The Right to Retire Early and Mortality*

Cristina Bellés-Obrero[†]
University of Mannheim,
IZA

Sergi Jiménez-Martín[‡]
Universitat Pompeu Fabra,
Barcelona GSE, FEDEA

Han Ye [§]
University of Mannheim,
IZA, ZEW

Preliminary Results
Please do not cite without permission
February 2022

Abstract

This paper sheds new light on the mortality effect of delaying retirement by investigating the 1967 pension reform in Spain. The pension reform exogenously changed the early retirement age depending on the date individuals started contributing to the pension system. Those that contributed before January 1st, 1967 maintained the right to retire early at age 60, while individuals who started contributing after that date are regulated by the new regime and can not claim pension until age 65. Using the Spanish administrative social security data, we find that people in the new regime delay labor market exit by around half a year. The reform also increased the probability that individuals take up disability pension, partial pension, and no pension. We show evidence that delaying exiting employment increases overall mortality, especially we find large impacts on the hazard of dying between 60 and 64. Heterogeneous analysis indicates that delaying retirement affects both men and women, while the negative impact is driven by those employed in low-skill, physically demanding jobs.

JEL Codes: I10, I12, J14, J26

Keywords: pension form, retirement, mortality

*We are thankful to participants at the seminars at Pompeu Fabra University, University of Mannheim, Boston University and University of Barcelona for their helpful insights and suggestions. We gratefully acknowledge funding from the German Research Foundation (DFG) through CRC TR 224 (Project A02 and C01).The views expressed here are solely those of the authors. All errors are our own.

[†]University of Mannheim, Department of Economics, Germany. *Email:* cbelleso@mail.uni-mannheim.de

[‡]Universitat Pompeu Fabra, Department of Economics, Spain. *Email:* sergi.jimenez@upf.edu

[§]University of Mannheim, Department of Economics, Germany. *Email:* han.ye@uni-mannheim.de

1 Introduction

Many countries have reformed their public pension system to cope with the population aging and maintain financial solvency. One of the main policy tools is restricting access to early retirement schemes by increasing the minimum pension eligibility age. While there has been an extensive literature studying the labor supply responses of such pension reforms,[1] there are relatively few studies about the impact of closing the early retirement options on mortality. The impact of delaying retirement on mortality is theoretically ambiguous. While retiring earlier can prolong life expectancy via more leisure, less work-related stress, and accidents, earlier retirement can also harm health and life expectancy through the loss of social networks, reduction in cognitive and physical activities, and the adoption of unhealthy lifestyles.[2] The limited existing empirical literature on the impact of later retirement on mortality also finds contrasting results (see, e.g., Hernaes et al. (2013); Celidoni et al. (2017); Fitzpatrick and Moore (2018); Kuhn et al. (2020); Bozio et al. (2021)).

Our paper contributes to this literature by investigating the Spanish pension reform in 1967, which established the current public old-age pension system. Individuals who contributed to the pension system before January 1st, 1967, maintained their initial rights in the old system. One major change is the eligibility age for old-age pension. In the old system, people could voluntarily claim a pension as early as age 60. In the new regime, individuals can only voluntarily claim a pension at age 65.[3] Therefore, the reform exogenously increases the legal retirement age for those who started contributing after January 1st, 1967.

To the best of our knowledge, we are the first to study the impact of the 1967 reform in Spain. This reform has several advantages in answering our research question. First, the discontinuity change in retirement age based on year started contributing allows us to identify causal effects credibly. Second, the reform leads to a considerable delay in the exit of the labor market and affects a more general population as compared to existing studies (see, e.g., Hallberg et al. (2015); Bloemen et al. (2017); Hagen (2018)). This feature allows us to capture the mortality responses and study heterogeneous responses of subgroups. Lastly, the treatment was determined at the early stage of a worker's career, which provides a long time horizon for the expected retirement age to impact mortality if there are some anticipatory responses.

We use a restrictive version of the Spanish administrative social security panel data covering 10% of the cohort of individuals born between 1938 and 1949 registered in the Social Security at

[1] For example, see Coile and Gruber (2007), García-Pérez et al. (2013), Manoli and Weber (2016), Blundell et al. (2016) and Geyer and Welteke (2021) for recent evidence on the direct effects of raising retirement ages.

[2] For benefits of retire earlier, see, for example, Eibich (2015); Celidoni and Rebba (2017); Gorry et al. (2018)); for the negative effects of retire early, see, for example, Grip et al. (2012); Insler (2014); Celidoni et al. (2017).

[3] Depending on the birth year, some cohorts can retire at age 61 through involuntary early retirement under certain conditions. See section 2 for more details on the institutional setting.

any point until 2020. We focus on a sample of individuals who started contributing in 1966 and 1967 and compare those who started contributing one year before and after this cutoff date. Using within-cohort first-difference regression and controlling for a broad list of fixed effects, we find that the reform delays the age at last employment by around half a year. Those who contributed in 1967 are also less likely to claim a regular pension and more likely to claim partial and disability pensions. They also have a higher probability of not claiming any pension, driven mainly by premature death. Those who started contributing after January 1967 are 0.02 percentage points more likely to be dead before claiming any pension.

To better understand the mortality responses, we instrument the age at last employment using the reform treatment status and examine the impact on the hazard of dying between different age brackets. We find that delaying labor market exit by one year increases the hazard of dying between 60 and 69 by 4 percentage points (equivalent to a relative increase of 40%). Both mortality outcomes of men (6.6 percentage points) and women (2 percentage points) are affected by later retirement. The mortality responses between ages when public pensions are not accessible (60 and 64) are the strongest. Furthermore, we look at heterogeneity by sector's incidence of workplace accidents and individuals' last occupation skill level. We find that the detrimental impact of delaying retirement is driven by low-skill workers employed in sectors with high intensity of workplace accidents. This result implies that losing the right to retire early can kill those individuals with physically demanding jobs in sectors with high workplace-accident rates.

We provide various robustness tests, including regression-based tests of the differences in covariates, varying controls, and using within-age start contributing analysis. The results are robust to these checks. Moreover, we test the causality of our estimates by using placebo cut-off dates and find no significant impacts at these placebo dates both before and after 1967.

Apart from contributing to studies on the impact of pension reforms on retirement decisions (e.g., Mastrobuoni (2009); García-Gómez et al. (2012); Manoli and Weber (2016); Geyer and Welteke (2021)), our paper relates to and completes papers study the mortality effects of retirement. The existing well-identified empirical literature finds mixed results.[4] Among them, several papers find no significant impact of delaying retirement (Coe and Lindeboom, 2008; Hernaes et al., 2013; Hagen, 2018; Bozio et al., 2021). For example, Hagen (2018) studies the mortality effect of a two-year increase in the normal retirement age of local government female workers in Sweden and finds that the reform had no impact on mortality and health care utilization. Bozio et al. (2021) find delaying retirement has a precise zero effect on the probability to die between age 61 and 79 for both men and women among the French population.

[4]These papers causally estimate the impact on mortality either by using exogenous changes in early retirement ages of some special occupation groups (Hallberg et al. (2015), Bloemen et al. (2017), Hagen (2018), Kuhn et al. (2020)), or using the nationwide statutory retirement ages framework ((Hernaes et al., 2013; Fitzpatrick and Moore, 2018).

Other papers find that (earlier) access to pension increases mortality. For example, Kuhn et al. (2020) estimate the effect of 3-year earlier access to pension on mortality using Austria register data. They find that an additional year in early retirement increases men's risk of dying before age 73 by 1.47 percentage points, particularly among blue-collar workers, but has no effect on women. Fitzpatrick and Moore (2018) show that becoming eligible for pension at age 62 leads to an immediate increase in male mortality in the U.S. and find no significant impact on women.

Researchers have also shown that earlier retirement reduces mortality. Hallberg et al. (2015) find five-year earlier access to pension reduces mortality of male army officers in Sweden. Bloemen et al. (2017) find that male civil servants who are entitled to claim pension around eight years earlier have a lower mortality rate in the Netherlands. Similarly, using administrative social security data in Israel, Saporta-Eksten et al. (2021) find that working an additional full year at old age decreases longevity, and the mortality effect is driven by blue-collar workers.

Our paper provides support for this last set of papers using a reform that affected a more general population. Moreover, in our setting, those who are entitled to earlier retirement do not necessarily experience the pain of being displaced, which can lead to an increase in mortality (Sullivan and Von Wachter, 2009). In addition, eligibility is determined when they start contributing to the pension system. The treated individuals are unlikely to be shocked by the differential treatment, which can result in depression (Grip et al., 2012). Lastly, our reform allows people in the old regime to retire as early as age 60, which is not a very early age as in Kuhn et al. (2020). This institutional detail could be why we find that retiring earlier is not harmful.

This article proceeds as follows: Section 2 presents a brief description of the institutional setting in Spain and the 1966 pension reform. Section 3 describes the data and the empirical strategy. Section 4 presents results on the labor supply responses and the instrumental variable estimates of the impact of age at last employment on mortality. We also discuss the heterogeneity and potential mechanisms that may explain the impact on mortality. We conclude with a discussion of the findings in Section 5.

2 Institutional Setting

The nowadays old-pension system in Spain is a benefit pay-as-you-go system with an average replacement rate of around 80% (one of the highest in the EU). The key elements of the existing Spanish pension system were set in 1966.[5] Before 1967, a fixed-amount pension (*SOVI*) financed by employers and the state was available for low-income or disabled workers. This SOVI pension,

[5]It was then further developed in the 70s. In the last 30 years, the system has experienced six important reforms in 1985, 1997, 2002, 2007, 2011, and 2013. See Boldrin et al. (2010) and García-Gómez et al. (2012) for a detailed explanation of all the reforms of the old-age pension system in Spain.

which was basic and insufficient, was complemented by the "Mutual societies" (*Mutualidades*), which were specific to each occupation/sector.

In 1967, the General Social Security Law (*Ley General de Seguridad Social*) unified the pre-existing insurance systems in a single institution, the *Social Security*. Yet, individuals who contributed before the 1st of January of 1967 (even by one day) maintained the initial rights of the old system indefinitely. Because the law was published on the 30th of December of 1966, there is little room left to manipulate the date of the first pension contribution. This feature allows us to compare people who started contributing before and after the 1st of January of 1967.

Under the old system, the statutory retirement age is 65, but individuals could freely retire early at age 60 with some financial penalties.[6] Around 13% of people in the old system claimed pension at age 60. Individuals need a minimum of eight years of contributions to gain access to the pension. Finally, the pension benefits are calculated based on the average contributions in the last two years preceding retirement.[7]

Those that contributed after the 1st of January of 1967 are in the new regime. The pension rights are regulated by the specific law applicable in the year they retire, which for our cohort of individuals is the Law 35/2002.[8] Therefore, those who contributed after the 1st of January of 1967 faced a statutory retirement age of 65. The only way workers can retire earlier is via involuntary early retirement, which allows them to retire as early as age 61 with some financial penalties under some conditions. They need to be unemployed for at least six months beyond their willingness (involuntary) and have at least 30 years of contribution. Due to the stringent requirements, a very small share of workers takes up this involuntary early retirement option.

