the rise since the mid-1990s in many Organisation for Economic Co-operation and Development (OECD) countries. In Spain, participation rates of men aged 55 to 64 have increased by almost 10 percentage points over the last decades, while participation rates of women have more than doubled (see panels A and B of figure 9.1). Existing descriptive evidence points to the potential role of changes in the skill composition of workers, favorable economic conditions until the Great Recession, or the effect of wives' labor market participation on the probability that men will retire later (see Coile 2018; García-Gómez, Jiménez-Martín, and Castelló 2018).

Panels C and D in figure 9.1 show the employment rate over time for men and women aged 55 to 59, 60 to 64, and 65 to 69. For men, employment was decreasing for all age groups until the mid-1990s. At the end of the 1990s, the employment rate began to rise until the financial crisis hit in 2008. The result-

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We acknowledge financial support from the Spanish ministry of economy projects ECO2014-52238-R and ECO2017-83668-R and helpful comments from the International Social Security (ISS) group meeting participants and Alfonso Sánchez. For acknowledgments, sources of research support, and disclosure of the authors' material financial relationships, if any, please see https://www.nber.org/chapters/c14199.ack.

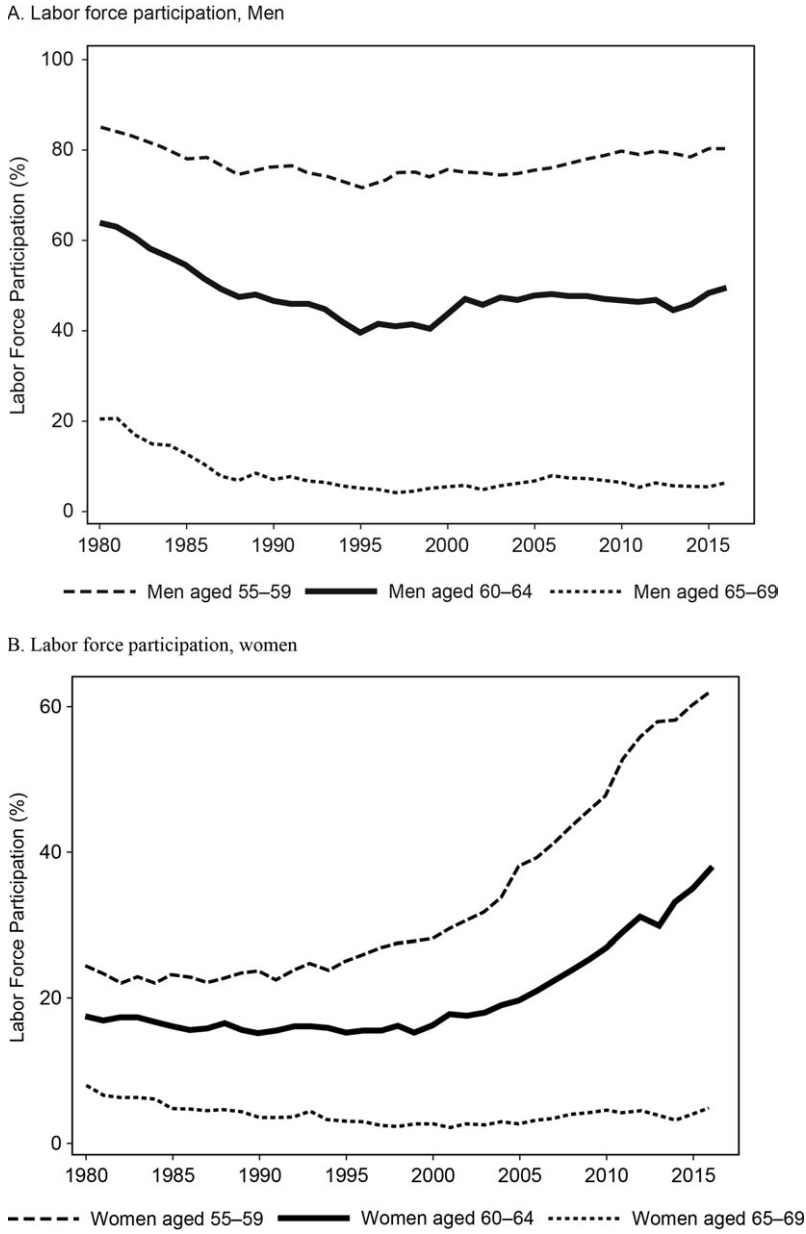
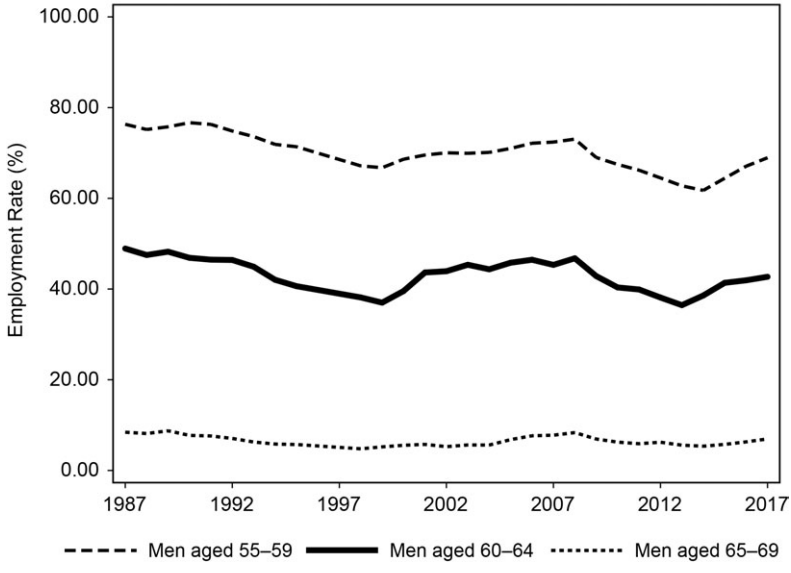



**Fig. 9.1 Trends in employment rates and labor force participation of men and women from 1987 to 2017**

C. Employment rates, Men




D. Employment rates, Women

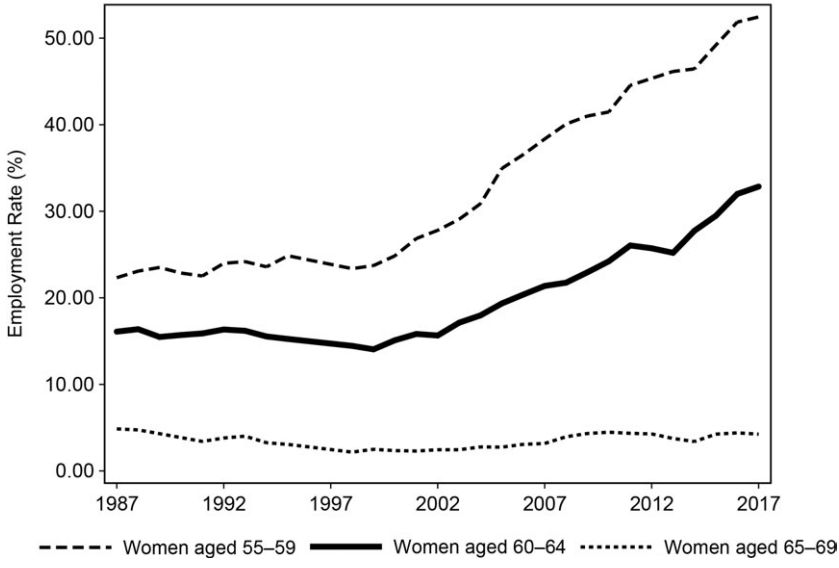



**Fig. 9.1 (cont.)**

ing drop in employment, however, did not translate into lower labor force participation (see panel A of figure 9.1). From 2015 onward, we observe again an increasing trend in employment coinciding with the recovery of the Spanish economy. Both employment and labor force participation of men aged 65 to 69 remained relatively constant at low levels over the entire period. The picture for women aged 55 to 64 is distinctively different. Women experienced flat employment and labor participation trends until the late 1990s, when their employment rate soared (see panels B and D in figure 9.1). These increasing trends continued even during the period of economic recession from 2008 to 2013. As for men, employment and participation rates of women aged 65 to 69 were rather constant at low levels throughout the entire period. In this chapter, we investigate to what extent changes in financial incentives from Social Security (SS) programs can explain these trends.

Changes in the Social Security system, defined as the old-age pension system (OA) as well as unemployment insurance (UI) and disability insurance (DI), have the potential to modify the incentives of workers to retire at a given age. The empirical literature exploring the effect of financial incentives on retirement behavior of employed workers is extensive (Samwick 1998; Gruber and Wise 1999, 2004; Börsch-Supan 2000; Belloni and Alessie 2009). The general finding of this literature is that financial incentives do affect retirement decisions—that is, more generous financial incentives significantly increase the probability of (early) retirement.

A more recent line of research also investigates the responses of unemployed workers to Social Security financial incentives. Coile and Levine (2007, 2011) use US data to investigate how the Social Security system affects the retirement responses of older unemployed workers. Using French data, Hairault, Sopraseuth, and Langot (2010) find that the distance from the statutory retirement age is a key predictor of retirement behavior. Although, in general, the authors find that financial incentives affect retirement behavior, eligibility conditions turn out to be the most important determinant of retirement behavior.

For the Spanish case, the seminal papers by Boldrin, Jiménez-Martín, and Peracchi (1999, 2004) and Jiménez-Martín and Sánchez-Martín (2004) find that financial incentives have a significant effect on retirement probabilities, although the magnitude is small. More recently, Cairó-Blanco (2010); García-Pérez, Jiménez-Martín, and Sánchez-Martín (2013); and Sánchez-Martín, García-Pérez, and Jiménez-Martín (2014), who explicitly consider the behavior of unemployed workers, also find a significant but weak influence of financial incentives on labor force exit. This chapter extends previous work for the Spanish case by analyzing a longer time series (1980–2015), which allows us to cover several reform periods.

We analyze the association between financial incentives and retirement decisions using aggregate data over four decades in Spain. We first compute

expected social security benefits from each possible retirement pathway (OA, UI, and DI) at ages 55 to 69 for a representative worker for each cohort falling in this age range in our observational period. We allow representative workers to differ by marital status, gender, and earnings level. We then move on to calculating the *implicit tax rate on employment*, a measure that weights the gains and losses from working one additional year for each representative worker. Finally, we test the correlation between the implicit tax rate on employment and the employment rates for older workers using both graphical inspection and regression analysis with data aggregated at the regional level. Our results suggest that financial incentives play a role in explaining the retirement patterns of Spanish workers. However, they seem to play a less important role in consistently explaining changes in overall employment rates among older workers. In other words, while aggregate financial incentives are associated with the aggregate exit rate of older workers, other factors seem to play a more crucial role in explaining aggregate employment trends. This is consistent with the descriptive evidence in García-Gómez et al. (2018).

The rest of the chapter is organized as follows. Section 9.2 describes the reforms of the Spanish social security system over the last three decades. Section 9.3 explains the measurement of the Social Security incentives and the assumptions behind our calculations. Section 9.4 reports the resulting calculations, and section 9.5 analyzes the relationship between the Social Security incentives and employment rates since 1980. Section 9.6 concludes.

## 9.2 Reforms in the Spanish Social Security System

### 9.2.1 Changes in the Old-Age Pension System

The Spanish old-age pension system is a defined benefit pay-as-you-go system. There have been several reforms of the system over the last 30 years, which we briefly summarize here (see table 9.1 for a summary and Boldrin, García-Gómez, and Jiménez-Martín 2010 and García-Gómez, Jiménez-Martín, and Castelló 2012 for a detailed exposition of the changes in the old-age pension system in Spain). We start describing the system before the 1985 reform. Since this reform, there have been substantial parametric reforms in 1997, 2002, 2007, and 2011 and a nonparametric reform in 2013. Figure 9.2 depicts the timeline of the reforms of the Spanish social security system from 1980 until 2015 as well as the main parameters that were modified in each of the reforms.

#### *9.2.1.1 The System before the 1985 Reform*

As described in Boldrin et al. (1999), the transition from the old *Mutualidades* system to a system of Social Security contributions was completed in

**Table 9.1** Main reforms of the old-age pension system in Spain since 1980

| Year of the reform | Main changes |
|---|---|
| 1985 | Minimum mandatory annual contributions increase from 8 to 15<br>Number of contributive years used to compute the pension increases from 2 to 8<br>Several early retirement schemes introduced; partial retirement and special retirement at age 64 |
| 1997 | Number of contributive years used to compute the pension increases from 8 to 15 (progressively by 2001) |
| | Formula for replacement rate made less generous. |
| | 8 percent penalty applied to early retirees between ages of 60 and 65 reduced to 7 percent for individuals with 40 or more contributory years |
| 2002 | Early retirement only from age 61 |
| | Impulse partial retirement; possible to combine it with work |
| | Unemployed aged 61 can retire if contributed for 30 years and the previous 6 months registered in employment offices |
| | Incentives to retire after age 65 |
| 2007 | 15 "effective" contributory years used to calculate the pension |
| | Reduction from 8 percent to 7.5 percent of the per-year penalty applied to early retirees between 60 and 65 for individuals with 30 contributory years |
| | Broaden incentives to stay employed after age 65 |
| | Increase contributions made by the social security administration for individuals receiving the special scheme of UA for 52+ (they will receive a higher old-age pension when retiring) |
| 2011 | Number of contributive years used to compute the pension increases from 15 to 20 |
| | Normal retirement age increases from 65 to 67 |
| | Eligibility conditions for early retirement modified |
| 2013 | Introduction of sustainability factor (SF)<br>Intergenerational equity factor<br>Pension revaluation index |

1979 with the removal of *bases tarifadas* (fixed covered wages). The crucial ingredients of the system until 1985 were as follows:[1]

- The earliest eligibility age was 60, and the statutory eligibility age was 65 if the individual did not have any job that required affiliation with the social security system.

1. See Boldrin et al. (1999, 2004) for other details regarding disability and survivor pensions.

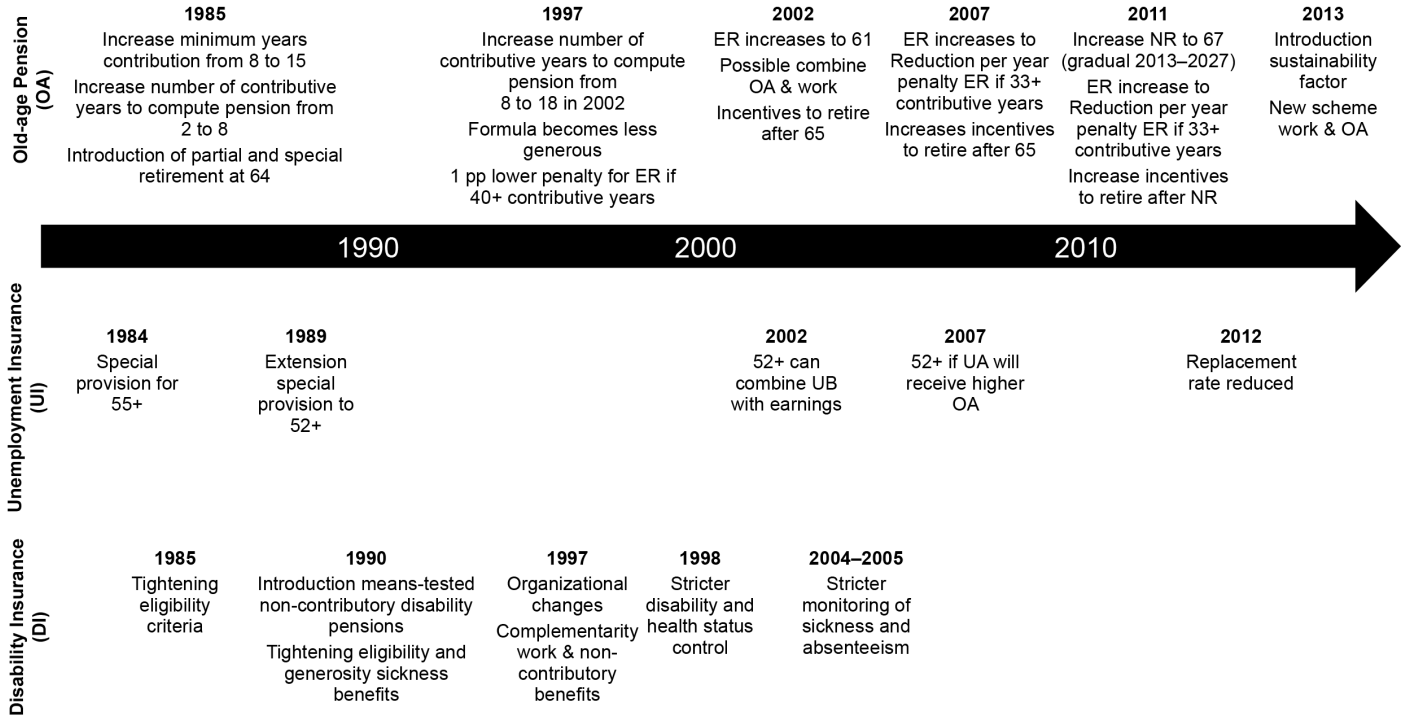



**Fig. 9.2** Timeline of the reforms of the Spanish social security system

- A minimum of 10 years of contributions was required to gain access to a contributive pension.
- The pension was calculated on the basis of three elements: (1) the average of the contributions in the 24 months preceding retirement, (2) the penalty for early retirement (8 percent per year anticipated), and (3) the penalty for insufficient contributions (2 percent per year not contributed; full benefit reached with 35 contribution years).

