# The Effect of Removing Early Retirement on Mortality*

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June 2022
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**Abstract**

This paper sheds new light on the mortality effect of delaying retirement by investigating the Spanish 1967 pension reform that exogenously changed the early retirement age depending on the date individuals started contributing to the social security system. Those that contributed before January 1st, 1967, maintained the right to voluntarily retire early at age 60, while individuals who started contributing after could not voluntarily claim pension until age 65. Using the Spanish administrative social security data, we find that the reform delayed labor market exit by around half a year and increased the probability that individuals take up disability pensions, partial pensions, and no pensions. We show evidence that delaying existing employment increases the harzard of dying between ages 60 and 69. Heterogeneous analysis indicates that the negative impact is driven by those employed in low-skill, physically and psychosocially demanding jobs. Moreover, we show that allowing for flexible retirement schemes, such as partial retirement, mitigates the negative effect of delaying retirement on mortality.

**JEL Codes:** I10, I12, J14, J26
**Keywords:** Pension reform, Mortality , Delaying retirement, Instrumental variable

*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) and the Spanish Ministry of Science, Innovation and Universities (MICINN) through PID2020-114231RB-I00. We thank the Social Security Administration for giving us access to the data througth the Barcelona Research Room. Sergi Jiménez also acknowledges financial support from Spanish National Research Agency (AEI), through the Severo Ochoa Programme for Centres of Excellence in R&D (Barcelona School of Economics CEX2019-000915-S).The views expressed here are solely those of the authors. All errors are our own.

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# 1 Introduction

Many countries have reformed their public pension system to cope with the aging population 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 to such pension reforms,[1] there are relatively few studies about the impact of retirement on mortality. Moreover, the existing empirical evidence mostly draws lessons from policy experiments that allowed for earlier retirement (Coe and Lindeboom, 2008; Hernaes et al., 2013; Hallberg et al., 2015; Bloemen et al., 2017; Kuhn et al., 2020). Because the effects on mortality from preponing and postponing the retirement age are not necessarily symmetric, these estimates might not generalize to today's policy world, where most policymakers aim to incentivize prolonged working lives. Therefore, it is policy-relevant to understand the impact of delaying retirement on mortality, particularly the effect of closing the early retirement options on mortality.

This paper provides novel empirical evidence on this important question by investigating a Spanish pension reform. This reform exogenously changed the early retirement age depending on the date individuals started contributing to the social security system. Individuals who contributed to the pension system before January 1st, 1967, could voluntarily claim a pension as early as age 60. On the other hand, individuals that started contributing after 1967 can only voluntarily claim a pension at age 65.[2]

This reform has several advantages in answering our research question. First, the discontinuity change in retirement age based on the year individuals' contribution starts allows us to identify causal effects credibly. Second, in contrast to most of the previous literature, this reform creates a substantial increase ($\sim$ four years) in the early retirement age and leads to a considerable delay in the exit of the labor market. Third, the reform affects a more general population as compared to existing studies (see, e.g., Hallberg et al. (2015); Bloemen et al. (2017); Hagen (2018), which study specific subsets of the population, such as military personnel and civil servants.). This feature allows us to capture the mortality responses in the general population and examine the 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 novel version of the Spanish administrative social security panel data covering 10% of

[1] For example, see Coile and Gruber (2007), García-Pérez et al. (2013), Atalay and Barrett (2015), 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] Depending on the birth year, individuals of certain cohorts can retire at age 61 through involuntary early retirement under certain conditions. See Section 2 for more details on the institutional setting.

the cohort of individuals born between 1938 and 1949 registered in the Social Security at any point in time until 2020.[3] 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 January 1st, 1967. 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.[4] Those who contributed in 1967 are also less likely to claim a regular pension and more likely to claim partial and disability pensions. It indicates that individuals utilized other ways to leave the labor market earlier when their eligible age for claiming a regular pension increases. We also show that they have a higher probability of not claiming any pension, driven mainly by premature mortality. More specifically, individuals who started contributing after January 1967 are 2.5 percentage points more likely of dying before claiming any pension.