As we can see in Figure 1, individuals who contributed before 1967 independently on their birth year could voluntarily retire early at age 60. For those that contributed after 1967, the only other way to claim early was via involuntary early retirement. Otherwise, they can voluntarily claim pension the earliest at age 65. Therefore, we expect individuals who wish to retire early and started contributing after 1967 to increase their retirement age substantially.

The early retirement age was not the only change that the new *Social Security* system introduced. First, eligibility for the old-age benefits is of 15 years of contribution instead of 8 years. Secondly, the calculation of pension benefits in the new system considers contributions made 15 years before retirement rather than only two years. Therefore, we also explore the impact of the reform on pension income.

Other factors that may affect older workers' labor market exit behavior are the disability pension and partial pension. Permanent disability benefits have been used extensively as an early retire-

[6]The penalty for early retirement is 8 percent per year of early claim.

[7]Full benefits are given to people with 35 contribution years. The penalty for insufficient years of contributions is 2 percent per year.

[8]Ley 35/2002,de medidas para el establecimiento de un sistema de jubilación gradual y flexible

ment mechanism in Spain (García-Gómez et al., 2012). This action has prompted several reforms since 1985 that tightened the eligibility criteria and managed to keep the inflows into the disability system stable after that. Nevertheless, disability insurance is an important way to exit the labor market. Additionally, from 2002, partial retirement options became available, allowing the combination of income from work with old-age benefits. Partial retirement enables individuals aged 60 years and older with at least 30 years of contribution and six years of tenure in the same company to claim 85% pension while working for 15%. In the paper, we investigate the impact on the ages when claiming disability pension and partial pension and the probabilities of choosing different types of pension. Given that the treated ones have to wait till age 65 to claim a regular pension, we expect them to exploit other ways to leave the labor market and become more likely to take up disability pension and partial pension.

3 Data and Empirical Strategy

3.1 Data and Sample

This paper uses administrative data from the Continuous Sample of Working Histories (Muestra Continua de Vidas Laborales (*MCVL*), in Spanish) provided by the Spanish National Statistics Institute. The main dataset contains a 10% random sample of individuals born between 1938 and 1949 and registered in the Social Security (contributive workers and pensioners) at any point of their lives till 2020.

The *MCVL* also includes time-invariant information (such as gender, birth month, birth year, place of birth). It also includes detailed labor market biographies from the age when they enter the data set until they die. Notably, we have information about the date individuals started contributing, allowing us to identify the treatment status.[9] Moreover, we observe their employment and unemployment spells, occupations, industry, type of contract, and monthly earnings. The pension records from the *MCVL* contain accurate information on the age at claiming pension, amount of pension benefits, the type of pension they receive at each point of time, and years contributed. When individuals exit from the dataset due to death, we observe the exact date of death, which helps us measure mortality accurately.

Our sample covers Spanish individuals born between 1938 and 1949 who were contributing to the Social Security system at age 50. We further restrict our sample to individuals that started contributing to the pension system 12 months before and after the 1st of January of 1967. This final sample contains 25,495 individuals, of which 37% are women.

[9]Note that the date that individuals started contributing to the social security system coincides with the date at which they had their first formal job. It is important to emphasize that, for some people, this date does not correspond to the date they started working (for example, for those that switch from informal sector to formal sector).

One caveat of the dataset is that the exact date of the first contribution to Social Security is poorly recorded for some individuals, especially those who started contributing around 1967. We partially correct this measure by using the number of contribution years.[10] Figure A1 shows the distribution of years started contributing before and after the adjustment. This limitation is why we do not explore the Regression Discontinuity Design.[11]

3.2 Empirical Strategy

Estimating the causal effect of retirement age on mortality is difficult because many unobserved factors can influence both retirement age and mortality. To deal with endogeneity in retirement behavior, we exploit an exogenous variation in retirement age, provided by the 1967 Spanish pension reform. We first provide causal estimates of the reform effects using a with-in cohort OLS regression with a list of fixed effects and controls. We then further use an instrumental variable (IV) approach to estimate the causal impact of age at least employment on mortality.

First, we estimate Equation 1, where $Treated_t$ is a dummy that takes the value one for those who started contributing to the pension system in 1967 and zero for individuals that started contributing in 1966. The treatment group can claim regular pensions the earliest at age 65, while the control group can claim pensions as early as age 60.

$$R_{imct} = \beta_0 + \beta_1 \delta_c + \beta_2 \mu_m + \beta_3 Treated_t + \gamma X_{imct}, + U_{imct} \tag{1}$$

R_{imct} represents the outcome variable of individual *i* born in year *c* and month *m* that started contributing in the year *t*. The outcome variables include age at last employment, the probability of claiming different types of pensions, the age at which individuals claim regular pension or disability insurance, or pension benefit. δ_c is the year of birth, and μ_m is the month of birth fixed effects. β_3 measures the average treatment effect of the reform on age at least employment.

We control for a list of fixed effects, including the region of the first affiliation, highest occupation, and industry sector between the ages 30 and 40, and a list of other predetermined covariates, including individuals' monthly contribution to the pension system, the share of days active and employed, the fraction of time self-employed between age 30 and 40. We cluster the standard errors at the birth year level and report the wild-bootstrap standard errors in all tables.

The estimates from Equation 1 provide us the reduce-form reform effects and also the first stage estimates for the IV regression. The second stage of our IV estimates are given by Equation 2 ,

[10] We correct the reported date of the first contribution by subtracting the total number of years contributed from the year they claim pension. If the corrected year of starting contributing is before the reported date of the first contribution, we make this correction.

[11] In future work, we plan to test for robustness using the RD method, and the sample where the date started contributing is relatively smooth around 1967 and relatively accurately measured.

where the age at last employment (R_{icmt}) is replace by the predicted value ($\widehat{R_{icmt}}$) from Equation 1:

$$M_{imct} = \alpha_0 + \alpha_1 \delta_c + + \alpha_2 \mu_m + \alpha_3 \widehat{R_{imct}} + \gamma X_{imct} + U_{imct} \quad (2)$$

M_{imct} represents the probability of dying of individual *i* born in year *c* and month *m* that started contributing in the year *t*. We also include the same list of controls used in Equation 1. The coefficient α_3 captures the local average treatment effect of age at last employment on mortality among the individuals who delay retirement in the new regime and who would not leave the labor force later had they be able to claim pension at age 60.

Assumptions: The critical assumption for the treatment status to be a valid instrument for access to early retirement is that individuals' date at starting contributing to the pension system is independent of unobserved characteristics that affect the age at last employment and mortality. We do the following steps to support the validity of our instrument.

First, we restrict our sample to those who started contributing in 1966 and 1967. The treated and control group individuals had similar labor market conditions when they began working: they were born in the same year and started working only one year apart. Second, we control for region, occupation, and industry fixed effects and include birth year and month fixed effects. This allows us to estimate within occupation, industry, and birth year variations.

Furthermore, we check whether the characteristics of the treated and control groups are similar when they are between 30 and 40 years old.[12] Table A2 shows the impact of the treatment on a list of predetermined variables, including the faction of time spent in employment, activity, and self-employment between age 30 and 40; the probability of working in different occupations and industry sectors; and average monthly earnings between age 30 and 40. The estimates are obtained from estimating Equation 1. Except for the fraction of time spent in self-employment, there are no significant impacts. This suggests that there is no manipulation of the treatment status and that our control and treatment groups are very similar. In the robustness test, we also show our reduced-form results with and without these controls, and the estimates are not sensitive to the inclusion of controls.

To further establish causality of the first stage estimates, we perform placebo tests using other years to define treatment status and a robustness test using age at first contribution fixed effect instead of birth month fixed effects. These tests rule out the possibility that other confounding factors drive our reduced-form estimates. For more details see Section 4.

As for the exclusion restriction, we need to ensure that the treatment status affects mortality only

[12] Ideally, we would also test if the characteristics before they start contributing to the social security system are similar and control for that. However, it is unlikely to observe many labor market variables before people start contributing to the pension system.

through its impact on age at last employment. The only possible channel in which the new regime can affect mortality is through changes in pension benefits. We, therefore, always control for the base pension benefits to wash out the possible income effect channel effect.

Finally, the monotonicity assumption requires that being in the new regime would not lead people to retire earlier. The monotonicity assumption is also satisfied in our context because the treated individuals do not have the option to retire as early as age 60, and the new system is overall less generous.

4 Results

4.1 Descriptive Evidence

Table A.1 provides summary statistics for the main outcomes used in our analysis. There are three different pensions that individuals can claim. Table A.1 shows that 47% of individuals claim the regular pension (old-age pension), while 33% claim disability pension and 4% of individuals choose the partial pension. Finally, some people exit the labor market without claiming any pension due to reasons such as going into inactivity ($\sim$ 7%), dying before claiming ($\sim$7%), and being still active in 2020 (0.3%). In our sample, 15% of individuals are in this category. Figure 3 compares the share of different types of pension by treatment status. Compared with those that started contributing in 1966 (control, light green bars), individuals who started contributing in 1967 (treated, darker green bars) have a lower likelihood of claiming regular pension and are more likely to claim disability pension, partial pension, and claim no pension.

On average, individuals leave the labor market at 59.7 years old and claim regular pensions at 63.5 years old. Figure 2 shows the distribution of the age at last employment for individuals that started contributing in 1966 and 1967. As expected, we see a distinct difference. Figure 2 shows that around 8% of individuals that started contributing in 1966 (control group, red solid line) retire at age 60, while this percentage is almost zero for those individuals that started contributing in 1967 (treated group, green dashed line). More than 20% of individuals in the new regime exit the labor market at age 65, while this number is only 15% of those belong to the old regime. We see the same pattern in terms of age at claiming regular pension. Figure 4a shows that 13% of people who started contributing in 1966 (control group, red solid line) claim regular pension at age 60, and 18% of them claim at age 65. We also see some actions at ages 61 to 64. However, for the people who started contributing in 1967 (treated group, green dashed line), almost no one claims regular pension any age other than age 65. Almost 30% of them claim regular pension at age 65. These figures provide graphical evidence that the law of 1967 is binding, and individuals affected by the reform delay their retirement timing.

In our sample, individuals, on average, claim disability pension at age 57 and partial pension at 61 years old. Figure 4b and Figure 4c shows that the distribution of these ages by treatment status. We observe that individuals that started contributing in 1967 (green dashed line) claim more disability insurance at all ages compared with individuals that started contributing in 1966. And individuals that started contributing in 1967 (green dashed line) claimed more partial pensions between the ages of 60, 61, and 62.

Finally, regarding the mortality measure, conditional on being alive at age 50, 32% of our sample dies between 50 and 86 years old. The hazard rate of dying between 50 and 59 and the hazard rate of dying between 80 and 86 are low, at 7% and 2%, respectively. The highest mortality happens between 60 and 79 years old. The hazard of dying between 60 and 69 is 12%, and the hazard of dying between 70 and 79 is 18%.

4.2 The Reform Effect on Retirement Outcomes

Table 1 examines the impact of the reform on the different types of pensions individuals claimed. We find that individuals who started contributing to the pension system in 1967 are less likely to claim regular pension by 11 percentage points ($\sim$ 21%). Their probability of taking disability insurance increases by 6.4 percentage points ($\sim$ 21%). They are also 1.8 percentage points ($\sim$ 51 %) more likely to take up partial pension. These results indicate that individuals did not fully comply with the rise in statutory retirement age and utilized other ways to leave the labor market before claiming regular pension, such as claiming disability insurance or a partial pension.