#### *9.2.1.2 The Old-Age Pension System after the 1985 Reform*

The key elements of the Spanish pension system prevailing until 2011 were set in 1985. Eligibility for the old-age benefits increased from 10 to at least 15 years of contributions to the system. The pension amount was calculated by multiplying a regulatory base by a percentage, which depended on the age of the individual and the number of years contributed to the system. Under the 1985 regime, the regulatory base was obtained by dividing by 112 the wages of the last 96 months (8 years) before retiring, and the percentage applied to this regulatory base depended on the number of years of contributions ($n$) as follows:

$$\begin{cases} 0, \textit{ if } n < 15 \\ .5 + 0.03(n - 15), \textit{ if } 25 > n \geq 15 \\ .8 + 0.02(n - 25), \textit{ if } 35 > n \geq 25 \\ 1, \textit{ if } n \geq 35 \end{cases}.$$

The pension amount was capped from below by the minimum pension (see Jiménez-Martín 2014 for details) and from above by the maximum benefit (between four and five times the minimum wage).

#### *9.2.1.3 The 1997, 2002, and 2007 Reforms*

In 1997, the number of contributory years used to compute the benefit base was progressively increased from 8 to 15 years in 2002, and the formula to calculate the replacement rate was made less generous. On the other hand, the 8 percent penalty applied to early retirees between the ages of 60 and 65 was reduced to 7 percent for individuals with at least 40 years of contributions at the time of early retirement.

In 2002, further changes were introduced. Before 2002, only individuals who had contributed to the system earlier than 1967 could benefit from early retirement at 60, while the rest had to wait until the statutory eligibility age of 65. In 2002, early retirement at 61 was made available for the rest of the population. At the same time, there was an impulse toward partial and flexible retirement with the possibility of combining income from work with old-age benefits and the introduction of incentives for individuals to

retire after the statutory eligibility age of 65.[2] At the same time, the possibility to access retirement was extended to individuals unemployed for reasons beyond their willingness at 61 and who had contributed for at least 30 years and had been registered in the employment office for the previous six months.

In 2007, the incentives to retire later than 65 were further increased by providing an additional 3 percent instead of the 2 percent agreed upon in 2002. The 8 percent penalty applied to early retirees between the ages of 60 and 65 was reduced to 6 to 7.5 percent, depending on the number of years contributed, for individuals with at least 30 years of contributions. In addition, the contributions for unemployed workers older than 52 were increased so that they would receive a higher old-age pension when retiring.

Although these reforms tried to increase the labor supply of older male workers, the existing evidence (see, e.g., Cairó-Blanco 2010; García-Pérez et al. 2013) does not show any clear link between these reforms and the increased labor supply of older male workers.

#### *9.2.1.4 The 2011 Reform*

The discouraging demographic and labor market scenarios prevailing during the first years of the great recession led the Spanish government (forced by EU pressure to reduce the future deficit) to deeply reform the pension system in 2011. Two main elements were targeted: (1) the number of contributive years in the pension calculation was increased from 15 to 25, and (2) the statutory eligibility age was raised from 65 to 67, gradually. The latter was particularly relevant for Spain, since the statutory eligibility age had not been modified since the year it was first established in 1979. These two changes severely cut the generosity of the pension system (see Sánchez 2017 for a recent evaluation). The reform also restricted the eligibility conditions for early retirement, although the effect of this change on the generosity of the system is less clear. In particular, because the reform barely changed the eligibility conditions to access the minimum pension, workers expecting to receive the minimum pension (i.e., workers with low income and short contributive careers) were less affected by the reform (Jiménez-Martín 2014).

The Spanish case is far from isolated, as most European countries have initiated or are about to initiate a process of pension reforms (EU 2012). Reforms mostly involve the following three elements: (1) a delay in the statutory eligibility age, together with relaxing the requirement to make compatible work and pension income; (2) a reduction of the system's generosity; and

2. An additional 2 percent per each year of contribution beyond the age of 65 for workers with at least 35 years of contributions on top of the 100 percent applied to the regulatory base.

(3) the introduction of a sustainability factor, which adds some uncertainty to the final benefit, thereby transitioning the system from a defined benefit to a defined contribution model. The 2011 Spanish reform (law 27/2011), which included elements (1) and (2) above, may have not been sufficient to alleviate the medium-term financial pressure on the pension system (Díaz-Giménez and Díaz-Saavedra 2017; Sánchez 2014).

#### *9.2.1.5 The 2013 Reform and the Sustainability Factor*

In an attempt to stabilize the short- and long-term financial sustainability of the Social Security system, the Spanish government amended the 2011 reform in 2013. In particular, this amendment introduced a sustainability factor (SF), which links the initial pension level to the evolution of life expectancy (Conde-Ruiz and González 2013). This mechanism can be seen as transforming defined benefit schemes into defined contribution schemes.

The SF has two key components: the intergenerational equity factor (IEF) and the pension revaluation index (PRI). The aim of the IEF is to provide equal treatment to those who retire at the same age and with the same employment history but with different life expectancies (which are specific to the cohort they belong to). The introduction of this factor didn't give rise to much controversy, since it was perceived as reasonable that if pensioners were to receive the same total pension throughout their retirement, an individual with a greater life expectancy should receive a little less each year. The second factor, the PRI, fixes a budgetary constraint on the economic cycle and, as such, is relatively flexible in the short term. However, the discretionary rule chosen by the government guarantees that even if Social Security revenues are insufficient to cover pension costs, pensions will rise each year by at least 0.25 percent and by no more than the annual change in the consumer price index (CPI) + 0.25 percent.

We expect the 2011/2013 pension reform to incentivize the labor supply of older workers in Spain by reducing benefit expectations and including incentives to work longer (partial benefit compatibility after the normal retirement age; Sánchez 2014).

#### *9.2.1.6 Evolution of Key Parameters*

To conclude this section, we show the temporal evolution of the key parameters of the old-age pension system. Panel A in figure 9.3 shows the increase in the years of contributions included in the benefit calculation. Reform years are marked with a vertical dashed line. We see that after the reforms in 1985, 1997, and 2011, the number of years included increased staggeringly. Panel B shows the earliest and statutory eligibility pension ages. The latter has only increased at the end of the period with the reform of the pension system in 2011. The earliest eligibility at age 60 was initially only available for those who started contributing before January 1967. In 2002,

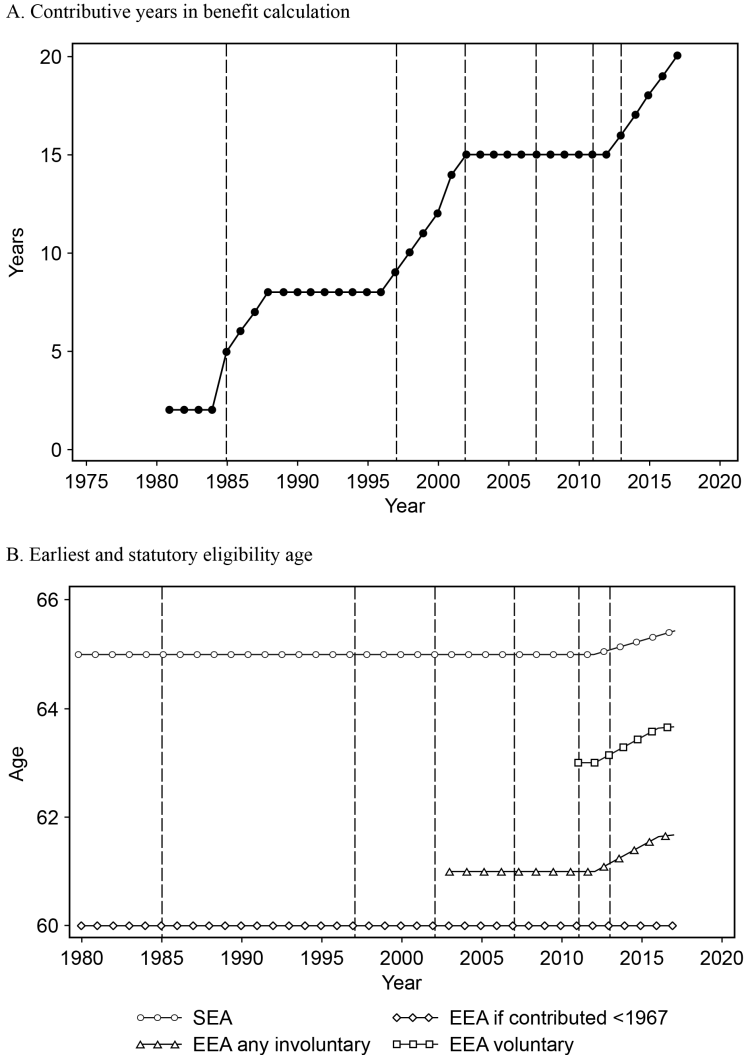



**Fig. 9.3 Time trends of key parameters**

early retirement at age 61 was introduced for all other workers. In 2011, this possibility became restricted to situations of involuntary retirement. At the same time, the earliest eligibility age for voluntary retirement was set at 63. Panel C shows the increasing trend in the ratio of minimum benefit to minimum wage, highlighting the generosity of the Spanish pension system. This trend was reverted with the 2013 reform and the introduction of the SF. Panel D shows the ratio of the minimum to the maximum benefit. Since the early

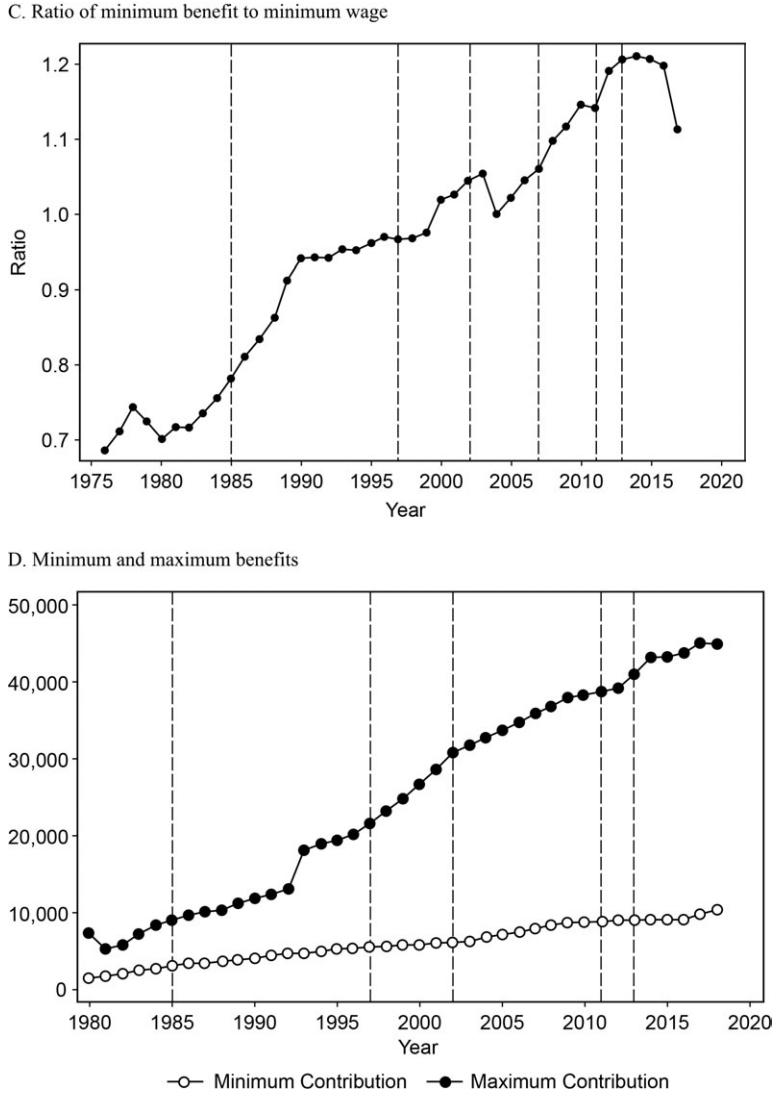



**Fig. 9.3 (cont.)**

1990s and, in particular, after the 1997 and 2002 reforms, the gap between minimum and maximum benefits widens over time. This tendency seems to have been curbed with the 2013 reform.

### 9.2.2 Reforms in the Disability and Unemployment System

Another factor that may affect the labor market behavior of older workers is disability and unemployment insurance policies (García-Gómez, Jiménez-

Martín, and Castelló 2012). In what follows, we summarize the main reforms of both the disability and unemployment systems in Spain.

#### *9.2.2.1 Disability Insurance*

Permanent disability benefits were used extensively as an early retirement mechanism for workers in restructuring industries (such as shipbuilding, steel, mining, etc.) or as a substitution for long-term unemployment subsidies in depressed regions during the late 1970s and 1980s (OECD 2001), which resulted in an increase in the inflows into the disability system and permanent disability benefits.

These events prompted a number of reforms introduced during the second half of the 1980s and the beginning of the 1990s (see table 9.2 for a summary). The main objective of these reforms was to abolish the incentive effects to permanently leave the labor market before reaching the statutory eligibility age for retirement through the disability system. Here we focus on some distinctive features of the main reforms since the creation of the National Institute of Social Security (NISS) in 1979, while we refer the reader to table 9.2 for a summary of all the reforms in the disability system in Spain during this period.

The first large disability insurance reform took place in 1997 and included four main points:

1. Sickness benefits: stricter control of the sickness status by Social Security physicians, a reduction of the level of long-term sickness benefits, and the replacement of the old job assessment with a more objective definition of the usual occupation of the individual.
2. Permanent disability pensions of individuals aged at least 65 were automatically transferred to the old-age pension system. This was just a change in the classification within the pensions system.
3. Organizational reform: all the issues related to disability insurance were transferred to the NISS. The permanent disability status was, in the past, assessed and granted by local GPs, and this reform created a group of experts (the disability assessment team inside the NISS) that was in charge of assessing applicants' ability to work on the basis of the available medical files and a medical assessment from an NISS physician.
4. The claimant no longer lost entitlement to noncontributory disability benefits if she started working. She would remain entitled to receive noncontributory disability benefits in case of job loss.

In addition to this major reform in 1997, the 1998 budget law introduced the possibility for NISS physicians and mutual insurance companies to review the health situation and status of beneficiaries. Effectively, very few claimants in the permanent disability system effectively exited the program.