To show the impact of delaying labor market exit on mortality, we instrument the age at last employment using the year individuals started contributing to the social security system. We examine the impact of age at last employment 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 5 percentage points (equivalent to a relative increase of 50%). When we further zoom in, we find that the mortality responses between ages 60 and 64, when public pensions are not accessible, are the strongest. This result indicates that the negative effect of delaying retirement on mortality is driven mainly by the immediate effect of losing access to the early retirement schemes.

Furthermore, we shed some light on the potential mechanisms behind the detrimental effect of delaying retirement on mortality. In particular, we focus on the heterogeneous effects of delaying the labor market exit by individuals' labor market conditions before retirement. As the burden of a job usually is multidimensional, we examine four dimensions of individuals' labor environment: physical burden, psychosocial burden, self-value at work, and occupational skill level.

First, using registered workplace accidents at the industry level as a proxy for physical burden, we show that the increase in mortality is stronger for those that worked in sectors with a high intensity of workplace accidents. This finding is consistent with previous literature establishing that physically demanding occupations lead to adverse health effects. We also find that the mental and social stress that individuals experience before retirement is influential. We measure psychosocial exposure following the Job Exposure Matrices constructed by Kroll (2001). Delaying labor market exit by one year increases the hazard of dying between 60 and 69 by 5.3 percentage points

[3]The data version used is similar to the publicly available *Muestra Continua de Vidas Laborales* but without the sample condition of still being alive in 2005 and having had contact with the Social Security after 2005.

[4]We show our results are robust using several robustness tests, including regression-based tests of the differences in covariates, and using within-age start contributing fixed effects analysis. Moreover, we test the causality of our estimates by using placebo cut-off dates and find no significant impacts on these placebo dates both before and after 1967.

for people in high psychosocial burden jobs, while this number is 3.6 percentage points for people in low psychosocial burden jobs. Furthermore, we measure individuals' sense of achievement and recognition at their last job using the Occupational Information Network data (O*NET). We show that only people who work in low self-value industries are more likely to die when facing a one-year delay in job exit. This result indicates that individuals that feel achieved and recognized at their job do not experience a negative mortality effect due to a delay in the exit of the labor market. Lastly, similar to previous literature, we look at blue-collar workers and find that delaying labor market exit by one year increases the hazard of dying by 6.6 percentage points for blue-collar workers, while this number is 3.2 percentage points for the rest. The heterogeneous results suggest that it can be beneficial to allow flexible retirement. In particular, advocating differential ages at exiting employment depending on the working conditions of individuals' occupations can mitigate the detrimental impacts of delayed retirement.

Our findings imply that losing access to early retirement can harm life expectancies. One potential solution to incentivize workers to stay longer in the labor force without having such a negative impact on their health is to allow these workers to gradually reduced their working time at the end of their career. In Spain, some workers can access partial retirement by working part-time while claiming a partial pension. One of the eligible conditions is at least 33 years of contribution. Comparing individuals with and without access to partial retirement, we find that indeed the people who have no access to partial pension suffer more from extending working life. This finding highlights the importance of providing the opportunity for gradual retirement, which can smooth the adverse effects of delaying retirement.

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 studying the mortality effects of retirement. The existing well-identified empirical literature finds mixed results. The studies explore three types of policy experiments: allowing earlier retirement (Coe and Lindeboom, 2008; Hernaes et al., 2013; Hallberg et al., 2015; Bloemen et al., 2017; Kuhn et al., 2020), promoting later retirement (Zulkarnain and Rutledge, 2018; Hagen, 2018; Bozio et al., 2021) and switching to retirement at statutory retirement age (Fitzpatrick and Moore, 2018).