We also observe that individuals contributing to the pension system in 1967 are 2.9 percentage points ($\sim$ 20 %) more likely to leave the labor market without any pension. In Table A.3, in the Appendix, we further explore three reasons why individuals might not claim any pension: they were still working in 2020, they became inactive, and never claimed a pension, or died before claiming any pension. Table A.3 indicates that the reform has no impact on the probability of continuing working up to 2020, nor on the probability of becoming inactive. Interestingly, we find that individuals who started contributing in 1967 have a 2.9 percentage point ($\sim$ 28%) higher probability of dying before claiming any pension. This finding implies that the main driver for not claiming any pension is premature death. We further explore this effect in the Section 4.3.

Table 2 examines the impact of the reform on the ages at which individuals leave the labor market and claim different types of pensions. We find that the reform caused the treated ones to delay labor market exit by around half a year and delay claiming their first pension (regardless of the type) by 0.3 years (4 months). We find that early retirement is reduced by 1 year and 3 months for individuals that claim a regular pension. The ages at claiming disability pension and claiming partial pension also are affected. Individuals that contributed after 1967 delay claiming disability

by around 4 months, but anticipate claiming partial pension by around 2 months.

In Table 3, we examine the reform impact on pension benefit amount. We expect the pension benefits to be affected by several dimensions. First, the reform changed how pension benefits are calculated and made them more generous for some workers in the new regime. Second, the reform gives incentives to individuals to work longer (as shown in Table 2), which increases the pension base and decreases the penalty for early retirement. Lastly, as we see more individuals claiming disability insurance due to the reform, we expect the overall pension benefits to be lower as disability pension benefit is typically less generous. We find that the total pension benefit of individuals that started contributing in 1967 increased by 45€($\sim$ 4%). The increase in the pension benefit is driven by an increment in the base pension (without any financial adjustments) of 22€($\sim$ 2%) and an increase in the pension adjustment (due to later claiming) of 5 percentage points ($\sim$ 6%).

4.2.1 Robustness and Placebo Tests

In this section, we perform a robustness test by using within-age start contributing analysis instead of within-cohort analysis. Moreover, we test the causality of our estimates by using placebo cut-off dates both before and after 1967.

In the baseline analysis, we compare individuals born in the same year (along with the first affiliation, highest occupation, and industry sector between the ages 30 and 40, fixed effects) that started contributing to the system one year apart (1966 vs. 1967). One potential confounding factor of this specification is the age when started contributing. These individuals born in the same year but started contributing in 1966 and 1967 were at different ages when they started contributing. To test the robustness, we examine the reform impact by using age at first contribution fixed effect instead of birth year fixed effects in Table A.4. This robustness check estimates the impact of losing access to early retirement for people who start working at the same age. These estimates should be similar to the main estimates unless the different starting age is a confounding factor. Compared with the baseline results in Tables 1 and 2, the magnitudes of the estimates in Table A.4 are very similar.

Another concern for causality is that our results could be potentially biased by unobserved characteristics that affect both the date of starting contributing and labor supply decisions. To test this possibility, we perform several placebo tests where we assign placebo treatment status to the individuals using other dates at first contribution. Figure 5 plots the estimated changes using placebo treatment statues, which are defined as start contributing after years from 1959 to 1976. The placebo estimates are labeled in black, while our baseline estimates are labeled in red. We can see that almost all placebo estimates are close to zero. This suggests that the estimated changes in our baseline analysis result from the exogenous increase in early retirement age rather than other

confounding factors.

4.3 Right to Retire Early and Mortality

4.3.1 The Effect of Age at Last Employment on Mortality

In this section, we move to examine the impact of retiring later on mortality using the instrumental variable method.

Table 4 reports the effects of age at last employment on mortality. Panel 1 reports the simple OLS estimation where we regress age at last employment over mortality. For all our estimations delaying retirement has a negative and significant effect on mortality. This correlation is probably downward biased because unhealthier workers tend to retire early.

Panel 2 shows the reduced form effect of the reform on mortality. We find that individuals who contributed in 1967 have a 3.1 percentage point ($\sim$ 10%) higher probability of dying between 50 and 86. When we examine the reform impact on mortality in different age brackets, we observe that the increase in mortality is concentrated between the ages 60 to 69. In particular, individuals who contributed in 1967 die between those ages with a 2.2 percentage points higher probability ($\sim$ 22%). We also find a smaller increase in mortality after 80 (0.5 percentage points). Figure 6 also shows that all the placebo estimates for the mortality outcomes are insignificant and close to zero, confirming that our reduced-form estimates result from the exogenous increase in early retirement age due to the reform rather than other confounding factors.

The IV estimates in Panel 3 of Table 4 indicate that delaying the age at last employment by one year increases the probability of dying between 50 and 86 by 6.6 percentage points ($\sim$ 22%), 4 percentage points ($\sim$ 40%) between 60 and 69, and 0.9 percentage points ($\sim$ 40%) after 80. In Table A.6, we also report the effect of age at last employment on mortality in 5 year age brackets. We observe that the mortality responses are the strongest between ages when public pensions are not accessible (60 and 64). Delaying one year leaving the labor market increases mortality in that age bracket by 3.4 percentage points ($\sim$ 59%).

Compared with the reduced-form estimates, the IV results are almost double. This is consistent with the estimated half a year increase in age at last employment (Table 2). Moreover, the IV estimates control the reform's effect on income, potentially driving the reduced-form estimates on mortality downwards. Also, when we compare the OLS results with the IV estimates, we can perceive that the IV strategy does a good job controlling for the negative bias present in the correlation between age of last employment and mortality.

4.3.2 Heterogeneous Impacts

By Labor Market Characteristics

In this section, we analyze if the effect of age at last employment on mortality is universal or masks significant heterogeneities among people with different labor market characteristics. Delaying retirement can have very different effects on an individual's life expectancy depending on the working conditions the individuals are experiencing during the last years of employment (Mazzonna and Peracchi, 2017).

Using the Spanish Register of Workplace Accidents between 2003 and 2019, we calculate the total number of workplace accidents by different sectors experienced by our cohort of individuals born between 1938 and 1949. Figure 7 shows that we can differentiate three distinctive groups of sectors depending on their workplace accidents incidence. We consider the manufacturing and the energy, water, and sanitation sectors as industries with a high incidence of workplace accidents. The health, construction, public administration, administrative, trade, agriculture, and hostelry sectors are considered medium workplace accident incidence sectors, and the rest are included in the low incidence group.

In Table 5 we examine the effect of age at last employment on mortality based on the incidence of workplace accidents of individuals' last industry. We observe that the increase in mortality is stronger for those individuals who worked in sectors with a higher incidence of workplace accidents during their last years of employment. In particular, we find that delaying the age at last employment by one year increases the probability of dying between 60 and 69 by 6.9 percentage points ($\sim 58\%$) in sectors with a high incidence of workplace accidents, by 2.5 percentage points ($\sim 25\%$) in sectors with a medium incidence of workplace accidents. On the contrary, as we expected, delaying retirement has no significant effect on mortality in sectors with a low incidence of workplace accidents.

In Table 6, we further explore this heterogeneity by distinguishing between individuals with high and low skilled occupations inside the sectors with the different incidence in workplace accidents. We observe that the effect of delaying retirement on mortality is driven entirely by those individuals with low-skilled occupations. This result implies that losing the right to retire early can kill those individuals with physically demanding jobs in sectors with high workplace-accident rates.

By Gender

Finally, we find that delaying the exit of the labor market increases mortality for both men and women. Table 7 shows that women that delay their age at last employment by one year have a higher probability of dying between 50 and 59 (by 1.2 percentage points). The effect on mortality for men in this age bracket has a slightly larger magnitude but is not significant. The first-stage F-statistics for men is smaller than 10. Thus, we won't interpret too much about the impact on

men. We suspect that it could come from becoming inactive during this age range. We plan to examine this channel in the next step.

The effect of delaying retirement on the hazard of dying between 60 and 69 is present for both men and women. The F-statistics are both above 10. Women's mortality in that age bracket increased by 2 percentage points ($\sim$ 50%) while men's mortality by 6.6 percentage points ($\sim$ 51%). Finally, delaying the age at last employment by one year increases the probability of dying after 80 only for men but not for women (by 1.9 percentage points or 57%).[13]

5 Conclusion

This paper studies the effect of delaying retirement on mortality. We exploit a reform in 1967 in Spain that changed the access to early retirement for individuals who had not contributed by then. Individuals who started contributing to the pension system before the 1st of January of 1967 maintained the right to retire early at age 60. Yet, individuals who have not contributed by that date are regulated by the new regime and can only retire voluntarily at the statutory retirement age of 65.

Focusing on cohorts born between 1938 and 1949, we use Spanish administrative social security data from 2005 to 2020 and compare people who started contributing 12 months before and after the 1st of January of 1967. We first show the reform effect on labor supply outcomes using a within-birth month OLS regression controlling for gender, province of the first affiliation, and the individuals' employment history between 30 and 45. We find that individuals who started contributing after 1967 delayed labor market exit by around half a year. The reform not only modified the age at last employment but also changed the age of claiming a pension and the types of pensions claimed. We find a decrease in the probability of claiming a regular pension, an increase in the probability of claiming a partial pension, and the probability of claiming disability insurance. Moreover, the results suggest that treated individuals are more likely to claim no pension, driven mainly by premature death.

Furthermore, we estimate the effect of age at last employment on mortality using the instrumental variable method. We find that delaying labor market exit by one year increases the hazard of dying between 60 and 69 by 4 percentage points. Both men (6.6 percentage points) and women (2 percentage points) are affected by later retirement. We also show that the detrimental impact of delaying retirement is driven by low-skill workers employed in sectors with high intensity of workplace accidents. This result suggests that despite similar impacts on the age of last employment,

[13] In the Appendix, Table A.7 shows the heterogeneous impact of the reform by gender on the different retirement decisions. We find that the effect of the reform on the age at the last employment is much bigger for women than for men (0.3 years versus 1.3 years).

losing the right to retire early for individuals with physically demanding jobs can kill them.

References

Bloemen, Hans, Stefan Hochguertel, and Jochem Zweerink, "The causal effect of retirement on mortality: Evidence from targeted incentives to retire early," *Health economics*, 2017, *26* (12), e204–e218.

Blundell, Richard, Eric French, and Gemma Tetlow, "Retirement incentives and labor supply," in "Handbook of the economics of population aging," Vol. 1, Elsevier, 2016, pp. 457–566.

Boldrin, Michele, Pilar García-Gómez, and Sergi Jiménez-Martín, "Social Security incentives, exit from the workforce and entry of the young," in "Social Security Programs and Retirement around the World: The Relationship to Youth Employment," University of Chicago Press, 2010, pp. 261–294.

Bozio, Antoine, Clémentine Garrouste, and Elsa Perdrix, "Impact of later retirement on mortality: Evidence from France," *Health economics*, 2021, *30* (5), 1178–1199.

Celidoni, Martina and Vincenzo Rebba, "Healthier lifestyles after retirement in Europe? Evidence from SHARE," *The European Journal of Health Economics*, 2017, *18* (7), 805–830.