In 2004 and 2005, monitoring of the use of sick leave was tightened with the creation of a new subdepartment at the NISS and a new monitoring tool

**Table 9.2** **Main reforms of the disability insurance and unemployment systems in Spain since 1980**

| Year of the reform | Main changes |
|---|---|
| 1984 | Introduction of temporary contracts and noncontributory unemployment benefits (also called unemployment assistance benefits)<br>**Special provision** for **workers 55+** to receive unemployment assistance benefits until retirement age<br>Eligible if satisfying the old-age pension entitlement requirement except for the age<br>Paid 75 percent of the minimum wage<br>Years spent under this scheme counted as contributive years toward an old-age pension |
| 1985 | Tightening of eligibility criteria for DI |
| 1989 | Extension of special provision for older workers to all **workers 52+** |
| 1990 | Introduction of **means-tested noncontributory disability pensions** for people aged 65+ and for disabled people aged 18+ who satisfy residency requirements |
| | **Sickness benefits:** |
| | Stricter control of the sickness status by doctors of the social security system |
| | Reduction of the level of long-term sickness benefits |
| | Replacement of the old own job assessment by a more objective definition of the usual occupation of the individual |
| 1997 | **Permanent disability pensions individuals 65+** automatically converted to old-age pensions |
| | **Organizational change; creation of the National Institute of Social Security (NISS):** |
| | Disability assessed by benefit administrators based on a medical assessment performed by the NISS's own doctors |
| | **Complementarities between work and benefits:** |
| | Entitlement to noncontributory benefits not lost if working and can be collected if losing the job |
| 1998 | Possibility for NISS doctors and mutual insurance companies to review health situation of beneficiaries |
| 2002 | Individuals aged 52+ receiving unemployment benefits could combine the receipt of these benefits with earnings (50 percent of the total benefits paid by the employer, and 50 percent paid by the Social Security) |
| | Extension of program that helps integrate people into the labor market to all individuals aged 45+ who have been unemployed for one month and to people with disabilities, among others. |
| 2004–2005 | Stricter monitoring of sickness and absenteeism through creation of a department at the NISS; general absence control put in place when duration of absence was greater than six months; possibility to combine noncontributory disability with some earnings |
| 2007 | Increase contributions made by the social security administration for individuals receiving the special scheme of UA for 52+ (they will receive a higher old-age pension when retiring) |
| 2012 | Replacement rate reduced from 60 percent to 50 percent after 180 days of unemployment spell—for first six months, kept constant at 70 percent—for all unemployment spells starting after July 15, 2012 |

to reduce absence rates. In 2005, a general absence control was put in place for cases of absenteeism longer than six months.

Finally, at the end of 2007, the minimum contributory period to access permanent disability pensions was reduced for young workers in order to adjust for the current later entrance into the job market. At the same time, the formula to calculate the regulatory base of the benefit was slightly modified: since then, the regulatory base of permanent disability due to a common illness decreased by 50 percent if the individual had not contributed at least 15 years, and it is lower the further the individual is from age 65.

All these reforms ensured the financial stability of the disability system in Spain, as inflow rates have remained stable compared to the dramatic increase experienced by other industrialized countries.[3]

#### *9.2.2.2 Unemployment Insurance*

In 1984, the government introduced unemployment benefits for workers employed in temporary contracts and noncontributory unemployment benefits (also called unemployment assistance benefits). In addition, it established a special provision for workers aged over 55 who were allowed to receive unemployment assistance benefits until the claiming age. To receive these benefits, individuals had to satisfy the entitlement requirements of the retirement pension, except for the age. The subsidy paid 75 percent of the minimum wage until reaching the age to be transferred to the old-age pension system. Furthermore, the years spent unemployed under this special scheme were counted as contributive years toward an old-age benefit.

In 1989, the special provision of unemployment assistance benefits until the statutory eligibility age of 65 for individuals aged at least 55 was extended to individuals aged 52, thus increasing the incentives for older workers to leave the labor market at younger ages.

The reform in 2002 opened up the possibility for individuals aged at least 52, receiving unemployment benefits, to combine the UI payments with earnings. They could receive 50 percent of their previous unemployment insurance entitlement, and the employer would pay the remaining amount in wages.

Finally, in 2012, the amount an individual receives from unemployment insurance after the first six months was reduced from 60 to 50 percent of previous earnings.

## 9.3 Measurement of Social Security System Incentives

The Spanish social security system provides different incentives to leave the labor market at different ages and over time, as detailed in the previous section. In this section, we explain the measures we use and the assumptions

3. See Jiménez-Martín, Mestres, and Castelló (2018).

we make to capture the impact of social security programs on retirement decisions.

### 9.3.1 Definitions and Methodology

The key concept used to assess the impact of social security programs on retirement decisions is the annual accrual of social security wealth (SSW), which is the present discounted value of lifetime social security benefits. For an individual of type $i$, where the type is defined by her gender, skill level, and marital status, starting to claim benefits from program $k$ at age $R$, her social security wealth is defined as

$$SSW_{k,t}(R,i) = \sum_{a=R}^{T} B_{k,t,a}(R,i)\sigma_{t,a}\beta^{a-R}, \tag{1}$$

where $\sigma_{t,a}$ is the survival probability at age $a$ in year $t$, $T$ is the maximum length of life, and $\beta^{a-R}$ is the discount factor set at a rate of 3 percent.

Postponing claiming by one year has two effects on SSW. On the one hand, annual benefits $B_{k,t,a}(R,i)$ increase with later claiming due to additional contributions and actuarial adjustments. On the other hand, however, benefits are received one year less. We thus define the accrual of SSW as

$$ACC_{k,t}(R,i) = SSW_{k,t+1}(R+1,i) - SSW_{k,t}(R,i). \tag{2}$$

The social security system provides incentives to retire when $ACC_{k,t}(R,i) \leq 0$ and to continue working otherwise—that is, when the accrual of SSW is negative, the social security system imposes an implicit tax on working longer and claiming later. We define the resulting implicit tax rate as the (negative) ACC divided by the after-tax earnings obtained during the additional year of work ($Y_{t+1,1}$):

$$ITAX_{k,t}(R,i) = -\frac{ACC_{k,t}(R,i)}{Y_{t+1,i}}. \tag{3}$$

Finally, we also consider the replacement rate, $rr$, defined as the ratio of the initial benefit to the last wage, for (planned) retirement at age $R$:

$$rr(R,i)_{k,t} = B_{k,t}(R,i)/Y_{t-1,i}. \tag{4}$$

### 9.3.2 Assumptions and Scenarios

In order to compute SSW and its corresponding accrual and implicit tax rate, we take the following steps.

We first calculate the previously defined measures for 12 different types of individuals: men, women of three different earnings levels, and two marital statuses (married and single). We thus evaluate the retirement incentives for low-earner males and females, median-earner males and females, and high-earner males and females. The earnings profiles are based on educational attainment. In particular, low earners are those workers having up

to some secondary education, median earners are those having at most completed upper secondary education, and high earners are those having tertiary education. We consider three potential pathways to retirement: old age, unemployment, and disability insurance. Figure 9.4 shows the share of the population aged 55 to 69 that reports being, in any given year, in to unemployment or disability or receiving an old-age pension, obtained from the Spanish Labor Force Survey (Encuesta de la Poblacion Activa, EPA).[4] DI and UI represent about 20 percent of all transitions to retirement, with an increasing trend in recent years.

In order to construct the financial incentive measures, we first obtain age-earnings profiles for each of our six types of workers (married and single workers do not differ in their earnings profiles). We define low earners as workers with, at most, lower secondary education (low skilled); median earners as workers with upper and/or postsecondary education (medium skilled); and high earners as workers with tertiary educations (high skilled). We use two different age-earnings profiles. First, and given the comparative nature of the whole project, we use a synthetic earnings profile obtained from earnings of the US Current Population Survey (CPS), the German Socio-economic Panel (GSOEP), and administrative data from the Italian pension system (INPS) for 2016. Using these data, we compute a simple average of the median income separately for three earnings levels and by gender. We then rescale this synthetic profile so that earnings at age 50 are one and multiply them by the Spanish median annual earnings at age 50 reported in the Spanish working histories survey (Muestra Continua de Vidas Laborales, MCVL)[5] in 2014 for the respective sex and earnings groups. We refer to this earnings profile as the *common earnings profile* and use it in our main incentive calculations.

Second, we use a time-invariant Spanish earnings profile based on the Spanish median earnings by age, gender, and earning level in 2014, calculated from the MCVL. We take the median earnings of workers in each category to calculate the earning-specific wage profile. We refer to this earnings profile as the *Spanish earnings profile*.

For both earnings profiles—that is, common and Spanish—we deflate/inflate the cross-sectional earning profile obtained (for 2014) to construct the earnings profiles of workers in earlier years (from 1980 to 2013) and in 2015.

4. 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 approximately 150,000 adult individuals. Although the survey has been conducted since 1964, publicly released cross-sectional files are available only from 1977. The 1977 questionnaire was modified in 1987 (when a set of retrospective questions were introduced), in the first quarter of 1992, in 1999, and in 2004. The EPA provides fairly detailed information on labor force status, education, and family background variables, but it does not include information on earnings. The reference period for most questions is the week before the interview.

5. The MCVL is a random draw of the stock of Social Security affiliates (4 percent of the total) and provides information on employment and unemployment spells of the entire labor history.


**Fig. 9.4 Pathways to retirement for men and women from 1975 to 2016**

*Notes:* Data obtained from the shares of males and females in each pathway from the EPA. There was a major change in the survey in 1988, so we cannot obtain a consistent definition of the different pathways prior to 1988. We then normalize each share in this time interval to the level in 1988.

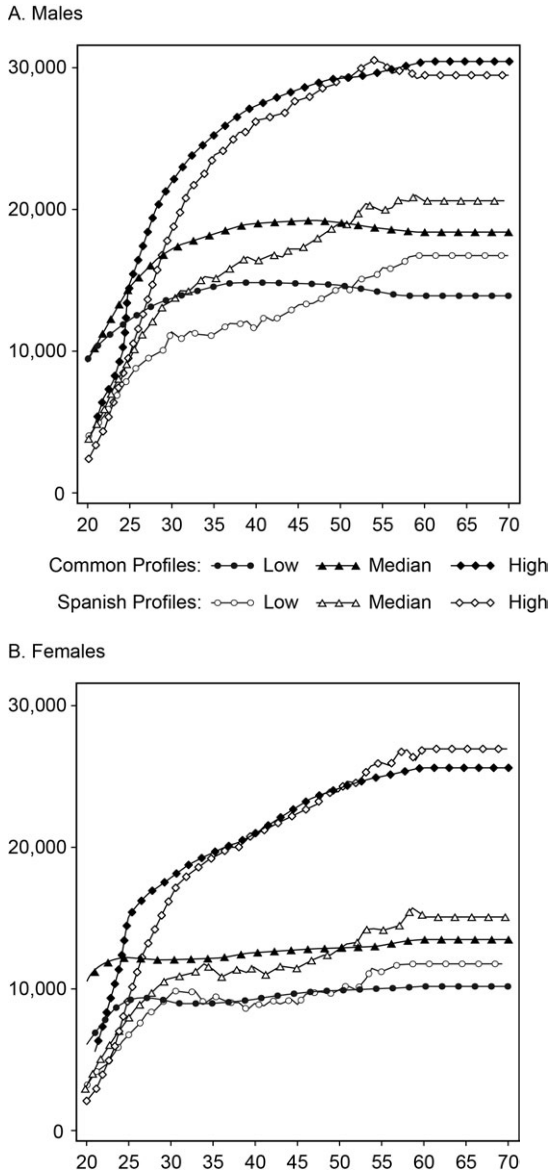



**Fig. 9.5 Common and Spanish earning (real) profiles for a worker born in 1925**

Figure 9.5 shows how the two earning profiles compare for male and female workers born in 1925, by different earning levels. We note that for high earners, the common earnings profile follows the Spanish time-invariant one quite closely. However, the common earnings profiles of median and low earners are much flatter than what we observe for the one based on Spanish workers.

We construct survival probability curves for each type of worker using average EU-28 survival rates (Eurostat 2016). The underlying life expectancy at age 15 is 67.8 years for women and 64.7 years for men. We adjust these survival curves for differences in life expectancy across skill levels. In particular, we generate a life expectancy that is three years higher (lower) to reflect the difference in life expectancy across the three earnings categories (Van Baal et al. 2016; Regidor et al. 2016).[6]

All calculated magnitudes are net of social security contributions and personal income taxes. Exact calculations of after-tax social security wealth and replacement rates are complicated by the fact that the number of bend points in the Spanish marginal tax schedule is high, although decreasing over time (34 in 1985, 17 in 1995, 7 in 2011, and 5 in 2016). As an approximation, we proceed as follows. We first use the 1995 tax schedule to trace out the relation between the average tax rate (net of standard deductions) and income (net of social security contributions paid by a worker). We then fit by least squares a fourth-order polynomial to this relation. Finally, the estimated coefficients are used to determine after-tax earnings for all previous and subsequent years.

The following sections present the results of the social security incentives calculations using the previous definitions and assumptions. We show measures of financial incentives by type of worker, age or cohort, and route into retirement. In addition, we also present some aggregate measures using the following weights. First, we aggregate the old-age, DI, and UI pathways to retirement using as weights the population share that moves in a given year from employment to retirement through each of the three programs, as presented in figure 9.4. As we have information on these shares over time and gender, we are able to attribute a particular weight to each gender-age time observation. The second step is to aggregate the retirement incentives over gender, earnings level, and age. We obtain population data by age, gender, and earnings level over time from Eurostat (Eurostat 2016) and construct sample averages by gender and earnings level for each age over time. We use these sample averages as the second weight to compute aggregate retirement incentives.

## 9.4 Social Security Incentives over Time

In order to ease the explanation of how the different components of the Spanish social security system shape financial incentives to retire over time and facilitate comparison with the evolution in other countries, most of our results are presented for a base-case worker. This worker is a male median earner born in 1925. In addition, we focus on the social security incentives

6. The measures of financial incentives remain practically unchanged using Spanish survival rates in 2014. Results are available upon request.

for workers retiring through the old-age pension pathway, but we present a comparison of the incentives for workers retiring through the disability or unemployment pathway in subsection 9.4.7.

### 9.4.1 The Base Case

Our base case is a male worker at the median earnings level born on January 1, 1925, who has been contributing to social security without interruption since he turned 20 on January 1, 1945. He reaches the earliest eligibility age of 60 in 1985 and the statutory eligibility age of 65 in 1990. He is married to a woman who is three years younger than he is and has never worked, and they have no dependent children.

Simulations start in 1980, when our base-case worker turns age 55 and completes 35 years of contributions, and run for each year until he turns 69 in the year 1994.

Our basic assumptions are the following. First, if the worker stops working before age 60, then he chooses to first claim his old-age pension benefits at age 60, the earliest eligibility age, whereas if he stops working past age 60, then he starts receiving his old-age pension immediately. Second, if he stops working before age 60, then he receives no benefits or unemployment compensation in the interim years until he starts drawing old-age benefits.

It may be worth summarizing the main qualitative effects of working one more year beyond age 60 in the simulations we are about to present: (1) It may increase social security benefits by increasing the benefit base or the replacement rate. The benefit base increases if earnings from the extra year of work exceed average earnings during the last eight years. The replacement rate increases if the worker has contributed for fewer than 35 years, in which case an extra year of work buys an extra 2 percent of the benefit base. If the worker has already contributed for 35 years, as in the base case, only the effect on the benefit base is relevant. (2) It reduces the penalty for early retirement by 8 percentage points. (3) It reduces by one year the expected period over which the worker will receive a pension. (4) It implies paying additional social security contributions. (5) The marginal tax rate on labor income may turn out to be higher than the marginal tax rate on pension income, owing to the high progressiveness of the Spanish income tax schedule.

Figure 9.6 depicts the computed replacement rate, social security wealth, accrual of social security wealth, and implicit tax rate at each age between 55 and 69 for our base case. Social security wealth and its accrual are net of income taxes and presented in €1,000 at 2015 prices.