The studies of earlier retirement overall find no significant or positive impacts on mortality. For example, Hernaes et al. (2013) find that accessing to pension two to five years earlier has no effect on the probability of dying by ages 67, 70, 74, and 77 for the full population of Norway. Looking at some particular population groups, Hallberg et al. (2015) and Bloemen et al. (2017) find a positive impact of earlier retirement. Hallberg et al. (2015) show that five-year early 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. The only paper that finds (earlier) access to pension increases mortality isKuhn et al. (2020). Using Austria register data, they estimate the effect of 3-year early access to pension on mortality. 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.

The evidence on the impacts of later retirement is more scarce. Our paper directly contributes to this literature. To the best of our knowledge, there are only three papers studying the effect of delayed retirement. Hagen (2018) studies the mortality effect of a two-year increase in the statutory 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) studies the entire French population and also finds that delaying retirement has a precise zero effect on the probability of dying between age 61 and 79 for both men and women. Zulkarnain and Rutledge (2018) find that delaying retirement reduces the probability of dying within five years for men aged 62–65 in the Netherlands.[5]

Our paper is the first one that provides empirical evidence that later retirement increases mortality. When we turn to the literature on the health impact of delayed retirement, it is not surprising that we find a negative impact of delayed retirement. Many studies on the health impact of delayed retirement find adverse health effects through an increase in social isolation and depression (Atalay and Barrett, 2014; Eibich, 2015). Studies also find a positive impact of retirement on health outcomes due to the adoption of a healthier lifestyle (Insler, 2014; Celidoni and Rebba, 2017; Gorry et al., 2018). Therefore, it is reasonable to expect that later retirement might increase mortality.

Our findings have important policy implications. First, we show a large heterogeneity in the effect of delayed retirement on mortality, depending on the characteristics of jobs the individuals held before retirement. Going beyond distinguishing between blue- and white-collar jobs, we show that other job dimensions, such as physical, psychosocial, and self-value, also matter. This finding implies that policies that remove access to early retirement for the general population differential impact subgroups, which can exacerbate the socio-economic disparities in life expectancy. The results also speak to the recent public discussions on flexible retirement.

Second, we show the option of a gradual transition to retirement matters for impacts of retirement on mortality. Allowing older workers to gradually reduce their working time at the end of their careers can mitigate the adverse effects on mortality. Such mitigating effects can be made possible by promoting gradual retirement options. This insight is relevant for public policy and budgetary considerations, particularly when policymakers in many countries face long-run solvency challenges

[5]Saporta-Eksten et al. (2021) explore an exogenous decrease in implicit tax of working in Israel and show the impact of work on longevity. They find that later retirement increases mortality between ages 75 and 85 but has no impact on mortality between ages 65 and 74.

in both the pension and public healthcare systems.

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 1967.[6] Before 1967, a fixed-amount pension (*SOVI*) financed by employers and the state was available for low-income or disabled workers. This SOVI pension, which was basic and insufficient, was complemented by the "Mutual societies" (*Mutualidades Laborales*), 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*. In the new system, further modified by the 1985, 1997, and the 2002 reforms,[7] the statutory retirement age is 65. Initially, individuals needed a minimum of 8 years of contributions to gain access to the pension, gradually increasing to 15 years after the 1997 reform. The pension benefits were calculated based on the average contributions in the last 15 years after the 1997 reform. In addition, full benefits are given to people with 35 contribution years. Finally, the penalty for insufficient years of contributions is 2 percent per year.[8]

Even though the statutory retirement age was set at 65,[9] individuals who contributed before the

[6]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.

[7]Ley 24/1997, de 15 de julio, de Consolidación y Racionalización del Sistema de Seguridad Social, and Ley 35/2002, de medidas para el establecimiento de un sistema de jubilación gradual y flexible.