_ , Chiara Dal Bianco, and Guglielmo Weber, "Retirement and cognitive decline. A longitudinal analysis using SHARE data," *Journal of health economics*, 2017, *56*, 113–125.

Coe, Norma and Maarten Lindeboom, "Does retirement kill you? Evidence from early retirement windows," 2008.

Coile, Courtney and Jonathan Gruber, "Future social security entitlements and the retirement decision," *The review of Economics and Statistics*, 2007, *89* (2), 234–246.

de Grip, Andries, Maarten Lindeboom, and Raymond Montizaan, "Shattered dreams: the effects of changing the pension system late in the game," *The Economic Journal*, 2012, *122* (559), 1–25.

Eibich, Peter, "Understanding the effect of retirement on health: Mechanisms and heterogeneity," *Journal of health economics*, 2015, *43*, 1–12.

Fitzpatrick, Maria D and Timothy J Moore, "The mortality effects of retirement: Evidence from Social Security eligibility at age 62," *Journal of Public Economics*, 2018, *157*, 121–137.

García-Gómez, Pilar, Sergi Jiménez-Martín, J Vall Castelló et al., "Health, disability, and pathways into retirement in Spain," *Social security programs and retirement around the world*, 2012, pp. 127–174.

García-Pérez, J Ignacio, Sergi Jiménez-Martín, and Alfonso R Sánchez-Martín, "Retirement incentives, individual heterogeneity and labor transitions of employed and unemployed workers," *Labour Economics*, 2013, *20*, 106–120.

Geyer, Johannes and Clara Welteke, "Closing Routes to Retirement for Women How Do They Respond?," *Journal of Human Resources*, 2021, *56* (1), 311–341.

Gorry, Aspen, Devon Gorry, and Sita Nataraj Slavov, "Does retirement improve health and life satisfaction?," *Health economics*, 2018, *27* (12), 2067–2086.

Hagen, Johannes, "The effects of increasing the normal retirement age on health care utilization and mortality," *Journal of Population Economics*, 2018, *31* (1), 193–234.

Hallberg, Daniel, Per Johansson, and Malin Josephson, "Is an early retirement offer good for your health? Quasi-experimental evidence from the army," *Journal of health economics*, 2015, *44*, 274–285.

Hernaes, Erik, Simen Markussen, John Piggott, and Ola L Vestad, "Does retirement age impact mortality?," *Journal of health economics*, 2013, *32* (3), 586–598.

Insler, Michael, "The health consequences of retirement," *Journal of Human Resources*, 2014, *49* (1), 195–233.

Kuhn, Andreas, Stefan Staubli, Jean-Philippe Wuellrich, and Josef Zweimüller, "Fatal attraction? Extended unemployment benefits, labor force exits, and mortality," *Journal of Public Economics*, 2020, *191*, 104087.

Manoli, Day and Andrea Weber, "Nonparametric Evidence on the Effects of Financial Incentives on Retirement Decisions," *American Economic Journal: Economic Policy*, November 2016, *8* (4), 160–82.

Mastrobuoni, Giovanni, "Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities," *Journal of Public Economics*, dec 2009, *93* (11-12), 1224–1233.

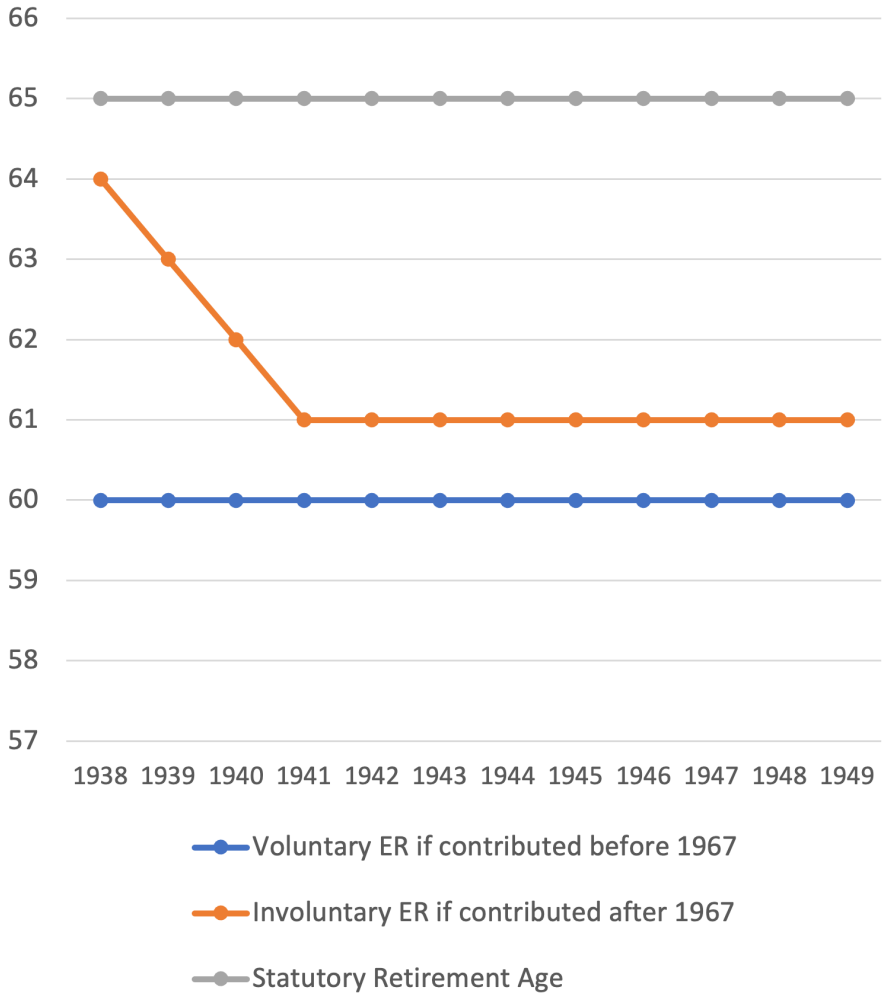
Mazzonna, Fabrizio and Franco Peracchi, "Unhealthy retirement?," *Journal of Human Resources*, 2017, *52* (1), 128–151.

Saporta-Eksten, Itay, Ity Shurtz, and Sarit Weisburd, "Social Security, Labor Supply, and Health of Older Workers: Quasi-Experimental Evidence from a Large Reform," *Journal of the European Economic Association*, 2021, *19* (4), 2168–2208.

Sullivan, Daniel and Till Von Wachter, "Job displacement and mortality: An analysis using administrative data," *The Quarterly Journal of Economics*, 2009, *124* (3), 1265–1306.

6 Figures and Tables

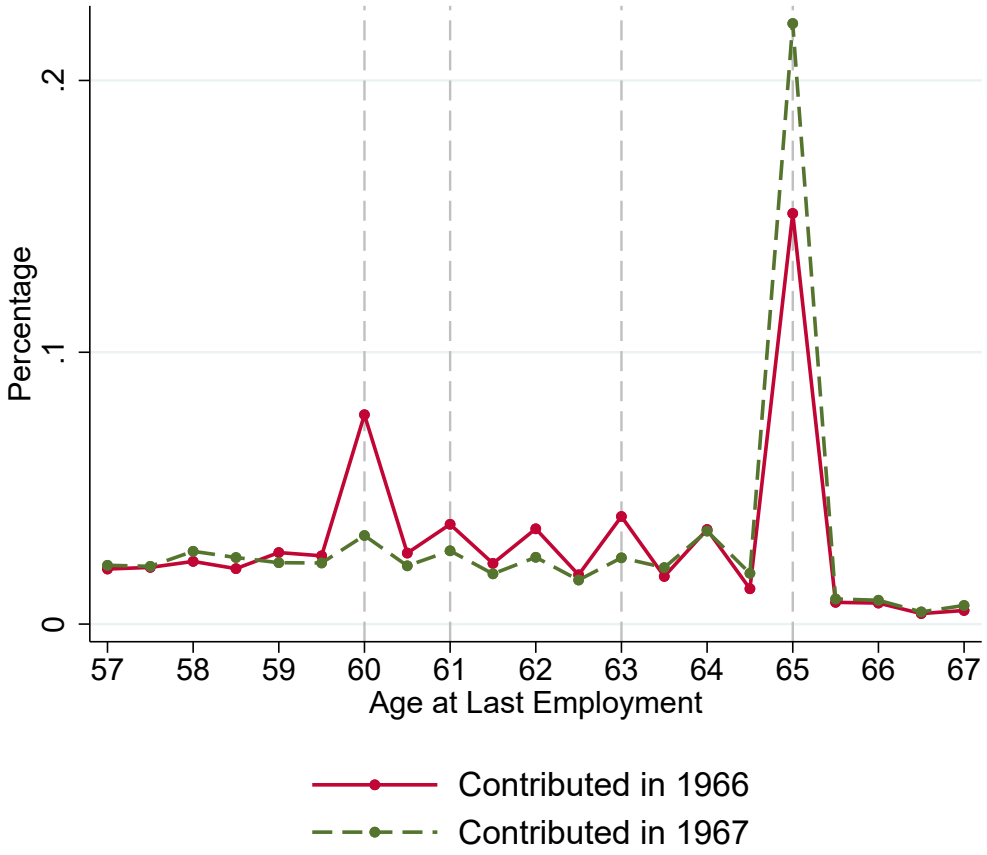
Figure 1: Retirement Age by First Year of Contribution and Cohort



Source: Authors' own construction according to the pension law.

Notes: This figure plots the statutory retirement age and the earliest possible early retirement age for those individuals that contributed before and after the 1st of January of 1967 as a function of their birth year.The blue line shows that individuals that start contributing before the 1st of January of 1967 can voluntary retire after age of 60, independently of their birth year. The orange line shows the for those that start contributing after 1967 can only involuntary retire after the age 64 to 61 depending on their birth year. The grey line shows that statutory retirement age remains at age 65 for all cohorts independently on the moment they started contributing.