The replacement rate is zero before reaching 60, the earliest eligibility age for retirement. It then increases gradually, converging to one and exceeding it slightly by age 65. SSW starts up at €92,982, remains flat until reaching 58, and increases steadily, peaking at 65 with a value of €260,958. This increase is due to a very progressive reduction of the penalty for early retirement (effect 2) and the reduction in one year in the expected period

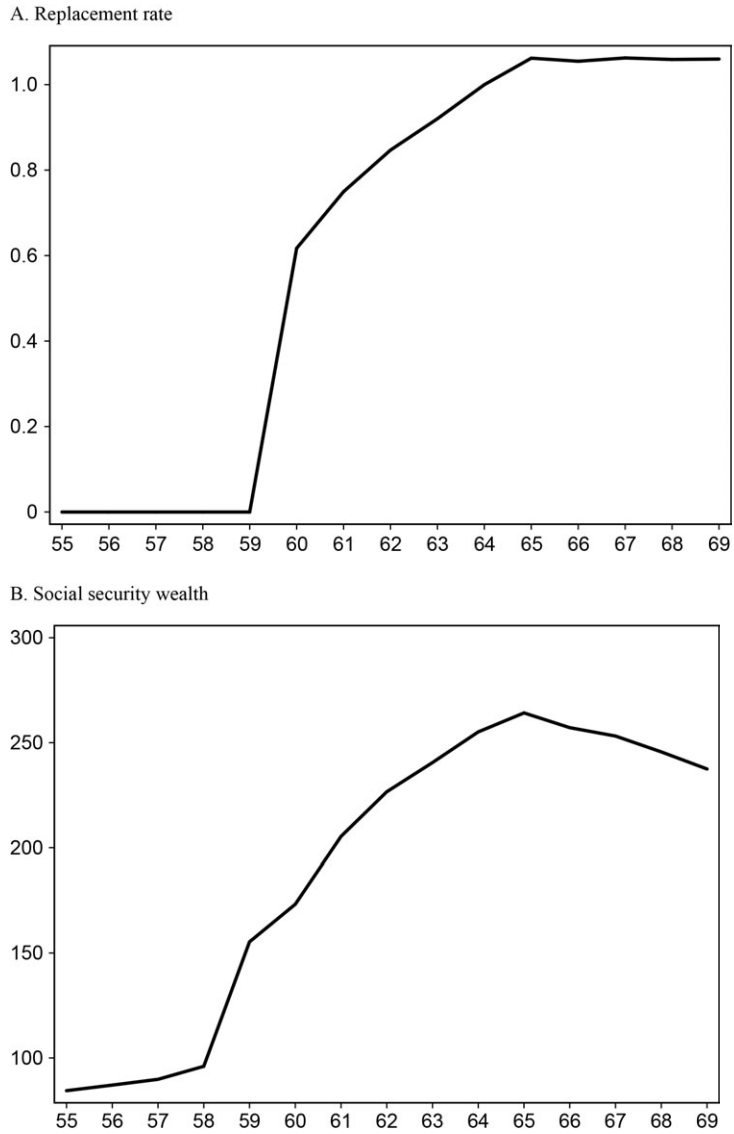



**Fig. 9.6 Incentives calculation for a male median-earner worker born in 1925 (after-tax values in €1,000 at 2015 prices)**

of pension receipt and increases in one year of social security contributions (effects 3 and 4). There are no further gains from claiming after age 65, as the base-case worker reaches the statutory retirement age in 1990, a year without incentives for late retirement. Thus from age 65 onward, when additional years of work add nothing to the expected pension amount, effects 3 and 4 dominate, and the social security wealth falls. The

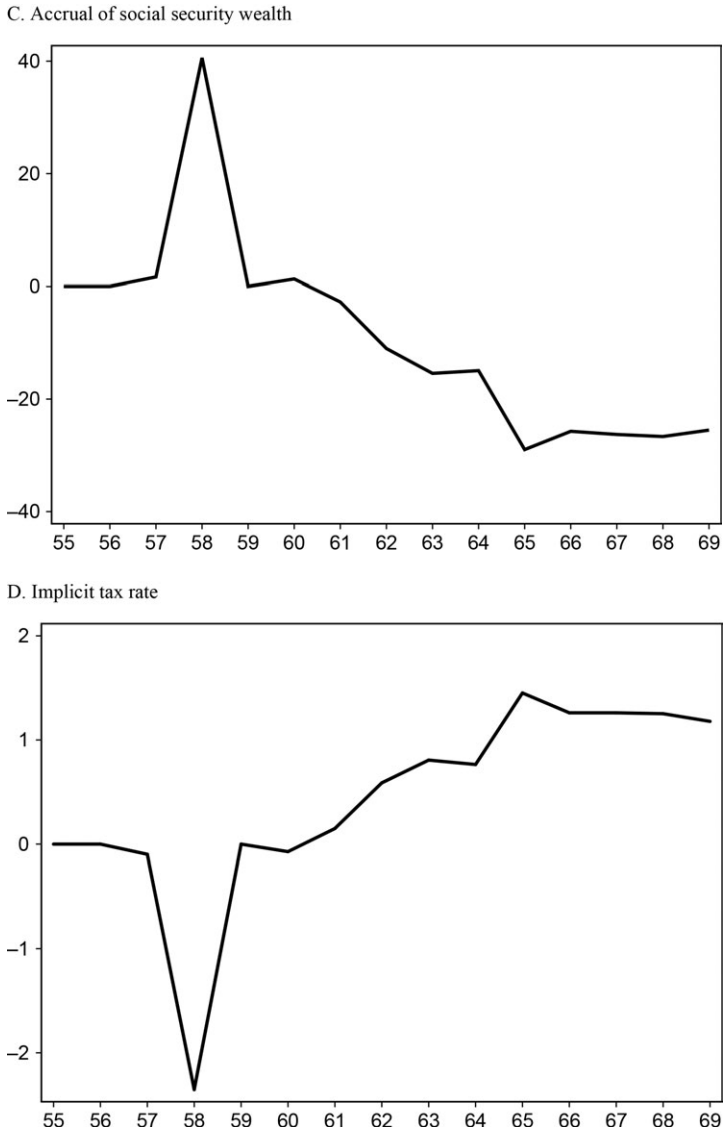



**Fig. 9.6 (cont.)**

implicit tax rate on continuing work is negative between ages 55 and 60, due to the earliest eligibility age for retirement, and becomes positive thereafter. From 60 to 65, the implicit tax rate increases, showing the disincentives generated by the program to work an additional year. From age 65 onward, the implicit tax rate falls slightly but remains large and positive.

We compare the previously specified base-case worker born in 1925 to an analogous worker (a male median earner) born in 1945. The latter will

likely face different social security incentives, as he would retire under a different old-age pension system. For this worker, simulations start in year 2000, when he reaches 55 and completes 35 years of contributions, and run for each year until he turns 69 in 2014. Figure 9.7 shows the comparative incentives calculation for both cohorts of workers, with a solid line for workers born in 1925 and a dashed line for workers born in 1945. In panel A, we note that the replacement rate at the earliest eligibility age is higher for the younger worker than for the older one. It converges when reaching the statutory eligibility age and then becomes larger again for the younger worker. The social security wealth follows a similar pattern: workers born in 1945 started at age 55 with a social security wealth around €15,000 larger than workers born in 1925. Through the age period, their social security wealth remained larger until reaching 65, where they converged. The drop in social security wealth upon reaching the statutory eligibility age for retirement was smaller for workers born in 1945, possibly due to the late retirement incentives introduced by the 1997 reform. Panel D shows the implicit tax rate for both cohorts of workers. We note that the incentives to retire at different ages faced by workers born in 1945 were quite different than the ones of workers born in 1925. First, as with workers born in 1925, workers born in 1945 had a negative tax rate on working before age 60. However, they did not experience the subsidy peak at age 58 that workers born in 1925 did. This is clearly related to the diverging age trends in social security wealth prior to the earliest eligibility age for retirement. Second, younger cohorts experienced a peak tax rate at age 60, whereas the tax rate was close to zero for older cohorts. This results from the heightened generosity of the old-age pension system at age 60 for younger cohorts. Following this peak, the implicit tax rate fell to zero at age 62 before increasing steadily until age 69.

The comparison of these two cohorts of workers is informative of the significant changes in retirement incentives initiated by reforms to the old-age system. In particular, male workers becoming eligible for retirement under the 1980 system seem to have smaller incentives to retire at the earliest eligibility age than male workers eligible for retirement under the 2005 system. This could be due to two factors. The first one is that the penalization for early retirement became smaller, in particular for workers having already contributed 30 years at the time of first eligibility for retirement. The second one comes from the adjustment of the earning profiles for older cohorts, which are slightly disproportionate and intercept the maximum contribution base at several points in time, resulting in smaller incentives for the 1925 cohort to retire prior to the statutory eligibility age.

### 9.4.2 Differences in Social Security Incentives by Skill Level

In this section, we evaluate to what extent workers with different skill levels face different social security incentives. Figure 9.8 depicts our calculations for the base-case worker described in the previous section, a married

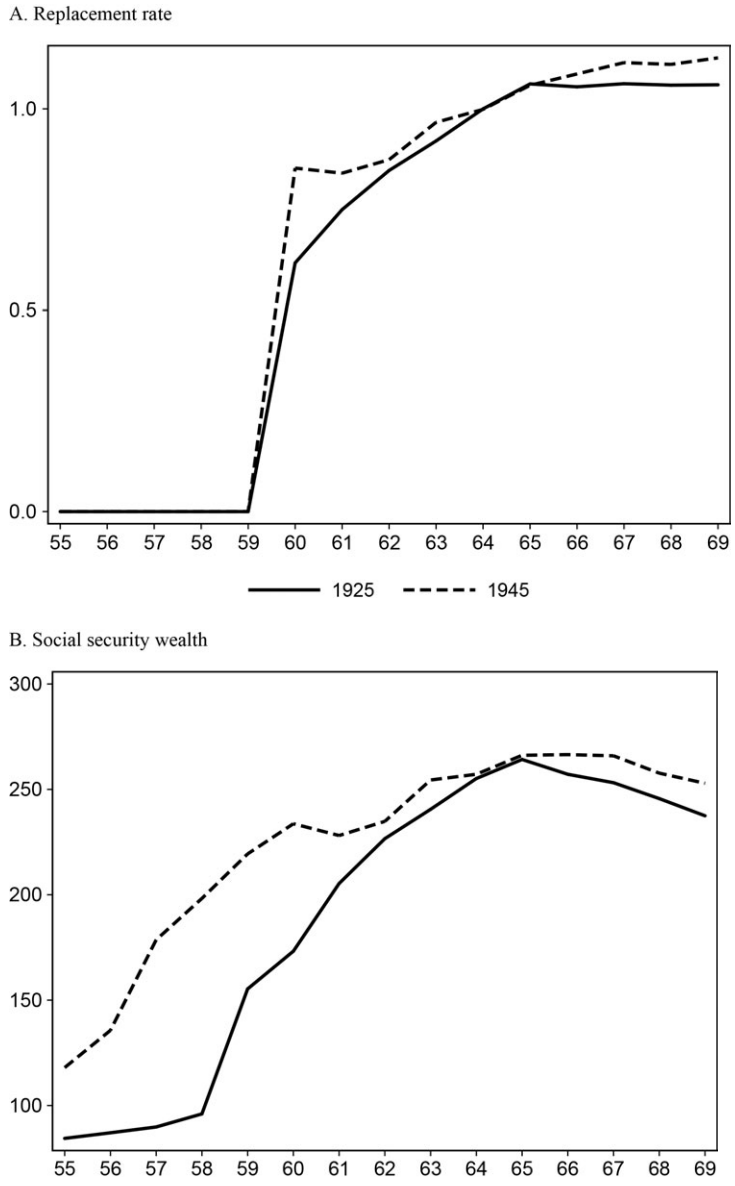



**Fig. 9.7 Incentives calculation for a male median-earner worker born in 1925 and in 1945 (after-tax values in €1,000 at 2015 prices)**

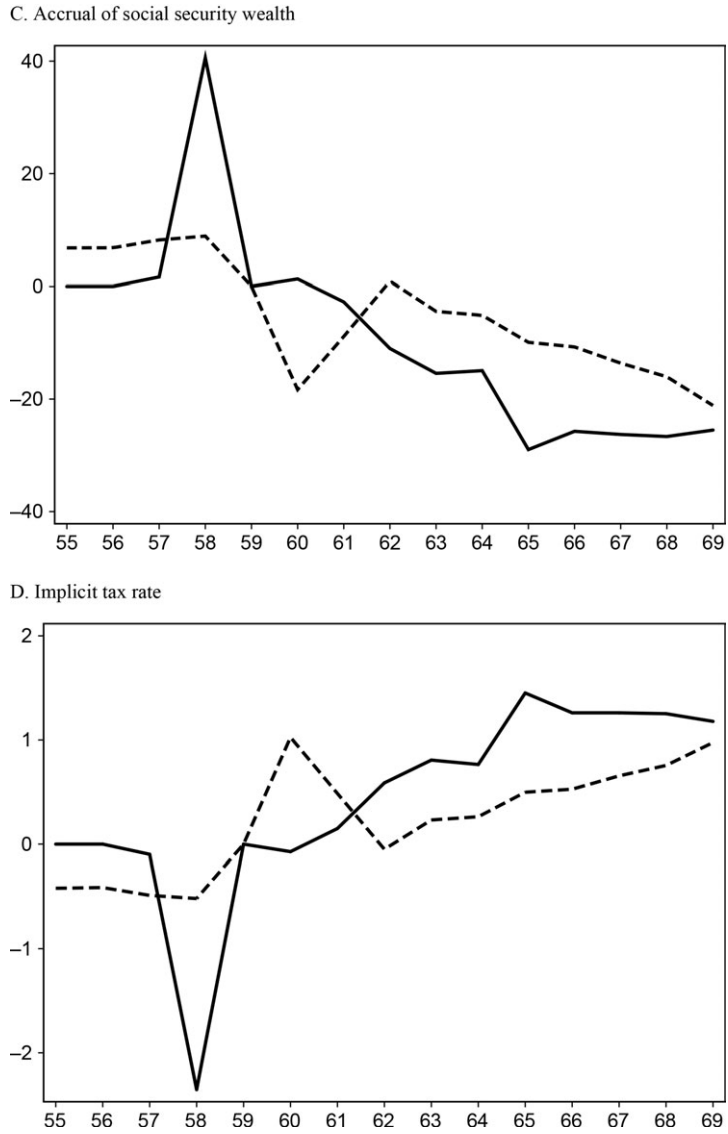



**Fig. 9.7 (cont.)**

male born in 1925, varying his skill level from medium to low and from medium to high. In each figure, the line with circles corresponds to low skills, the line with triangles to medium skills, and the line with diamonds to high skills. Panel A shows the replacement rate for each type of worker, and we note that low- and medium-skilled workers have identical replacement rates. The replacement rate of high-skilled workers follows the same pattern until

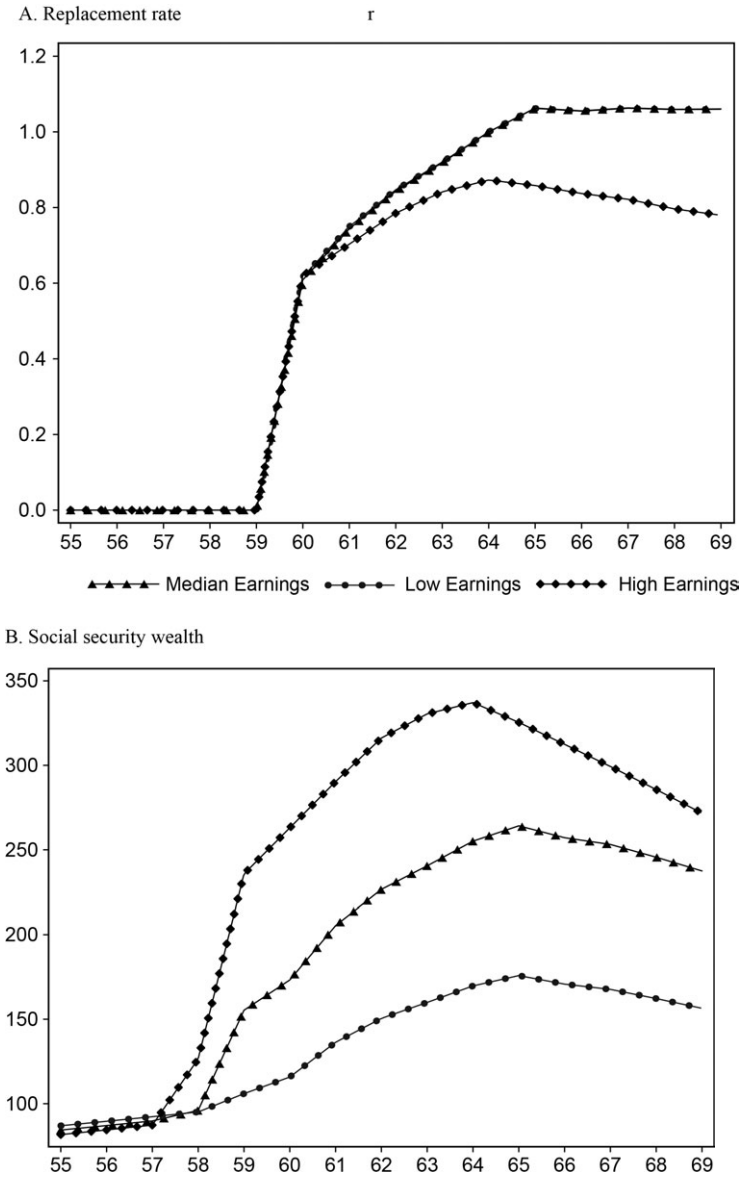



**Fig. 9.8 Incentives calculation for a male married worker born in 1925 by skill level (after-tax values in €1,000 at 2015 prices)**