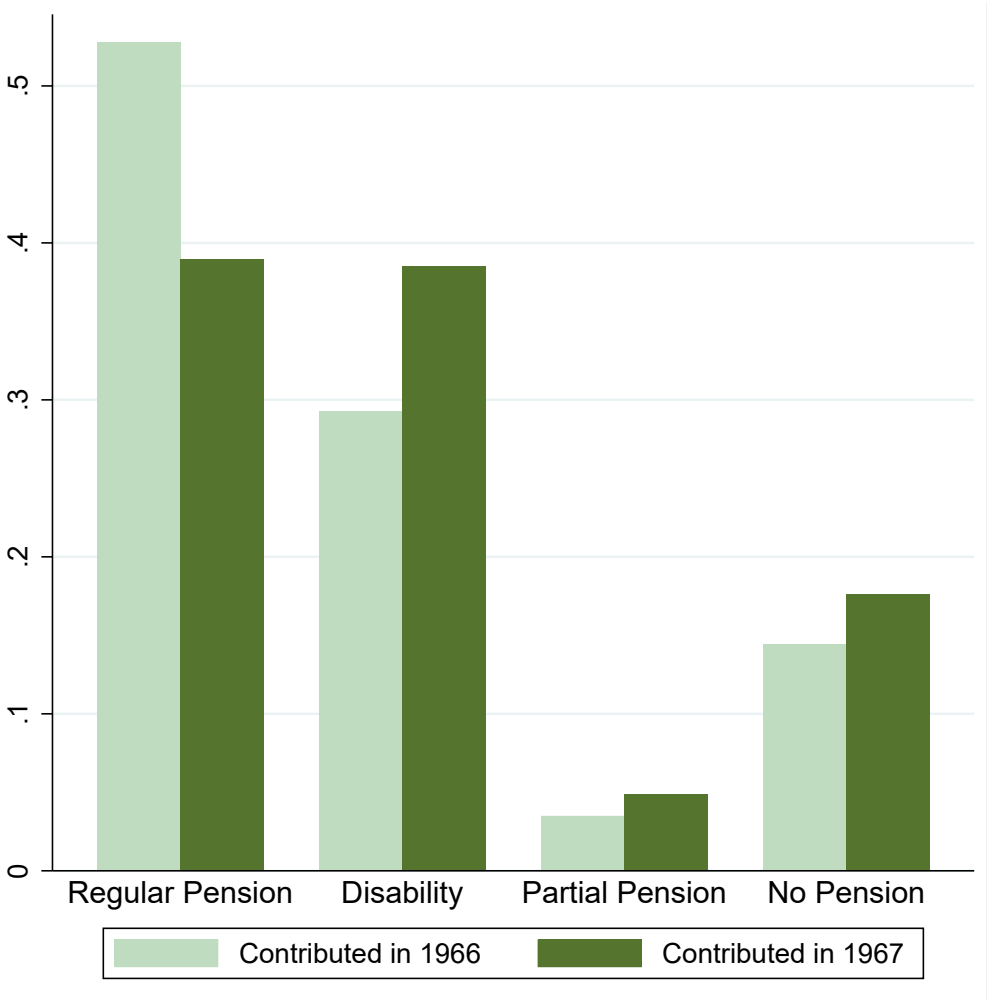
Figure 2: Density of Age at Last Employment by Treatment Status



Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This figure plots the density of age at last employment for individuals that started contributing in 1966 and 1967. The red solid line shows the density for those that started contributing in 1966, while the green dashed line shows the density for those started contributing in 1967.

Figure 3: Types of Pension by Treatment Status

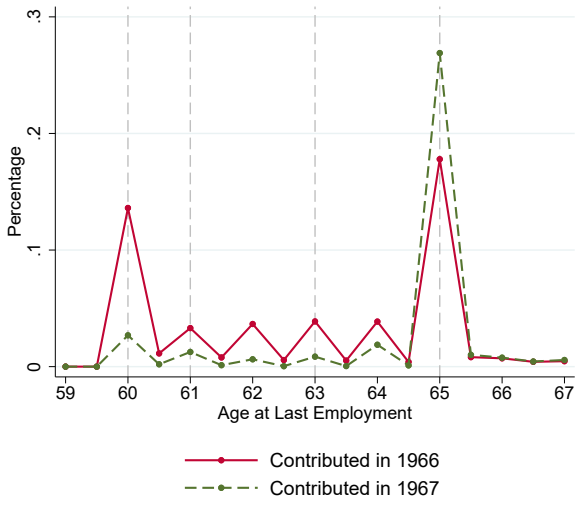


Source: MCVL 2005-2020, cohorts 1938-1949.

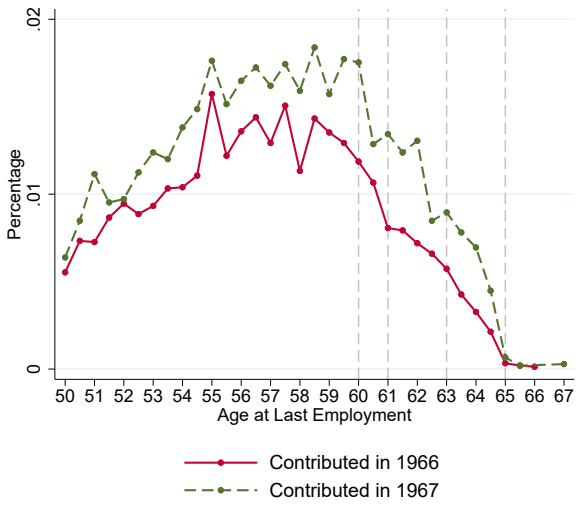
Notes: This figure plots the density of the different type of pension claimed by individuals that started contributing in 1966 and 1967. The light green bars show the density for those that started contributing in 1966, while the dark green bars show the density for those started contributing in 1967.

Figure 4: Density of Pension Ages by Treatment Status

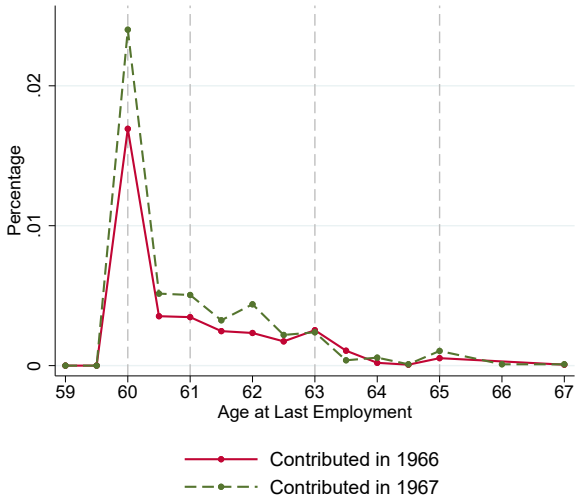
(a) Age at Regular Pension



(b) Age at Disability Pension



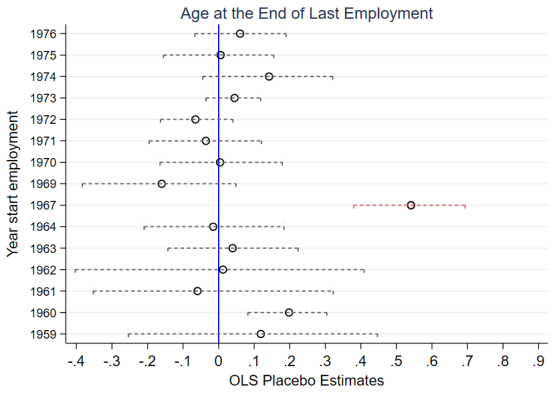
(c) Age at Partial Pension



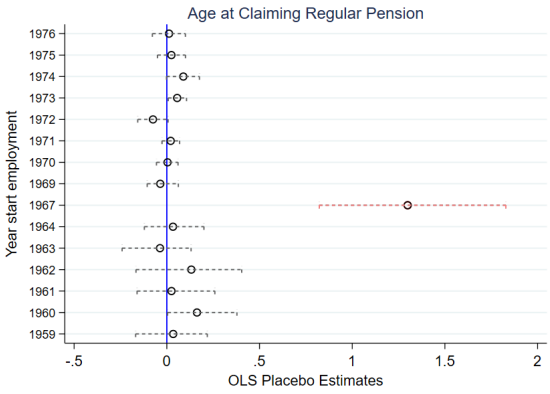
Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This figure plots the density of age at claiming regular pension (Graph a)), age at claiming disability pension (Graph b)), and age at claiming partial pension (Graph c)) for individuals that started contributing in 1966 and 1967. The red solid lines show the density for those that started contributing in 1966, while the green dashed lines show the density for those started contributing in 1967.

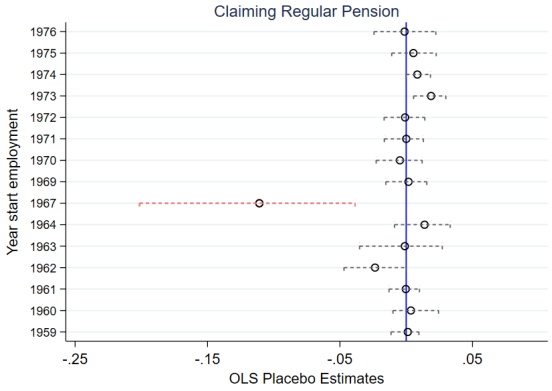
Figure 5: Placebo Tests: Using Other Cutoffs



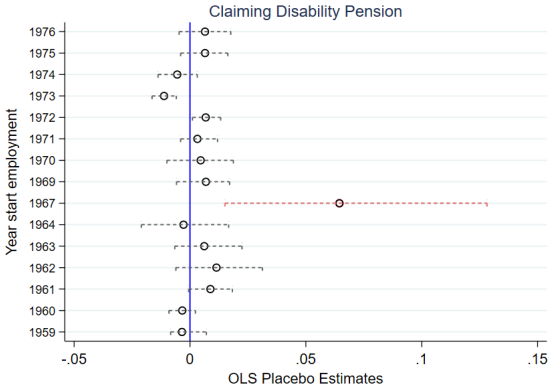
(a) Age at last employment



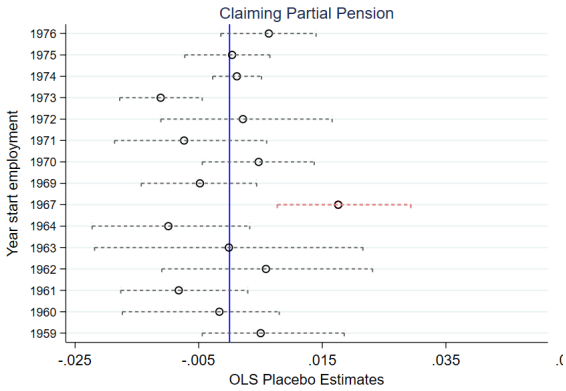
(b) Age at claiming regular pension



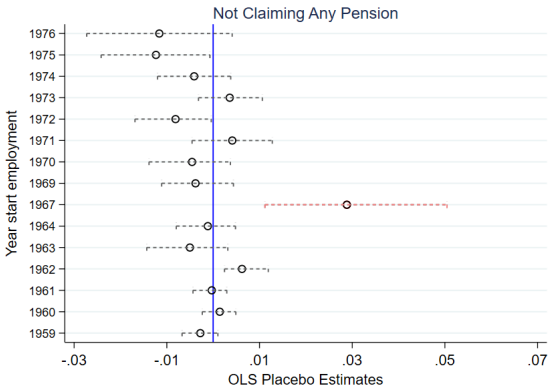
(c) Probability of claiming regular pension



(d) Probability of claiming disability pension



(e) Probability of claiming partial pension



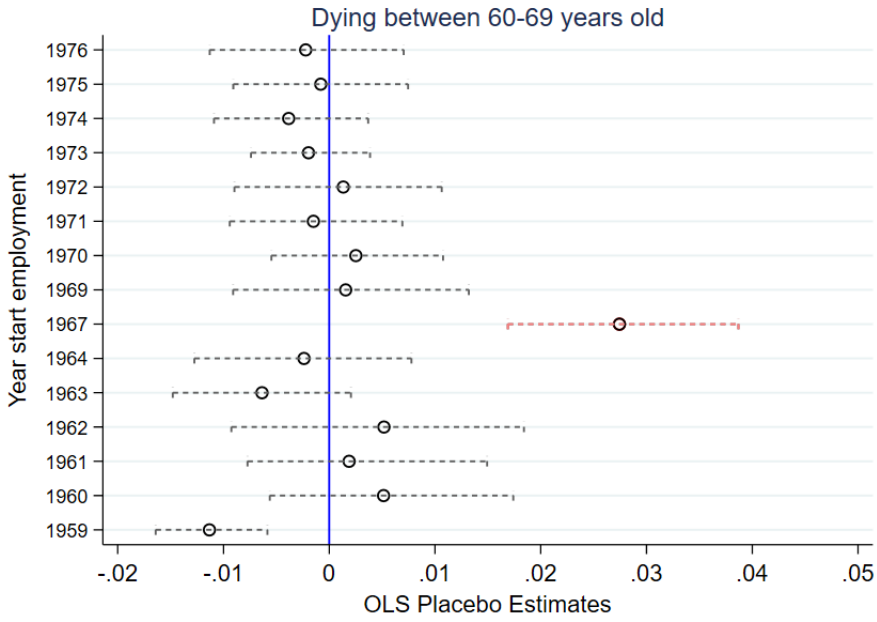
(f) Probability of not claiming any pension

Source: MCVL 2005-2020, cohorts 1938-1949.