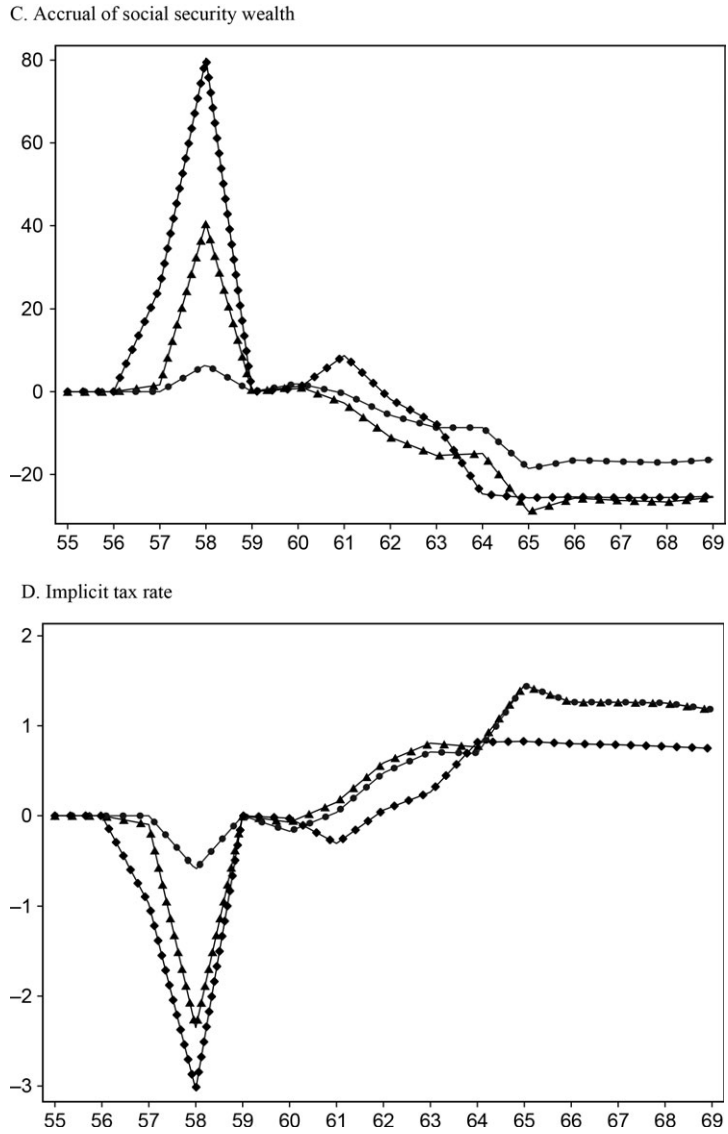



**Fig. 9.8 (cont.)**

age 60 and then remains at a significantly lower level for all subsequent ages. This is possibly due to the fact that earnings for high-skilled workers born in 1925 were significantly above the maximum contribution level, implying that they get a capped pension that only partially replaces their earnings. The social security wealth and resulting implicit tax rate follow a similar pattern across workers, but with different levels. High-skilled workers experience

larger social security wealth at all ages, followed by medium-skilled workers (base case) and then low-skilled workers. The incentives to retire before the statutory eligibility age are lower for high earners through the ages analyzed.

### 9.4.3 The Effects of Varying the Earnings Profile

In this section, we assess to what extent the measures of social security incentives are sensitive to the earnings profile used. We thus reproduce our simulations using the Spanish time-invariant earning profile. Figure 9.9 compares the resulting incentives using the common earnings profiles (black) and the Spanish earnings profiles (white). The shape of all the measures across all ages is very close independent of the earnings profiles used. In addition, there are marginally no differences in the levels for any of the measures of incentives for low and median earners between the synthetic and Spanish-specific earnings profiles. The differences in the level of social security wealth become more notable the higher the earnings level: common earnings profiles seem to overestimate the social security wealth of median and, particularly, high earners before reaching the statutory eligibility age. This results in a slightly lower implicit tax rate when using the common earnings profiles. Overall, these differences are minimal and do not affect the trends of our measures. In what follows, we continue using the common earnings profiles.

### 9.4.4 Social Security Incentives by Gender and Marital Status

Figure 9.10 presents a comparison of the calculations for single (in white) and married (in black) male and female workers.[7] The main difference between a married and a single worker is the survivor benefit that can potentially be added at each age point. Across genders, the main difference in the incentives simulated comes from the differences in earnings profiles and survival probabilities. From panel A, we conclude that replacement rates are very close across gender. We note a small difference regarding the replacement rate of high-earning women, which is higher than that of men, most likely because the earnings of women are above the maximum contribution level to a lower extent than those of men. Social security wealth and implicit tax rates are very close across genders, in both shape and levels. The differences across single and married workers are also quite marginal consistently across gender. For males, married workers have a slightly higher social security wealth than single workers across all earning levels. For females, the difference between married and single workers is much smaller and only becomes noticeable from age 60 onward. There are virtually no differences across marital status in the resulting tax rates for males. For females, the resulting tax rate on working an additional year is slightly larger for married than single workers.

7. We assume that husbands are three years older than wives for all types.

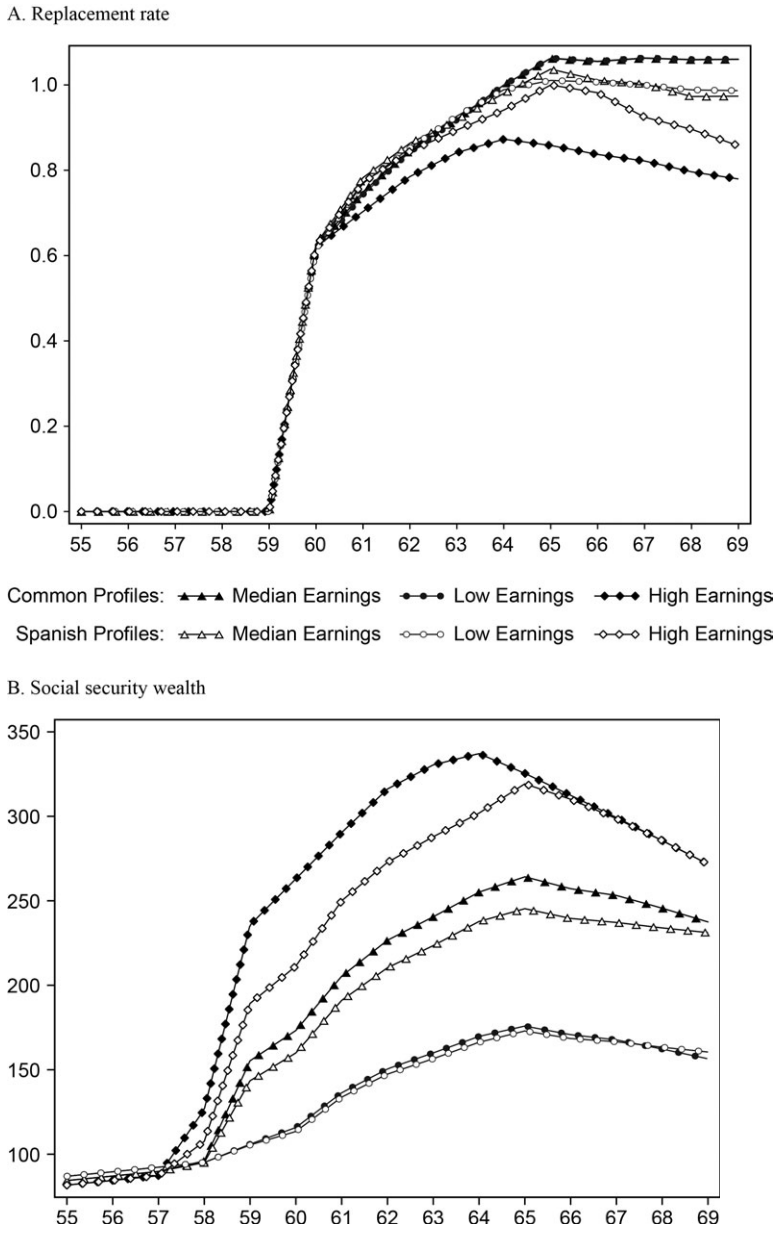



**Fig. 9.9 Incentives calculation for a male married worker born in 1925 by level of earnings and earnings profile (after-tax values in €1,000 at 2015 prices)**

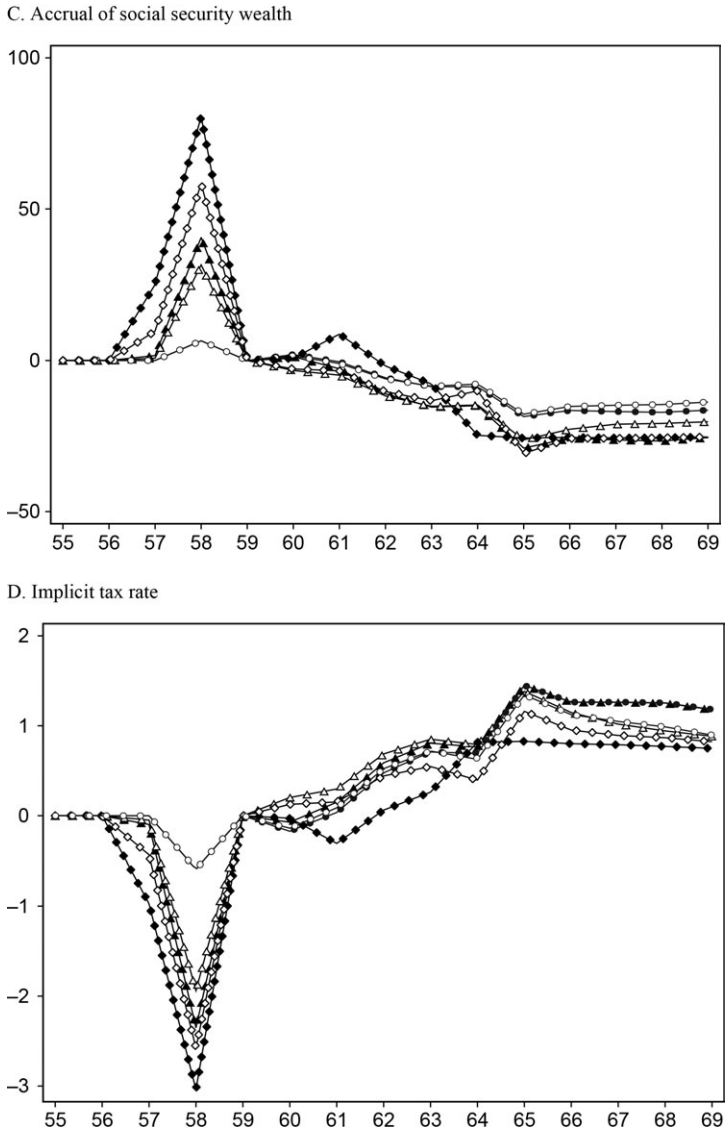
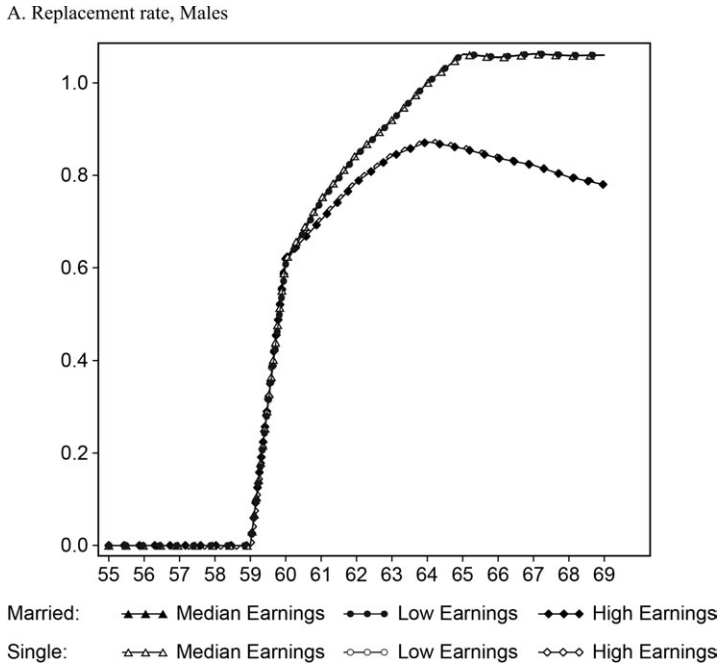



**Fig. 9.9 (cont.)**

### 9.4.5 Temporal Variation of Retirement Incentives

The evidence shown in the previous subsections provides an interesting snapshot of the incentives to retire for a worker born in 1925 from his 55th to his 69th birthday. However, it fails to encompass the role of the numerous reforms to the Spanish social security system over the last three decades in



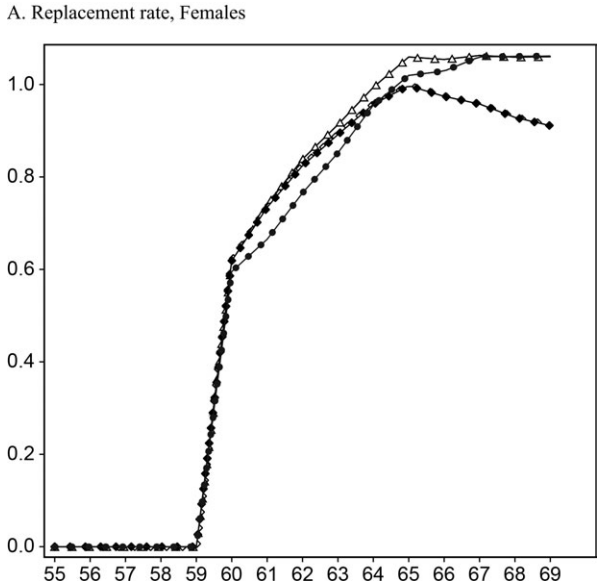




**Fig. 9.10 Incentives calculation for a male and female worker born in 1925 by level of earnings and marital status (after-tax values in €1,000 at 2015 prices)**

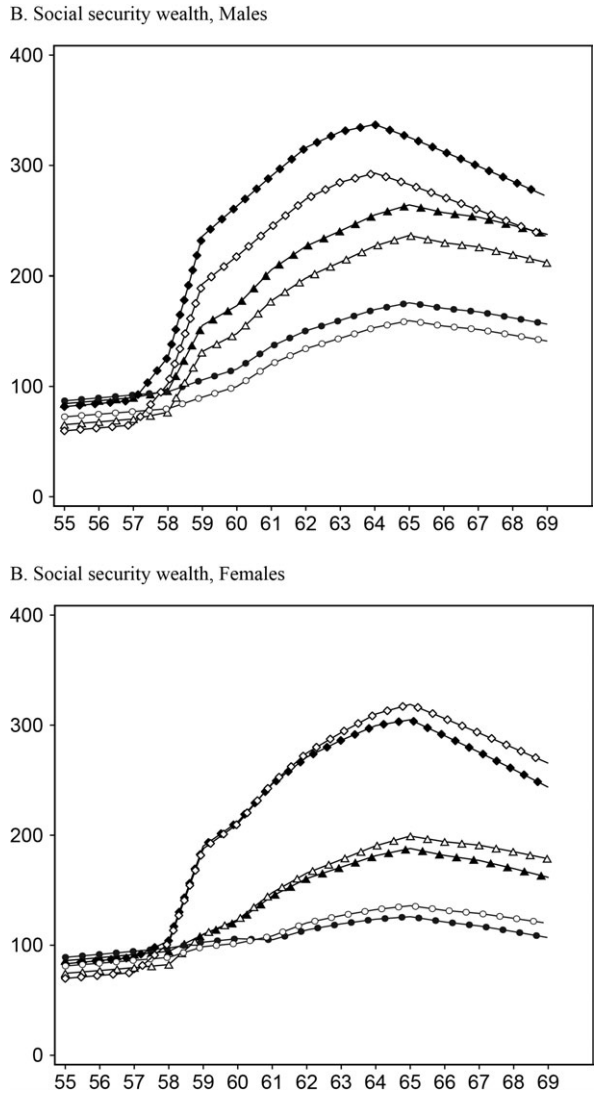
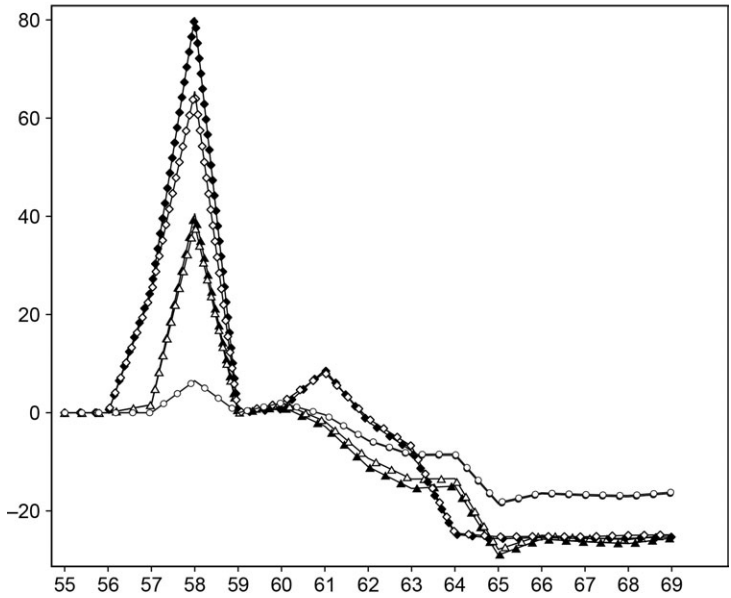



**Fig. 9.10 (cont.)**

shaping social security incentives. In this subsection, we show how the measures evolve over time and how they relate to policy reforms.

Figure 9.11 shows the evolution of the replacement rate, social security wealth and its accrual, and the implicit tax rate for different age groups. Panel A shows the calculated replacement rate from 1980 to 2015 for workers aged 56, 58, 60, 62, 64, and 65. The replacement rate is zero for workers not eligible for retirement. We note in the figure the change in the penalties for

C. Accrual of social security wealth, Males




C. Accrual of social security wealth, Females

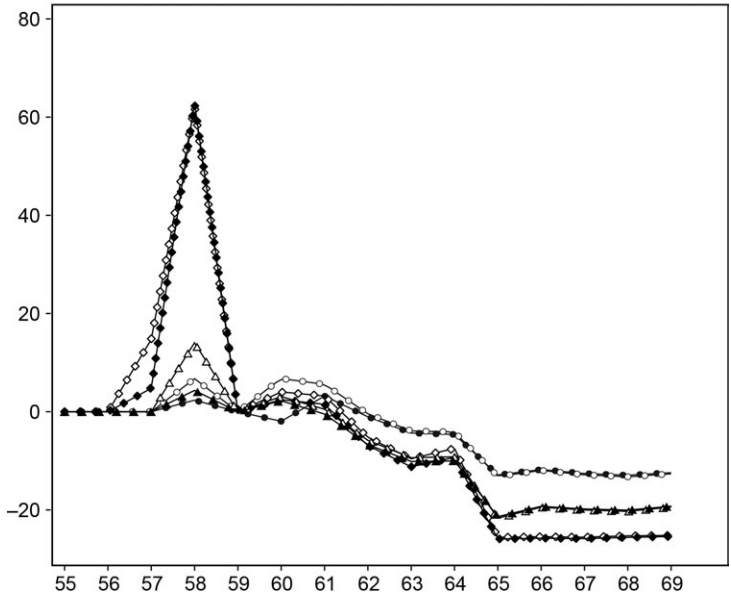
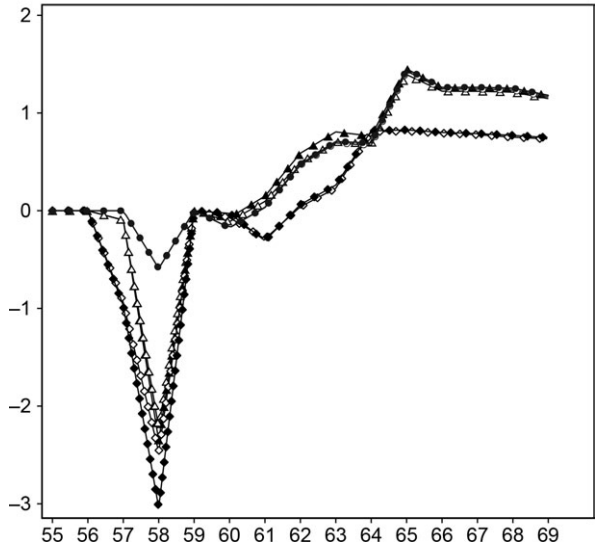



**Fig. 9.10 (cont.)**

D. Implicit tax rate, Males




D. Implicit tax rate, Females

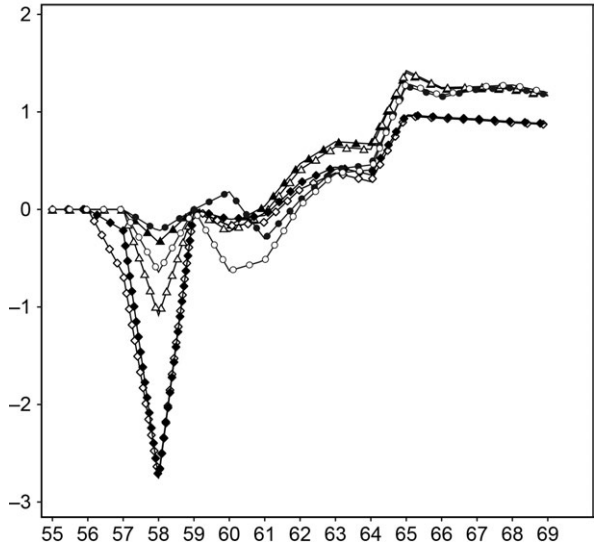



**Fig. 9.10 (cont.)**

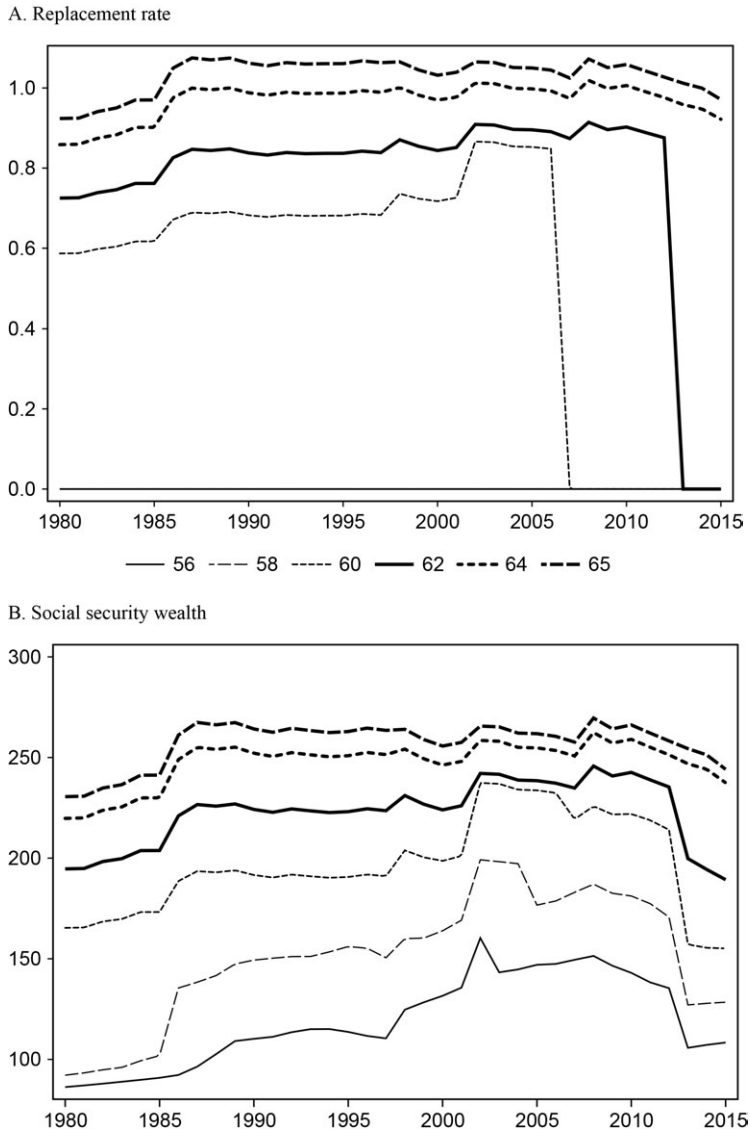



**Fig. 9.11 Time-varying incentives calculation for a married male worker with median earnings (after-tax values in €1,000 at 2015 prices)**

early retirement in 2002, the change in the earliest eligibility age from 60 to 61 in 2007 (year at which the first cohort unable to contribute before 1967 turned 60), and the change in the earliest eligibility age from 61 to 63 in 2013. Besides these changes, replacement rates are quite stable over time.

Panel B presents the social security wealth, which has been rather constant over time. We note some discontinuities in the trends that correspond

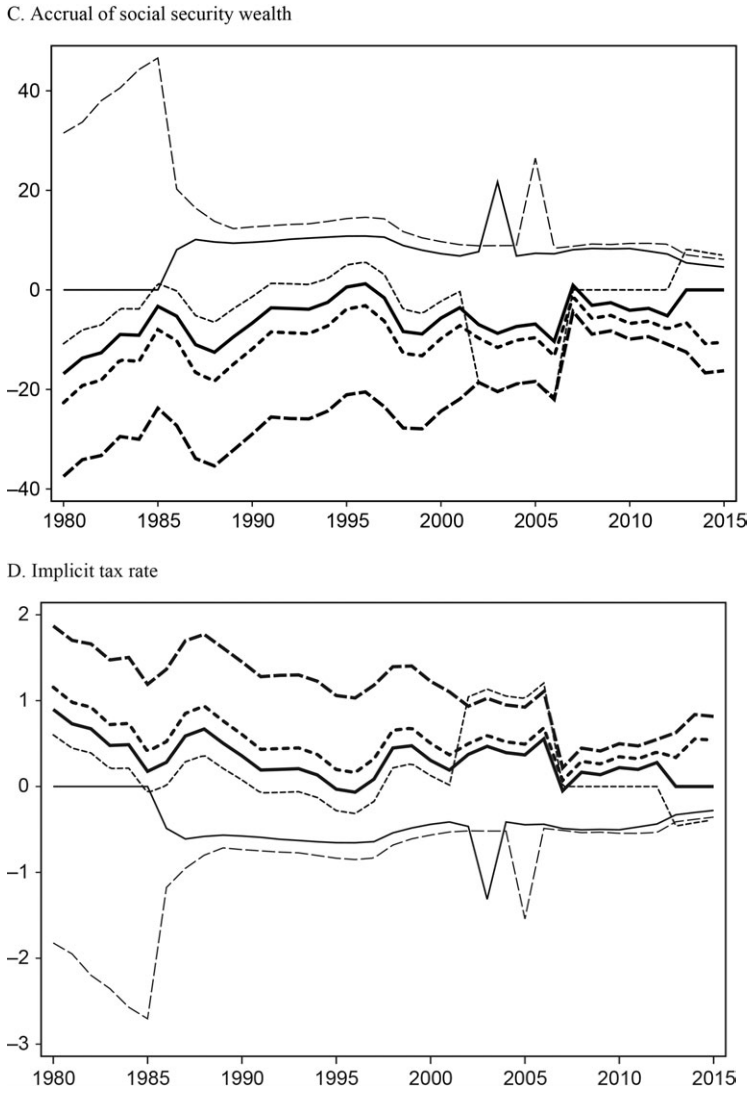



**Fig. 9.11 (cont.)**

to reform periods of the system. For instance, we note an increase in social security wealth in 1985 for ages 58 to 65 associated with the significant reform in 1985. The principal changes were an increase in the minimum number of years of contributions for pension eligibility (from 8 to 15) and an increase in the number of years entering the computation of the benefit base. Although this reform was implemented to tighten the generosity of the old-age pension system, we observe the opposite effect on the expected social security wealth of workers. This larger incentive to retire may actually have

been generated by the increase in the number of working years entering the benefit base, together with decreasing earning profiles from ages 45 to 60.

In 2002, we observe a peak in the social security wealth for ages 56 to 60, coinciding with the introduction of the earliest eligibility age at 61 for workers who started contributing into the system after 1967. The increase in social security wealth seems to affect only a few cohorts. For instance, for those aged 56, the increase in social security wealth peaks in 2002 and entirely subsides in 2003. Those aged 58 experience this increase for three years, from 2002 to 2004, and those aged 60 for five years. This means that only workers born in 1942–46 experience an increase in social security wealth.

The latest reform of the pension system in 2011 (introduced in 2013) generated a drop in social security wealth for all claimants younger than 64. This is possibly due to an increase in the earliest eligibility age from 61 to 63 for workers (there are some exceptions for unemployed workers with long contributive careers).

The implicit tax rate moderately responds to the changes in social security wealth previously described. The trends first change in 1985 and then in 2002, coinciding with the introduction of the earliest eligibility age at 61 for claimants contributing after 1967. The observed changes in the implicit tax rate from 2002 to 2007 are due to different cohorts with different rules regarding the earliest eligibility age approaching the different key ages.

Regarding the level of the implicit tax rate, we note that workers 64 or above are incentivized to retire through the observed period. Similarly, workers aged 62 faced a positive implicit tax rate until 2012; the incentive became zero in 2013 with the increase of the earliest eligibility age from 61 to 63. The incentives to retire faced by workers aged 60 change over time. They were incentivized to retire under the 1980 system and part of the 1985 system. In the mid-1990s, the system seemed to subsidize employment, but by the late 1990s, it was incentivizing retirement. Lastly, from 2007 onward, claimants aged 60 have been incentivized to work, mostly due to the increase in the earliest eligibility age. As expected, workers aged below 60 have always been incentivized to remain employed.

### 9.4.6 Average Old-Age Pension System Incentives

Figure 9.12 summarizes the previous results on the implicit tax rate by aggregating it over workers aged 55 to 69.[8] The vertical dashed lines signal the reform years, and the notes indicate the main change in the parameters of the old-age pension system in each reform. In 1985, following the increase in the minimum required service years for eligibility, we see a large spike in the implicit tax rate. As previously described, this is due to using decreasing income profiles from age 45 onward. The reduction in the generosity of benefits in 1997 decreased the implicit tax rate, albeit with some delay.

8. We use time-varying population weights on the fraction of individuals in each age category (55 to 59, 60 to 64, and 65 to 69) to compute these averages.

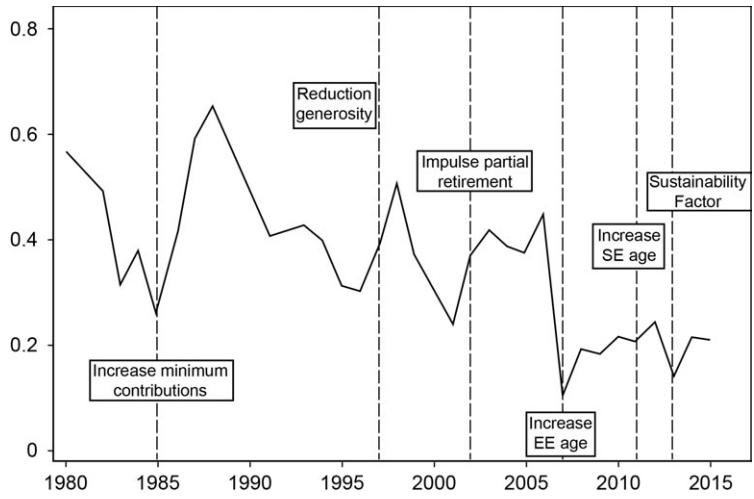



**Fig. 9.12 Implicit tax rate**

The impulse toward partial retirement in 2002 had mild effects in curbing the implicit tax rate on work. A bigger drop in the retirement incentives was induced by the increase in the earliest eligibility age in 2007. The latest reform in 2011 and the increase in the statutory eligibility age and the introduction of the sustainability factor in 2013 have surprisingly mild effects on the aggregated measure of retirement incentives.

### 9.4.7 Other Pathways to Retirement

In this subsection, we explore two additional pathways to retirement in the Spanish social security system—namely, disability and unemployment insurance programs. Figure 9.13 shows the incentives for our base-case worker for each retirement pathway. Panel A shows the replacement rate for the three different pathways over ages 55 to 69 for a married male worker with median earnings. First, we notice that the replacement rate is not zero for UI and DI pathways before 60. For DI, the replacement rate is the fraction of benefits to the wage at the onset of disability, and it is linked to the severity of the disability but not to age. For the unemployed, the system contemplates the possibility to enter in an early retirement route if losing their job at age 52 or later, where a positive replacement rate is ensured. From the age of the early eligibility onward, the workers in this pathway are automatically moved to the old-age pathway. It is thus not surprising that the old-age and UI pathways are very close in the social security wealth they provide (panel B). The DI pathway ensures a rather constant social security wealth to disabled workers. From age 60 onward, there is a small decline in wealth. Correspondingly, the implicit tax rate for the DI pathway is flatter and always positive.