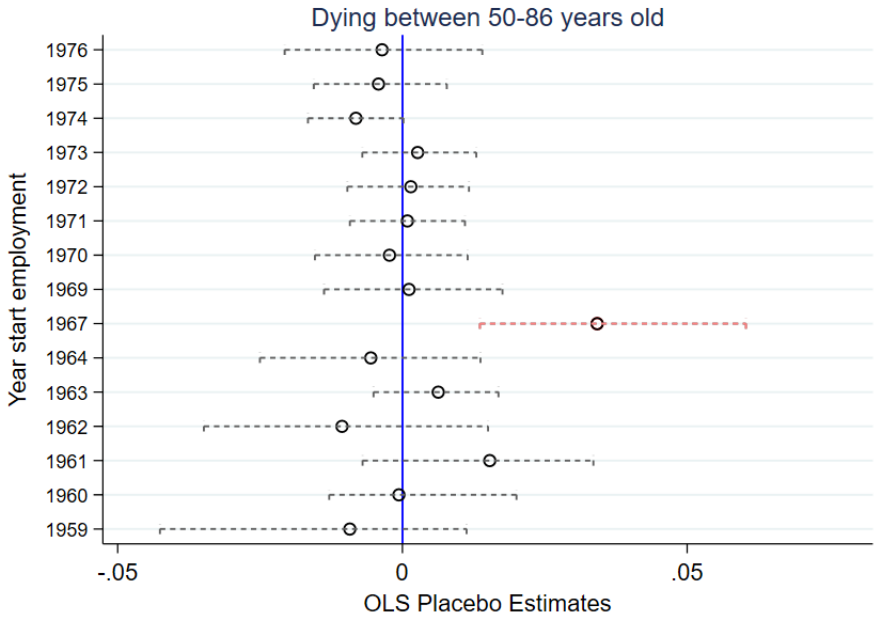
Notes: This figure shows the estimates of a list of placebos, estimating regression 1 using the years of y-axis as cutoff. 95 percent confidence intervals are also reported. The red estimate corresponds to the estimation of the regression 1 on the real cutoff: 1967. The outcomes considered are displayed on top of each figure.

Figure 6: Placebo Tests for Mortality: Using Other Cutoffs

(a) Dying between 60 and 69 years old



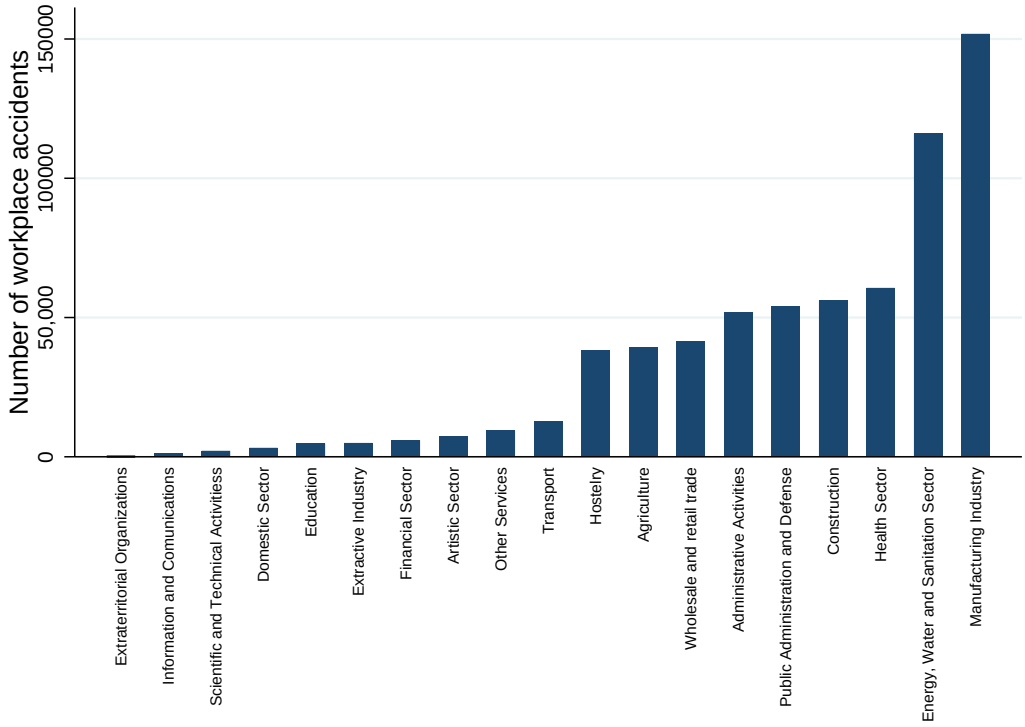
(b) Dying between 50 and 86 years old



Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This figure shows the estimates of a list of placebos for mortality outcomes, estimating regression 1 using the years of y-axis as cutoff. 95 percent confidence intervals are also reported. The red estimate corresponds to the estimation of the regression 1 on the real cutoff: 1967. The outcomes considered are displayed on top of each figure.

Figure 7: Distribution of Workplace Accidents by Sector



Source: Register of Workplace Accidents 2003-2019, cohorts 1938-1949.

Notes: This figure plots the total number of workplace accidents between 2003 and 2019 for workers born between 1938 and 1949 by the industry sector the workers were working at the moment of the accident.

Table 1: Impact of the Reform on the Type of Pension

	First pension claimed			
	Regular pension	Partial Pension	Disability insurance	No Pension
Contributed in 1967	-0.111***	0.018***	0.064**	0.029***
	(0.033)	(0.005)	(0.023)	(0.009)
	[0.006]	[0.003]	[0.020]	[0.004]
Month-Year Birth FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓
Observations	25,495	25,495	25,495	25,495
R^2	0.143	0.073	0.104	0.057
Mean Dep. Variable (Treated)	0.390	0.049	0.385	0.176
Mean Dep. Variable (Control)	0.528	0.035	0.293	0.144

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of the reform on the probability of leaving the labor market through regular pension (Column 1), disability insurance (Column 2), partial retirement (Column 3) and not claiming any pension (Column 4), obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table 2: Impact of the Reform on the Age at Claiming Pension

	Age of the individual at				
	Last Employment	First Pension	Regular Pension	Disability Pension	Partial Pension
Contributed in 1967	0.541***	0.298**	1.299***	0.347**	-0.145**
	(0.068)	(0.107)	(0.214)	(0.073)	(0.058)
	[0.001]	[0.030]	[0.001]	[0.019]	[0.041]
Month-Year Birth FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓
Observations	23,652	21,479	12,007	8,434	1,038
R^2	0.098	0.118	0.231	0.043	0.275
Mean Dep. Variable (Treated)	60.020	61.053	64.641	57.417	61.097
Mean Dep. Variable (Control)	59.482	60.909	63.034	57.051	61.131

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of the reform on the age at last employment (Column 1), at claiming first pension (any type) (Column 2), regular pension (Column 3), disability pension (Column 4), and partial pension (Column 5), obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table 3: Impact of the Reform on Pension Benefit

	Pension Benefit	Base Pension	Percent of Base Pension
Contributed in 1967	45.107***	22.335**	5.035***
	(12.005)	(7.800)	(1.037)
	[0.005]	[0.026]	[0.001]
Month-Year Birth FE	✓	✓	✓
Controls	✓	✓	✓
Contributed 1966-1967	✓	✓	✓
Observations	21,479	21,479	21,479
R^2	0.392	0.426	0.185
Mean Dep. Var (Treated)	1163.139	1191.043	85.918
Mean Dep. Var (Control)	1079.124	1140.294	78.649

Source: MCVL 2005-2020 cohorts 1938-1949.

Notes: This table reports the impact of the reform on monthly pension benefit (Column 1), pension base (Column 2) and pension adjustment factor (Column 3), obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4: IV: Impact of Age at Last Employment on Mortality

	Probability of Dying between the Ages				
	50-86	50-59	60-69	70-79	80-86
OLS:					
Age last employment	-0.012***	-0.011***	-0.003***	-0.003***	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
	[0.001]	[0.001]	[0.001]	[0.001]	[0.504]
Reduced form:					
Contributed in 1967	0.031***	0.010	0.022***	0.001	0.005**
	(0.009)	(0.006)	(0.004)	(0.006)	(0.003)
	[0.002]	[0.118]	[0.001]	[0.823]	[0.049]
IV:					
Age last employment	0.066***	0.017	0.040***	0.002	0.009**
	(0.023)	(0.012)	(0.009)	(0.010)	(0.004)
Month-Year Birth FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓
Observations	25,495	25,495	23,592	20,653	17,242
Mean Dep. (Treated)	0.369	0.086	0.132	0.183	0.036
Mean Dep. (Control)	0.297	0.067	0.098	0.154	0.022
F-stat First Stage	44.205	44.205	64.994	53.076	52.136

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of age at last employment on the probability of dying between the ages of 50-86 (Column 1), 50-59 (Column 2), 60-69 (Column 3), 70-79 (Column 4), and 80-86 (Column 5). The first panel reports the OLS results, the second panel shows the reduced form effect using regression 1. and the IV estimates, obtained from the estimation of regression 2, are reported in the third panel. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, region of first affiliation fixed effects, and pension benefit. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

Table 5: IV: Impact on Mortality by Incidence of Workplace Accidents

	Probability of Dying between the Ages								
	50-86			60-69			80-86		
	High WP acc	Medium WP acc	Low WP acc	High WP acc	Medium WP acc	Low WP acc	High WP acc	Medium WP acc	Low WP acc
OLS:									
Age last employment	-0.009***	-0.012***	-0.017***	-0.001	-0.004***	-0.006***	0.000	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
	[0.001]	[0.001]	[0.001]	[0.599]	[0.001]	[0.001]	[0.921]	[0.745]	[0.872]
Reduced form:									
Contributed in 1967	0.055***	0.015	0.013	0.031***	0.019***	0.009	0.003	-0.002	0.008
	(0.012)	(0.009)	(0.022)	(0.009)	(0.006)	(0.012)	(0.007)	(0.002)	(0.006)
	[0.001]	[0.113]	[0.573]	[0.016]	[0.005]	[0.461]	[0.808]	[0.430]	[0.200]
IV:									
Age last employment	0.133**	0.022	0.037	0.069*	0.025***	0.020	0.006	-0.002	0.013*
	(0.055)	(0.014)	(0.058)	(0.036)	(0.008)	(0.026)	(0.012)	(0.003)	(0.007)
Month-Year Birth FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	5,254	10,515	3,761	4,740	9,897	3,479	3,283	7,264	2,606
Mean Dep. (Treated)	0.429	0.343	0.342	0.167	0.132	0.122	0.032	0.029	0.034
Mean Dep. (Control)	0.337	0.288	0.293	0.118	0.100	0.104	0.026	0.021	0.018
F-stat First Stage	6.034	72.609	16.242	7.112	112.146	24.280	4.364	48.170	12.777

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of age at last employment on the probability of dying between the ages of 50-86 (Columns 1,2, and 3), 60-69 (Columns 4, 5, and 6), and 80-86 (Column 7, 8, and 9) by industry sectors (depending on their workplace accident incidence) individuals had before retirement. We classify the manufacturing sector and the energy, water and sanitation sector as high workplace accident incidence sectors (Columns 1, 4, and 7). The health, construction,public administration, administrative, wholesale and retail trade, agriculture and hostelry sector as considered as sectors with medium workplace accident incidence (Columns 2, 5, and 8). The rest of sectors are classified as sectors with low workplace accident incidence. (Columns 3, 6, and 9) The first panel reports the OLS results, the second panel shows the reduced form effect using regression 1. and the IV estimates, obtained from the estimation of regression 2, are reported in the third panel. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, region of first affiliation fixed effects, and pension benefit. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table 6: IV: Impact on Mortality by Incidence of Workplace Accidents and Skills

	Probability of Dying between 60-69					
	High WP acc		Medium WP acc		Low WP acc	
	High-skilled	Low-skilled	High-skilled	Low-skilled	High-skilled	Low-skilled
OLS:						
Age last employment	-0.001	-0.000	-0.004***	-0.004***	-0.007***	-0.004***
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)
	[0.497]	[0.941]	[0.001]	[0.001]	[0.001]	[0.003]
Reduced form:						
Contributed in 1967	0.027	0.034**	0.010	0.023**	0.018	-0.001
	(0.020)	(0.011)	(0.011)	(0.008)	(0.015)	(0.024)
	[0.212]	[0.017]	[0.380]	[0.016]	[0.272]	[0.968]
IV:						
Age last employment	0.035	0.090*	0.014	0.027***	0.033	-0.014
	(0.029)	(0.054)	(0.016)	(0.009)	(0.029)	(0.052)
Month-Year Birth FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓	✓
Observations	1,264	3,402	3,323	5,955	1,887	1,445
Mean Dep. (Treated)	0.165	0.170	0.126	0.141	0.132	0.119
Mean Dep. (Control)	0.130	0.116	0.103	0.105	0.102	0.112
F-stat First Stage	8.164	5.238	16.493	46.474	4.903	3.967

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of age at last employment on the probability of dying between the ages of 60-69 by industry sectors (depending on their workplace accident incidence), and the type of occupation individuals had before retirement. We classify the manufacturing sector and the energy, water and sanitation sector as high workplace accident incidence sectors (Columns 1, and 2). The health, construction,public administration, administrative, wholesale and retail trade, agriculture and hostelry sector as considered as sectors with medium workplace accident incidence (Columns 3, and 4). The rest of sectors are classified as sectors with low workplace accident incidence (Columns 5, and 6). Individuals work as officers, or that have non-qualified jobs are considered as individuals having a low-skilled occupation (Columns 2, 4, and 6), while the rest of individuals are classified as having a high-skilled occupation (Columns 1, 3, and 5). The first panel reports the OLS results, the second panel shows the reduced form effect using regression 1. and the IV estimates, obtained from the estimation of regression 2, are reported in the third panel. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, region of first affiliation fixed effects, and pension benefit. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table 7: IV: Impact on Mortality by Gender

	Probability of Dying between the Ages									
	50-86		50-59		60-69		70-79		80-86	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
OLS:										
Age last employment	-0.016***	-0.005***	-0.015***	-0.003***	-0.004***	-0.001**	-0.004***	-0.001***	0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.016]	[0.001]	[0.001]	[0.820]	[0.174]
Reduced form:										
Contributed in 1967	0.032***	0.031***	0.009	0.011**	0.023***	0.019**	0.003	-0.003	0.009**	-0.001
	(0.011)	(0.008)	(0.007)	(0.004)	(0.005)	(0.006)	(0.008)	(0.005)	(0.004)	(0.002)
	[0.009]	[0.003]	[0.205]	[0.023]	[0.003]	[0.019]	[0.707]	[0.588]	[0.039]	[0.596]
IV:										
Age last employment	0.116	0.033***	0.023	0.012***	0.066***	0.020***	0.007	-0.003	0.019**	-0.001
	(0.075)	(0.011)	(0.030)	(0.004)	(0.022)	(0.008)	(0.021)	(0.005)	(0.009)	(0.002)
Month-Year Birth FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	18,523	6,972	18,523	6,972	16,823	6,769	14,222	6,431	11,238	6,004
Mean Dep. (Treated)	0.417	0.417	0.097	0.097	0.151	0.151	0.215	0.215	0.045	0.045
Mean Dep. (Control)	0.382	0.123	0.087	0.024	0.129	0.039	0.206	0.064	0.033	0.007
F-stat First Stage	5.319	50.192	5.319	50.192	11.472	49.773	12.678	33.841	14.451	31.944

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of age at last employment on the probability of dying between the ages of 50-86 (Columns 1,2, and 3), 60-69 (Columns 4, 5, and 6), and 80-86 (Column 7, 8, and 9) by gender. The first panel reports the OLS results, the second panel shows the reduced form effect using regression 1. and the IV estimates, obtained from the estimation of regression 2, are reported in the third panel. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, region of first affiliation fixed effects, and pension benefit. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

The Right to Retire Early and Mortality

Cristina Bellés-Obrero
University of Mannheim, IZA

Sergi Jiménez-Martín
Universitat Pompeu Fabra Barcelona GSE, FEDEA

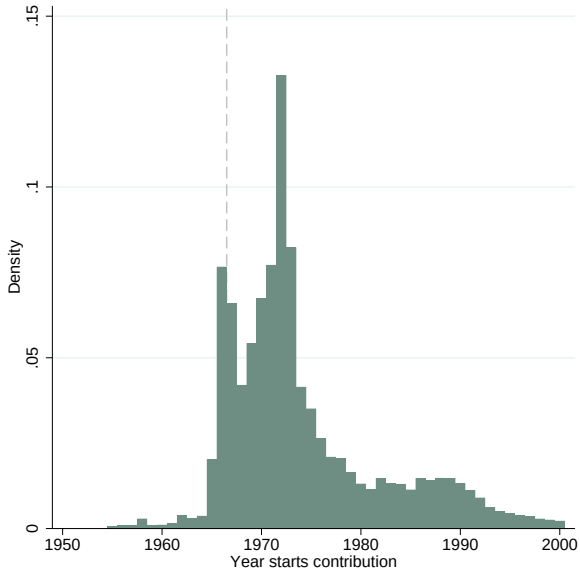
Han Ye
University of Mannheim, IZA, ZEW

Online Appendix

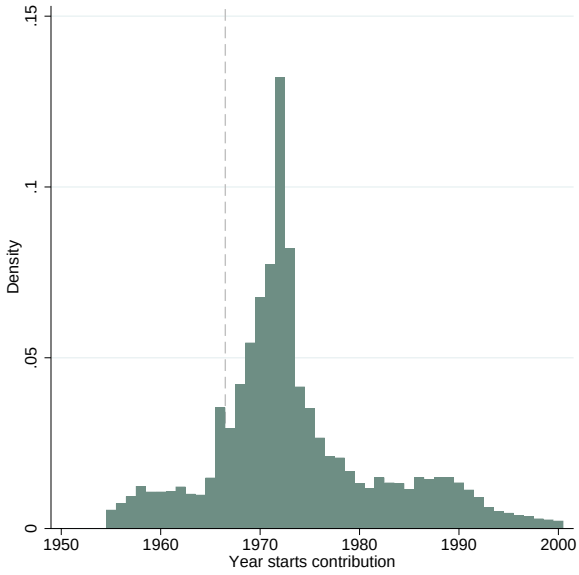
A Appendix Tables and Figures

Figure A.1: Correction of Year Started Contributing

(a) Without correction



(b) With correction



Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This figure plots the density of date started contributing without correction (Graph a) and with correction (Graph b).

Table A.1: Descriptive Statistics

	N	Mean	SD	Min	Max
Dependent Variables					
Regular Pension	25,501	0.47	0.49	0	1
Partial Pension	25,501	0.04	0.19	0	1
Disability Pension	25,501	0.33	0.47	0	1
No Pension	25,501	0.15	0.36	0	1
Age Last Employment	23,658	59.70	5.43	18.75	82.91
Age First Pension	21,485	60.96	4.21	50	79.41
Age Regular Pension	12,010	63.58	2.28	60	74
Age Disability Pension	8,437	57.22	3.72	50	79.41
Age Partial Pension	1,038	61.11	1.33	60	70.08
Dying 50-86 y.o.	25,501	0.32	0.46	0	1
Dying 50-59 y.o.	25,501	0.07	0.26	0	1
Dying 60-69 y.o.	23,597	0.12	0.33	0	1
Dying 70-79 y.o.	20,658	0.16	0.37	0	1
Dying 80-86 y.o.	17,246	0.02	0.16	0	1

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports summary statistics for the main outcome variables. The sample corresponds to individuals registered in the Social Security system between 2005 and 2020, that were contributing at the age of 50 and that are born between 1938 and 1949.