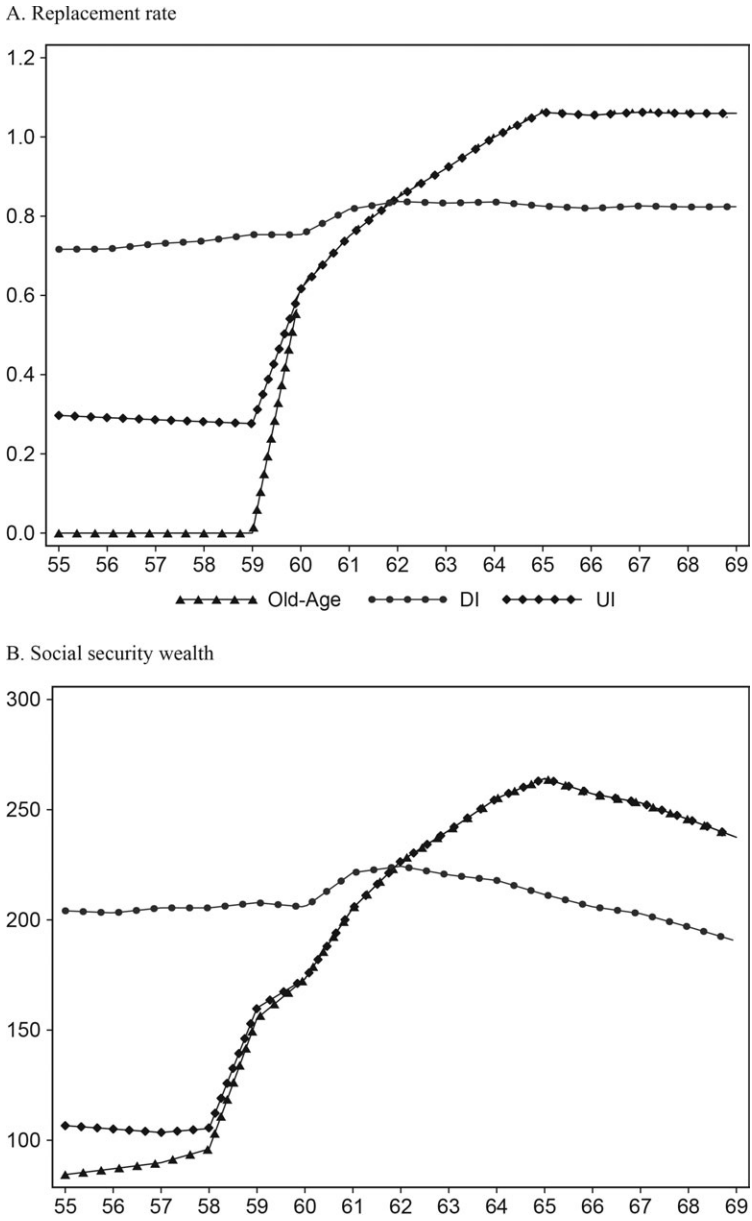
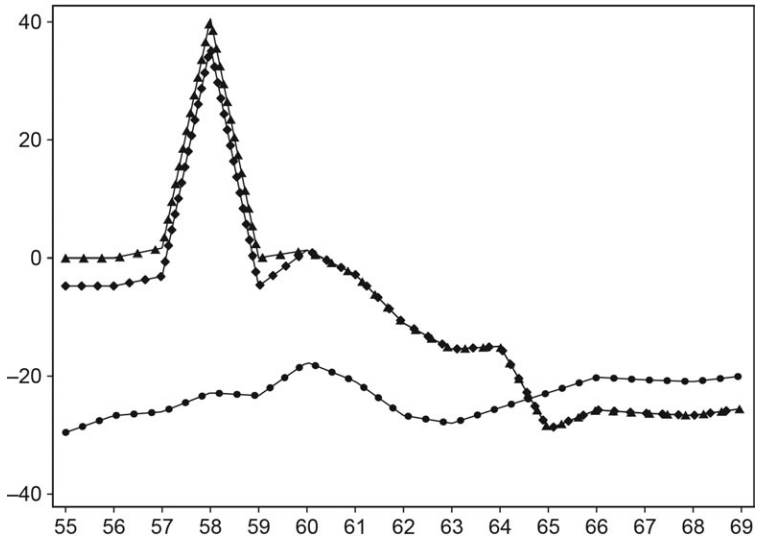



**Fig. 9.13 Incentives calculation for a base-case worker born in 1925 by retirement pathway (after-tax values in €1,000 at 2015 prices)**

C. Accrual of social security wealth




D. Implicit tax rate

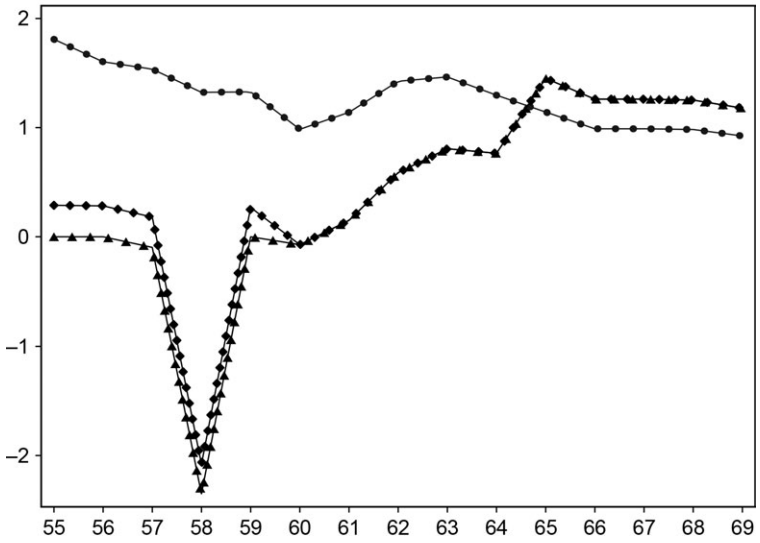



**Fig. 9.13 (cont.)**

### 9.4.8 Weighted Temporal Variation of Retirement Incentives

We reproduce the figures showing the temporal variation of the retirement incentives in Spain, aggregated over gender, level of earnings, and pathway to retirement. As explained in subsection 9.3.2, we weight the previously presented results by gender, earnings level, and pathway using the time-varying share of the population in each pathway and from each gender and earning level. Figure 9.14 depicts these aggregated financial incentives to retire. In panel A, we notice that the replacement rate is no longer zero for workers younger than the earliest eligibility age at any point in time given that UI and DI programs offer a positive replacement rate before reaching this threshold. Panel B shows the trends in the aggregated weighted social security wealth. We see that weighted social security wealth has been increasing over time for all ages. This is the result of the aggregation of the different routes into retirement, as social security wealth in each of the pathways either has been constant or has depicted a small increase over time.

## 9.5 Social Security Incentives and Employment

In this section, we analyze the correlations between the employment rate and the retirement incentives from the social security program. We first examine these correlations graphically by plotting the employment rate against the weighted implicit tax rate of working an additional year. We present the results in subsection 9.5.1. In subsection 9.5.2, we use out-of-labor-force transitions from the Labor Force Survey (EPA) to provide estimates of the association between the implicit tax/subsidy rate and transitions from employment to retirement.

### 9.5.1 Graphical Representations

Figure 9.15 plots the employment rate of men and women over the implicit tax rate from the old-age pension scheme weighted over earnings level for age groups 55 to 59 and 60 to 64. The graphs also show a linear fitted line over the scatter plot as well as the correlations between the employment rate and the implicit tax rate.

We find that both the significance and the sign of these correlations vary across age groups and gender. For men aged 60 to 64, we find a significant positive correlation between their employment rate and the implicit tax rate. This suggests that the higher the implicit tax (i.e., the incentives to retire), the higher the employment rates of this population group. We find a similar counterintuitive result, albeit statistically insignificant, among women aged 54 to 59. The sign of the correlation is as expected for men aged 54 to 59, albeit statistically insignificant, and among women aged 60 to 64. Only among this group, we find that a higher implicit tax rate is statistically significantly associated with lower employment rates.

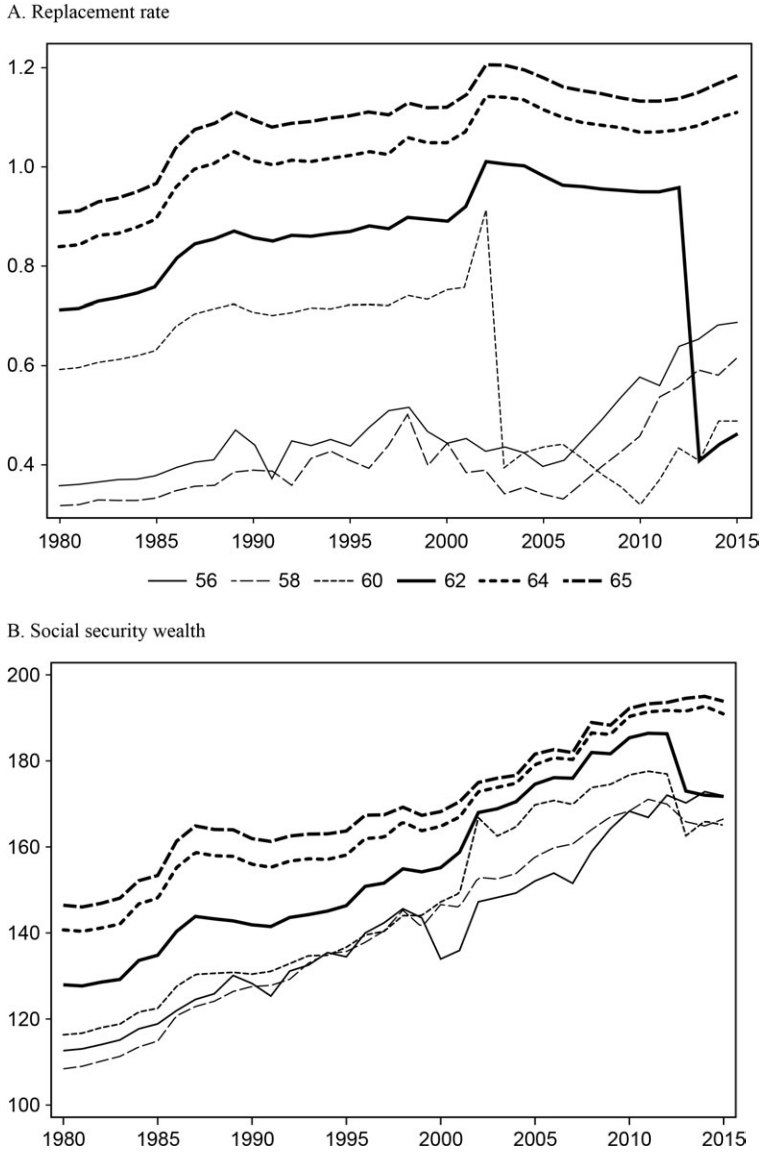



**Fig. 9.14 Time-varying weighted incentives calculation (after-tax values in €1,000 at 2015 prices)**

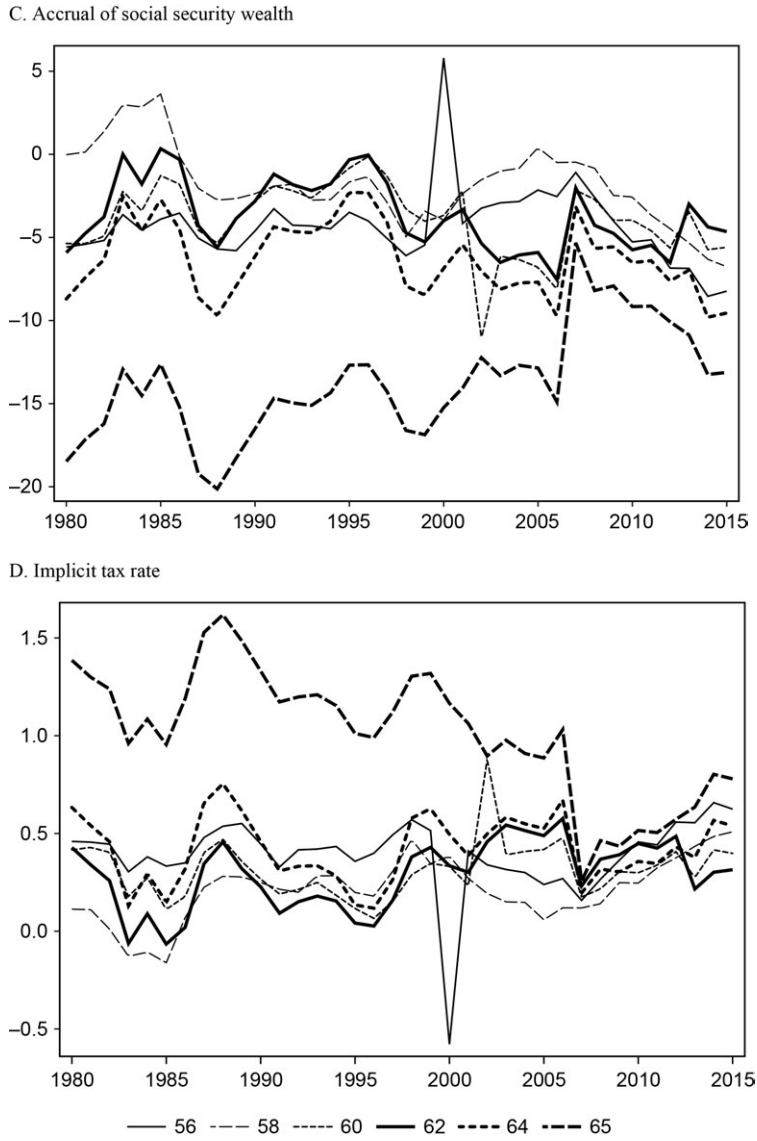



**Fig. 9.14 (cont.)**

Because part of their implicit tax rate had negative values, this could indicate that higher retirement incentives were correlated with lower employment rates. However, it could also indicate a counterintuitive correlation, where higher retirement incentives were correlated with higher employment rates. As expected, for men aged 54 to 59, we find a positive association,

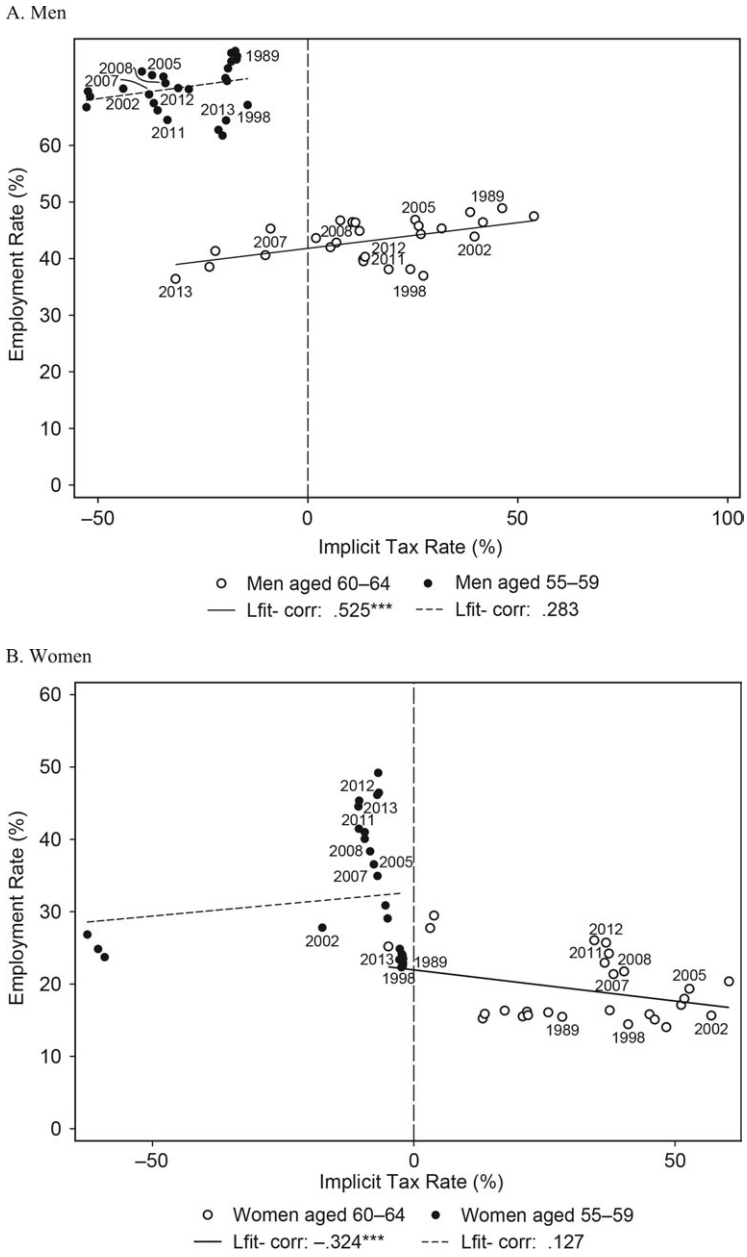



**Fig. 9.15 Employment rates over weighted implicit tax rates of men and women**

albeit statistically insignificant. Women aged 60 to 64 experienced a negative association between the implicit tax rate and the employment rate. The correlation is statistically significant, but of lower value than for males (–0.324 and 0.525, respectively). For women aged 54 to 59, we find a positive nonsignificant correlation between the retirement incentives and the employment rate, in line with the fact that the implicit tax rate is negative for this group.

### 9.5.2 Correlation Estimates

The previous graphs showed that the incentives stemming from social security systems could be impacting the national employment rates. However, we were not able to explain all the results. For instance, we found a positive correlation between the incentives and employment rate for males aged 60 to 64 and were not able to explain whether this result was due to the sign of the incentives or was counterintuitive.

The previous figures suggest that trends in financial incentives are not associated with changes in the employment rate. However, the lack of a simple relationship between overall employment rates and aggregate financial incentives measures can be driven by the importance of other factors. García-Gómez et al. (2018) show that other factors, such as changes in the skill composition of workers, cohort effects in female labor force participation, or economic conditions, have probably played a larger role in explaining trends in employment rates among older Spanish workers over the past decades. However, this does not rule out that financial incentives are still important determinants of transitions out of the labor force among Spanish workers.

To get a better idea of the potential effect of social security incentives, we assess their association with the probability of transitioning out of the labor force. In this section, we provide such estimates. We focus in particular on transitions out of the labor force for employed workers and contrast them with the incentives provided by the old-age pension system. For each individual, we obtain information on her current employment status and the situation in the previous year from the EPA for years 1978–2004 and 2006–16. We then construct an indicator for transition out of the labor force using the information from the employment situation in the previous year compared to the current employment situation. As we only consider the incentives from the old-age pathway, we focus on claimants who were employed at time $t - 1$. We aggregate the data at the regional level for the analysis. We estimate the following linear model:

$$Tr_{art}^{emp} = \alpha + \beta INC_{at} + X_{at} + \mu_t + \varepsilon_{art}, \tag{5}$$

where $Tr_{art}^{emp}$ is the share of the employed population of age $a$ in region $r$ in year $t - 1$ transitioning out of the labor force, $INC_{at}$ are the incentive measures aggregated at the region level (implicit tax rate and social security wealth), $X_{at}$ are the covariates (age in all models and dummy variables for the

**Table 9.3** **Exit from the labor force of employed individuals**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Implicit tax rate | 0.129*** | | 0.134*** | 0.137*** |
| | (4.342) | | (4.133) | (4.034) |
| Social security wealth (log) | | 0.163*** | 0.180*** | 0.186*** |
| | | (1.958) | (2.805) | (1.563) |
| Earliest eligibility age | | | | 0.015*** |
| | | | | (0.002) |
| Statutory eligibility age | | | | 0.007*** |
| | | | | (0.001) |
| N | 420 | 420 | 420 | 420 |
| Adj. *R*-squared | 0.380 | 0.339 | 0.409 | 0.409 |

*Notes:* Estimates of the association between aggregate social security incentives and the share of the employed population aged 55 to 69 that exits the labor force. We aggregate these shares over gender and earnings for each region. All models control for age and year fixed effects and have their standard errors clustered by region and year. Model 1 includes the implicit tax rate as an explanatory variable, whereas model 2 includes the logarithm of the social security wealth. Model 3 includes both variables. Model 4 also includes a dummy variable for the earliest eligibility age and a dummy variable for the statutory eligibility age.

earliest and statutory eligibility age in model 4), and $\mu_t$ are year fixed effects. Standard errors are clustered at the region and year levels.

Table 9.3 shows the results. Model 1 shows a statistically significant positive impact of the implicit tax rate on the share of the population that exits the labor force. In particular, a 0.1 increase in the implicit tax rate increases the share of the population that exits the labor force by 1.3 percentage points. This effect is quite similar to that obtained in model 3, where we also include the logarithm of the social security wealth. The magnitude of the association with the aggregate social security wealth is smaller: a 1 percent higher social security wealth increases the share of the population that exits the labor force by 0.163 percentage points. And the estimated effect of social security wealth is similar when we also control for the implicit tax rate. Lastly, we include two dummy variables for the earliest and statutory eligibility ages in model 4. We estimate statistically significant positive effects from both the earliest and statutory eligibility ages, although the effects are small compared to the estimated effect of the implicit tax rate. Importantly, the inclusion of these controls does not change the magnitude of the estimates for the implicit tax rate or the social security wealth, and it does not affect their significance either. Our results suggest there is a strong association between the social security incentives and the exit from the labor force.

## 9.6 Concluding Remarks

Employment and labor force participation trends of older male workers in Spain and elsewhere reverted and started to increase around the mid-

1990s after two decades of continually falling. In this work, we analyze to what extent the incentives from the social security system can play a role in explaining this evolution. In this respect, we extend existing evidence on the impact of financial incentives on labor force participation in Spain (Boldrin et al. 1999) by computing the financial incentives to leave the labor market that Spanish workers aged 55 to 69 have faced during the past four decades through three different pathways: the old-age pension system, disability insurance, and unemployment insurance. Our primary measure is the implicit tax rate, which compares the change in social security wealth from working an additional year with the earnings obtained during the additional year of work. We compute the implicit tax rate for different types of workers based on their gender and skill level using both a common earnings profile based on data from Germany, the US, and Italy and a Spanish-specific earnings profile.

Our results show that in general, and excluding those having very low wages or discontinued careers, which lead to minimum pensions at all ages (Jiménez-Martín 2014), incentive profiles for the different cohorts are very similar, except for some specific cases in which changes in eligibility ages play a crucial role. Regarding the variation of incentives over time, we find that apart from the substantial real growth of pension rights (social security wealth) observed in the last 35 years and the effect of changes in eligibility conditions, the results seem to be remarkably stable.

As a summary exercise, we compute bivariate correlations between the implicit tax rate and the employment rate of the different types of workers over time and estimate simple regression models exploiting the regional and temporal variations of the data. We find that both the implicit tax rate and social security wealth are important determinants of transitions out of the labor force even after controlling for the earliest and the statutory eligibility ages. Therefore, our results contrast with the previous evidence (see Boldrin et al. 2004; García-Pérez et al. 2013; or Sánchez-Martín et al. 2014), probably due to the availability of long time series in our analysis. Our results provide suggestive evidence that financial incentives and later reforms may be able to explain part of the initial decrease and later increase in labor force participation at older ages in Spain.

Our analysis and conclusions are based on estimates for workers without interrupted working careers or very low wages leading to minimum pensions at all ages (which generally disincentivize work; see Jiménez-Martín 2014 for a discussion). This limitation is more important among women, who are more likely to experience interrupted labor market trajectories due to maternity episodes. This is particularly relevant for the oldest cohorts of women in our analysis. In this sense, further research should exploit individual variation to investigate the role of financial incentives among a more representative sample of the Spanish working population.

# Appendix

## 9.A1 Key Parameters of the Spanish Social Security System from 1980 Onward

**Table 9.A1** **Key parameters of old-age pensions from 1980 onward**

| | Before 1985 | From 1985 to 1997 | From 1997 to 2001 | From 2002 to 2007 |
|---|---|---|---|---|
| | | *A. Eligibility conditions* | | |
| A1. Normal retirement age [ā] | 65 years | Id. | Id. | Id. |
| A2. Minimum contribution years [n] | 10 years | 15 years | Id. | Id. |
| | | *B. Pension computation* | | |
| B1. Contributions entering in benefit base [BB] | 2 years | 8 years | 15 years[a] | 15 years |
| B2. Replacement rate | 0, if $n < 10$<br>$\begin{cases} .5 + 0.02\,(n-10), \text{ if } 35 > n \geq 10 \\ 1, \text{ if } n \geq 35 \end{cases}$ | 0, if $n < 15$<br>$\begin{cases} .6 + 0.02\,(n-15), \text{ if } 35 > n \geq 15 \\ 1, \text{ if } n \geq 35 \end{cases}$ | 0, if $n < 15$<br>$\begin{cases} .5 + 0.03\,(n-15), \text{ if } 25 > n \geq 15 \\ .8 + 0.02\,(n-25), \text{ if } 35 > n \geq 25 \\ 1, \text{ if } n \geq 35 \end{cases}$ | Id. |

(*continued*)

**Table 9.A1** **(continued)**

| | Before 1985 | From 1985 to 1997 | From 1997 to 2001 | From 2002 to 2007 |
|---|---|---|---|---|
| | | | *C. Early retirement* | |
| C1. Early retirement age | 60, if first contribution prior to 1967 | Id. | Id. | 60, if first contribution prior to 1967; 61 if after 1967 |
| C2. Penalization [κ] where benefit = 1 − κ(ā− a) | κ = .08 | κ = .08 | $\kappa \begin{cases} .08 \text{ if } n < 40 \\ .07 \text{ if } 40 \geq n \end{cases}$ | $\kappa \begin{cases} .08 \text{ if } n = 30 \\ .075 \text{ if } 31 \leq n \leq 30 \\ .07 \text{ if } 35 \leq n \leq 37 \\ .065 \text{ if } 38 \leq n \leq 39 \\ .06 \text{ if } 40 \geq n \end{cases}$ |
| C2. Minimum pension | | | | 27 percent average income |
| C3. Partial retirement | No | No | No | Yes; working hours reduced from 25 percent–85 percent; replacement of working hours mandatory |
| | | | *D. Late retirement* | |
| D1. Incentives for late retirement | No | No | $0.8 + .02(a - 65)$ if $35 \geq n > 25$ and $a \geq 65$ | $1 + .02(a - 65)$ if $n \geq 35$ and $a \geq 65$ |
| D2. Partial retirement | No | | No | Yes |

[a] In 1997, the last 108 months are included, the last 120 months in 1998, the last 132 months in 1999, the last 144 months in 2000, the last 156 months in 2001, the last 180 months from 2002 onward.

**Table 9.A2** **Key parameters of old-age pensions from 1980 onward (cont.)**

| | From 2007 to 2010 | From 2011 onward | 2013 amendment |
|---|---|---|---|
| | | *A. Eligibility conditions* | |
| A1. Normal retirement age | 65 years | 67 years,[a] or 65 years old if 38.5 years of contributions | |
| A2. Minimum contribution years [c] | 15 years | Id. | |
| | | *B. Pension computation* | |
| | | | Introduction of new adjustment index (IRP) |
| B1. Contributions entering in benefit base [BB] | 15 years | 17 years. 25 years from 2022 onward. | $IPR_{t+1} = \overline{g}_{l,t+1} + \overline{g}_{P,t+1} + \overline{g}_{s,t+1} + a\left(\frac{I^*_{t+1} - G^*_{t+1}}{G^*_{t+1}}\right)$ |
| B2. Replacement rate | 0, if $n < 15$<br>$\begin{cases} .5 + 0.03\,(n-15), \text{ if } 25 > n \geq 15 \\ .8 + 0.02\,(n-25), \text{ if } 35 > n \geq 25 \\ 1, \text{ if } n \geq 35 \end{cases}$<br>1, if $n < 35$ | $\begin{cases} 0, \text{ if } a < 15 \\ 0.5 + 0.023\,(n-15), \text{ if } 37 > n \geq 15 \\ 1, \text{ if } n \geq 35 \end{cases}$ | where $\overline{g}_{l,t+1}$ is growth rate of contributions, $\overline{g}_{P,t+1}$ is the growth rate of the number of pensions, $\overline{g}_{s,t+1}$ is the growth of the median pension due to substitution effects |
| B3. Minimum pension<br>Maximum: CPI + .50 percent | 32 percent average earnings w/o dependent spouse. 39.9 percent w/ dependent spouse | 34 percent average earnings w/o dependent spouse. 42 percent w dependent spouse | Minimum: .25 percent. |
| B4. Maximum pension | 159 percent average earnings | 153 percent average earnings | |

(*continued*)

**Table 9.A2 (continued)**

| | From 2007 to 2010 | From 2011 onward | 2013 amendment |
|---|---|---|---|
| | | *C. Early retirement* | |
| C1. Early retirement age | 61 (involuntary retirement) or 63 (voluntary retirement), with 33 years of contr. | 63 (involuntary retirement) or 65 (voluntary retirement), with 33 or 35 years of contr. resp. | Introduction of sustainability factor (SF) |
| C2. Actuarial reduction of benefits | $1 - \kappa\,(a - 61)$, if $65 > a \geq 61$ where $\kappa \begin{cases} 0.75 \text{ if } 30 \leq n \leq 34 \\ .07 \text{ if } 35 \leq n \leq 39 \\ .06 \text{ if } 40 \leq n \end{cases}$ | $1 - \kappa(a - 63)$, if $67 > a \geq 63$ where $\kappa \in [0.08; 0.085]$ | Intergenerational equity factor (IEF) $IEF_{j,t+s} = \frac{e_{j,t}}{e_{j,t=s}}$ $e_{j,t}$ life expectancy of pensioner retiring at age j and period $t$ $e_{j,t+s}$ life expectancy of pensioner retiring at age $j$ and period $t + s$ |
| C2. Minimum pension | 30 percent average earnings w/o dependent spouse; 37 percent w/ dependent spouse | 32 percent average earnings w/o dependent spouse; 39 percent w/ dependent spouse | C2. Minimum pension |
| C3. Partial retirement | Yes; working hours reduced from 25 percent–75 percent, replacement of working hours mandatory, proportional contribution to the pension system | Yes, full contribution to the pension system | |
| | | *D. Late retirement* | |
| D1. Incentives for late retirement | If $a \geq 65$, then $\begin{cases} 1 + .02\,(a - 65) \text{ if } n \geq 35 \\ 1 + .03\,(a - 65) \text{ if } n \geq 40 \end{cases}$ | If $a \geq 67$, then $\begin{cases} 1 + .02\,(a - 65) \text{ if } 15 \leq n < 25 \\ 1 + .0275\,(a - 65) \text{ if } 25 \leq n < 37 \\ 1 + .04\,(a - 65) \text{ if } n \geq 37 \end{cases}$ | |
| D2. Partial retirement | Yes; no replacement of working hours | Yes; no replacement of working hours | |

[a] The retirement age of 67 will be reached in 2027. From 2013 to 2018, retirement age will ncrease in one month per year. From 2019 to 2026, retirement age will increase in two months per year. CPI = consumer price index

**Table 9.A3 Summary of key parameters of DI**

| | Ordinary illness | Work-related accident | Work-unrelated accident | Noncontributory |
|---|---|---|---|---|
| | | *A. Eligibility conditions* | | |
| | ***Incapacity to perform current job (IPT), workers older than 55 (IPTC)*** | | | |
| | **Age >26: Contributed 1/4 time between 20 years old and disabling condition, >5 years** | No contributive requirement | No contributive requirement | Not eligible for contributory disability insurance |
| | **Age ≤26:** Contributed 1/2 time between 16 years old and disabling condition | | | Means-tested |
| | ***Full incapacity (IPA) and Severe incapacity (GI)*** | | | |
| | 15 years of contribution | | | |
| | | *B. Benefit calculation* | | |
| B1. Regulatory base | 0.86*wage of last 8 years of work | Last year of work | 0.86*highest wage of 24 months within last 7 years | |
| B2. Replacement rate | **IPT:** 55 percent; **IPTC:** Up to 75 percent, **IPA:** 100 percent; **GI:** 150 percent | Id. | Id. | 55 percent of minimum wage |
| B3. Income tax rules | **IPT** and **IPCT:** General income tax reg. [a] **IPA** and **GI:** Tax exempted | Id | Id. | |

[a] There are tax deductions for IPT beneficiaries who are employed at the same time than receiving benefits. Precisely, there is a reduction in the earnings used to calculate the income tax of €2,800/year if their degree of disability is low (between 33 percent and 65 percent) or €6,200 if the disability level is higher (more than 65 percent) or if the disabled have reduced mobility.

**Classification of degrees of disability:**

**Incapacity to perform current job (IPT and IPTC):** The individual is impaired to develop all of the fundamental tasks of his or her usual job or professional activity, but he or she is still capable of developing a different job or professional activity.

**Full incapacity (IPA):** The individual is impaired for the development of any kind of job or professional activity.

**Severe incapacity (GI):** Individuals who, as a result of anatomic or functional losses, need the assistance of a third person to develop essential activities of daily living.

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