Table A.2: Smoothness of the Covariates

	Panel A : Labor Market between the Ages of 30 and 40					
	Fraction active	Fraction employed	High-skilled occ	Low-skilled occ	Av. monthly contribution	Fraction selfempoyed
Contributed in 1967	-0.120	0.342	0.012	-0.005	25.938	2.557***
	(0.385)	(0.522)	(0.009)	(0.010)	(16.196)	(0.558)
	[0.751]	[0.535]	[0.154]	[0.628]	[0.132]	[0.006]
R^2	0.180	0.202	0.041	0.046	0.245	0.006

	Panel B: Industry between the Ages of 30 and 40					
	Agriculture/Minery Construction	Manufacturing	Trade Hostelry	Public/Health Education	Science Administrative	Services Housekeeping
Contributed in 1967	0.001	-0.004	-0.002	-0.008	0.000	0.000
	(0.007)	(0.003)	(0.003)	(0.007)	(0.001)	(0.000)
	[0.843]	[0.145]	[0.497]	[0.224]	[0.993]	[0.255]
R^2	0.045	0.012	0.009	0.044	0.003	0.001
Month-Year Birth FE	✓	✓	✓	✓	✓	✓
Observations	25,495	25,495	25,495	25,495	25,495	25,495

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of the reform on a list of predetermined variables: fraction of time spent active (Column 1), fraction of time spend employed (Column 2), probability of having being employed in a high-skilled occupation (Column 3), probability of being employed in a low-skilled occupation (Column 4), average monthly contribution (Column 5), fraction of time self-employed (Column 6), and probability of being employed in the agriculture, minery or construction sectors (Column 7), manufacturing sectors (Column 8), public, health or educational sectors (Column 9), scientific or administrative sectors (Column 10), or services or housekeeping sectors (Column 10). The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, and month of birth fixed effects. All standard error are clustered at the birth year level and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Impact of the Reform on Reason for No Pension

		Reason for No Pension		
	No Pension	Still Working	Became Inactive	Died before Pension
Contributed in 1967	0.029***	0.002	0.007	0.020***
	(0.009)	(0.001)	(0.006)	(0.004)
	[0.004]	[0.115]	[0.265]	[0.003]
Month-Year Birth FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓
Observations	25,495	25,495	25,495	25,495
R^2	0.057	0.009	0.091	0.035
Mean Dep. Variable (Treated)	0.176	0.004	0.074	0.098
Mean Dep. Variable (Control)	0.144	0.003	0.071	0.071

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of the reform on the probability of leaving the labor market without claiming any pension (Column 1), continue working (Column 2), becoming inactive (Column 3), and dying before claiming a pension (Column 4), obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Robustness Age Start FE

	Type of Pension				Age at			
	Regular Pension	Partial Pension	Disability Pension	No Pension	Last Employment	Regular Pension	Disability Pension	Partial Pension
Contributed in 1967	-0.108***	0.022***	0.061**	0.025**	0.659***	1.345***	0.392**	-0.213*
	(0.033)	(0.006)	(0.020)	(0.011)	(0.159)	(0.165)	(0.103)	(0.101)
	[0.010]	[0.005]	[0.012]	[0.045]	[0.005]	[0.001]	[0.026]	[0.069]
Age Start Contributing FE	✓	✓	✓	✓	✓	✓		
Controls	✓	✓	✓	✓	✓	✓		
Contributed 1966-1967	✓	✓	✓	✓	✓	✓		
Observations	25,495	25,495	25,495	25,495	23,652	12,007	8,434	1,038
R^2	0.140	0.075	0.101	0.056	0.096	0.229	0.041	0.257
Mean Dep. Variable (Treated)	0.390	0.049	0.385	0.176	60.020	64.641	57.417	61.097
Mean Dep. Variable (Control)	0.528	0.035	0.293	0.144	59.482	63.034	57.051	61.131

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of the reform on the probability of leaving the labor market through regular pension (Column 1), disability insurance (Column 2), partial retirement (Column 3) not claiming any pension (Column 4), age at last employment (Column 5), age at claiming first pension (any type) (Column 6), age at claiming regular pension (Column 7), age at claiming disability pension (Column 8), and age at claiming partial pension (Column 9), using age at first contribution fixed effects. This robustness check estimates the impact of losing access to early retirement for people start working at the same age. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, age at first contribution, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at age of first contribution and wild-bootstrap standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5: Impact of the Reform on Pension Benefit by Type of Pension

	Regular Pensions			Disability Pensions			Partial Pensions		
	Mean Benefit	Base Benefit	Perc Base	Mean Benefit	Base Benefit	Perc Base	Mean Benefit	Base Benefit	Perc Base
Contributed in 1967	73.70***	31.30**	8.54***	-26.28**	-5.04	0.97	-6.67	-5.04	-0.10
	(11.75)	(11.10)	(1.59)	(8.81)	(23.93)	(0.61)	(22.20)	(23.93)	(0.31)
	[0.00]	[0.02]	[0.00]	[0.02]	[0.81]	[0.13]	[0.74]	[0.81]	[0.76]
Month-Year Birth FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	12,007	12,007	12,007	8,434	1,038	8,434	1,038	1,038	1,038
R^2	0.373	0.397	0.358	0.397	0.501	0.051	0.482	0.501	0.288
Mean Dep. (Treated)	1026.6	1041.36	88.30	1252.7	1852.11	84.03	1545.39	1852.11	81.72
Mean Dep. (Control)	937.0	1014.31	75.5	1279.64	1856.49	84.01	1544.27	1856.49	81.19

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of the reform on monthly pension benefit (Columns 1, 4, and 7), pension base (Column 2, 5, and 8) and pension adjustment factor (Column 3, 6 and 9) by type of pension claimed by the individual, obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.6: IV: Impact of Age at Last Employment on Mortality at Five-year Intervals

	Probability of Dying between the Ages							
	50-86	50-54	55-59	60-64	65-69	70-74	75-79	80-86
OLS:								
Age last employment	-0.012***	-0.006***	-0.005***	-0.002***	-0.002***	-0.002***	-0.002***	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.504]
Reduced form:								
Contributed in 1967	0.031***	0.003	0.007	0.019***	0.007**	0.001	0.000	0.005**
	(0.009)	(0.002)	(0.005)	(0.004)	(0.003)	(0.006)	(0.005)	(0.003)
	[0.002]	[0.187]	[0.184]	[0.004]	[0.015]	[0.883]	[0.923]	[0.049]
IV:								
Age last employment	0.066***	0.005	0.011	0.034***	0.014**	0.001	0.001	0.009**
	(0.023)	(0.005)	(0.010)	(0.007)	(0.006)	(0.009)	(0.007)	(0.004)
Observations	25,495	25,495	24,819	23,592	21,996	20,653	18,857	17,242
Mean Dep. (Treated)	0.369	0.031	0.057	0.083	0.069	0.094	0.098	0.036
Mean Dep. (Control)	0.297	0.024	0.044	0.057	0.056	0.082	0.078	0.022
F-stat First Stage	44.205	44.205	49.698	64.994	54.635	53.076	54.023	52.136

Source: MCVL 2005-2020, cohorts 1938-1949.

Notes: This table reports the impact of age at last employment on the probability of dying between the ages of 50-86 (Column 1), 50-54 (Column 2), 55-59 (Column 3),60-64 (Column 4), 65-69 (Column 5), 70-74 (Column 6), 75-79 (Column 7), and 80-86 (Column 8). The first panel reports the OLS results, the second panel shows the reduced form effect using regression 1. and the IV estimates, obtained from the estimation of regression 2, are reported in the third panel. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, region of first affiliation fixed effects, and pension benefit. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.7: Impact on Pension Ages and Types: Heterogeneity by Gender (Reduced-form)

	Type of Pension				Age at			
	Regular Pension	Partial Pension	Disability Pension	No Pension	Last Employment	Regular Pension	Disability Pension	Partial Pension
Men contributed in 1967	-0.092***	0.014***	0.062**	0.016**	0.274*	1.023***	0.340**	-0.147**
	(0.030)	(0.004)	(0.025)	(0.006)	(0.121)	(0.196)	(0.090)	(0.058)
	[0.007]	[0.005]	[0.025]	[0.024]	[0.081]	[0.001]	[0.025]	[0.015]
Women contributed in 1967	-0.169***	0.028***	0.069**	0.072***	1.313***	1.876***	0.402	-0.106
	(0.041)	(0.008)	(0.021)	(0.021)	(0.163)	(0.257)	(0.217)	(0.109)
	[0.009]	[0.002]	[0.027]	[0.008]	[0.001]	[0.003]	[0.106]	[0.265]
Month-Year Birth FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓	✓	✓	✓
Observations	25,495	25,495	25,495	25,495	23,652	12,007	8,434	1,038
R^2	0.160	0.084	0.115	0.065	0.113	0.248	0.052	0.362
Mean Dep. Men (Treated)	0.353	0.047	0.421	0.180	59.857	64.638	57.421	61.170
Mean Dep. Men (Control)	0.433	0.037	0.361	0.169	59.540	63.451	57.066	61.206
Mean Dep. Women (Treated)	0.541	0.058	0.239	0.162	60.719	64.648	57.387	60.856
Mean Dep. Women (Control)	0.722	0.030	0.153	0.094	59.364	62.521	56.979	60.943
P-value difference	0.018	0.017	0.711	0.019	0.002	0.000	0.810	0.716

Source: MCVL 2005-2020,cohorts 1938-1949.

Notes: This table reports the impact of the reform on types of pension and age at claiming different pensions by gender, obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.8: Impact on Pension Ages and Types: Heterogeneity by Skills (Reduced-form)

	Type of Pension				Age at			
	Regular Pension	Partial Pension	Disability Pension	No Pension	Last Employment	Regular Pension	Disability Pension	Partial Pension
Contributed in 1967* High skilled occ	-0.080**	0.016	0.056	0.006	0.002	0.000	0.351	1.048***
	(0.034)	(0.010)	(0.032)	(0.009)	(0.003)	(0.013)	(0.269)	(0.194)
	[0.022]	[0.122]	[0.093]	[0.519]	[0.583]	[0.977]	[0.225]	[0.001]
Contributed in 1967* Semi skilled occ	-0.121***	0.029**	0.040*	0.018**	0.005	0.029**	1.016***	1.669***
	(0.031)	(0.011)	(0.022)	(0.007)	(0.003)	(0.010)	(0.188)	(0.183)
	[0.008]	[0.012]	[0.090]	[0.012]	[0.160]	[0.023]	[0.003]	[0.001]
Contributed in 1967* Low skilled occ	-0.112**	0.019***	0.059**	0.018*	0.001	0.014**	0.582***	1.427***
	(0.036)	(0.005)	(0.024)	(0.008)	(0.002)	(0.005)	(0.125)	(0.248)
	[0.006]	[0.001]	[0.025]	[0.030]	[0.424]	[0.019]	[0.007]	[0.001]
Month-Year Birth FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Contributed 1966-1967	✓	✓	✓	✓	✓	✓	✓	✓
Observations	23,464	23,464	23,464	23,464	23,464	23,464	19,648	10,715
R^2	0.154	0.079	0.112	0.103	0.016	0.039	0.096	0.223
Mean Dep. Variable High Skilled (Treated)	0.390	0.064	0.335	0.086	0.008	0.118	61.146	64.843
Mean Dep. Variable High Skilled (Control)	0.462	0.043	0.337	0.075	0.003	0.081	59.541	63.328
Mean Dep. Variable Semi Skilled (Treated)	0.433	0.062	0.321	0.060	0.007	0.117	60.597	64.663
Mean Dep. Variable Semi Skilled (Control)	0.458	0.043	0.338	0.077	0.003	0.081	59.574	63.327
Mean Dep. Variable Low Skilled (Treated)	0.380	0.042	0.411	0.075	0.003	0.089	60.026	64.590
Mean Dep. Variable Low Skilled (Control)	0.507	0.040	0.299	0.071	0.003	0.079	59.859	63.282

Source: MCVL 2005-2020,cohorts 1938-1949.

Notes: This table reports the impact of the reform on types of pension and age at claiming different pensions for individuals with high, medium and low-skilled occupations before retirement, obtained from the estimation of regression 1. The estimation sample includes individuals that started contributing 12 months before and after January 1st 1967. All specifications control for gender, year of birth, month of birth, and region of first affiliation fixed effects. Each regression also includes the following controls measured when the individuals was between 30 and 40 years old: average monthly contribution, fraction of time employed, fraction of time active , fraction of time in self-employment, and highest occupation and industry sector fixed effects. All standard error are clustered at year of birth and wild-bootstrap standard errors in brackets.
*** p<0.01, ** p<0.05, * p<0.1.