[8]It is important to note that in many cases, the claim of regular retirement pensions is preceded by an unemployment spell that can be quite long. To help older workers in long unemployment spells, the government established a special provision for those unemployed at age 52 or above who have exhausted their contributive benefits. They were allowed to receive unemployment assistance benefits until their pension claiming age. The only prerequisite is to reach the minimum contribution years to become eligible for an old-age pension. This unemployment assistance paid 75% of the minimum wage. Moreover, a reform in 2002 also opened up the possibility of combining unemployment insurance claims with labor earnings. They could receive 50% of their unemployment insurance entitlement and work simultaneously, and the employer would pay the remaining amount in wages.

[9]The system also incentivizes to retire after the statutory eligibility age of 65. Individuals with at least 35 years of contributions receive an additional two percent per additional year of contribution beyond age 65 on top of the 100% applied to the regulatory base.

1st of January of 1967,[10] even by one day, maintained the early retirement right of the old system indefinitely. These individuals could freely retire early from age 60 with some financial penalties.[11] Around 13% of people that started contributing in 1966 claimed a regular pension at age 60.

On the other hand, individuals who contributed after the 1st of January of 1967 faced a statutory retirement age of 65. They can only retire earlier via involuntary early retirement, which allows them to retire as early as age 61 with some financial penalties (between 6 and 8 percent, depending on the years of contribution, per year of advancement) 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.

Because the law was published on the 30th of December 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 1967. As we can see in Figure 1, individuals who contributed before 1967 independently of their birth year could voluntarily retire early at age 60. For those who contributed after 1967, the only other way to claim early retirement was involuntary early retirement at age 61. 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.

In addition to the regular retirement pathway, there are two alternative pathways: the disability and the partial retirement pensions. Permanent disability benefits have been used extensively as an early retirement mechanism in Spain (Boldrin et al., 1999; 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 33 years of contribution and six years of tenure in the same company to claim 85% pension while working for 15%.[12] The partial retirement option needs the agreement of the firm because the worker has to be replaced with a new hire.[13] In the paper, we investigate the impact of the reform on the ages when claiming disability, partial and regular retirement pensions, and the probabilities of choosing these alternative exit routes. 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

[10]The January 1967 deadline was set at a later date for workers in specific sectors, such as construction, minery, fishery, and railway workers. We control for these specific deadlines for workers in those sectors.

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

[12]Up to 75% of benefits after the 2011 reform.

[13]This explains why the partial retirement option is more likely in large firms (García Díaz, 2018).

and partial retirement pensions.

# 3 Data and Empirical Strategy

## 3.1 Data and Sample

This paper uses novel administrative data of the Continuous Sample of Working Histories (Muestra Continua de Vidas Laborales (*MCVL*), in Spanish) provided by the Social Security Administration. The 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.[14]

The *MCVL* includes time-invariant information, such as gender, birth month, and birth year. It also includes detailed labor market biographies from the date individuals started contributing to the Social Security system until they die.[15] Moreover, we observe their employment and unemployment spells, occupations, industry, and monthly contributions. The pension records from the *MCVL* contain accurate information on the age at claiming a pension, pension benefits, the type of pension they receive at each point of time, and the total amount of years contributed before retirement. 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 that started contributing to the social security system 12 months before and after the 1st of January 1967. We further restrict our sample to individuals still contributing at age 50 with at least 8 years of contribution. We drop 20% of observations with this restriction. In Table A.1, we examine if our sample is selected. First, we check if the reform impacted the probability of not being in the main sample due to having stopped contributing before age 50 or not having at least 8 years of contribution, and we do not find significant differences. Moreover, we also show no significant mortality differences among individuals not included in the main sample. The final sample contains 25,903 individuals, of which 27% are women.

To identify the treatment status, we need information about the exact date individuals started contributing. One caveat of the dataset is that the exact date of the first contribution is poorly recorded for some individuals, especially those who started contributing around 1967. We partially

[14] We use a non-publicly available version of the MCVL provided by the Spanish Social Security Administration, which allows us to observe contributive workers and pensioners even before 2005 (the starting time of the publicly available version). This data advantage makes it possible to explore a representative sample of workers affiliated to the Spanish Social Security at any point in their working lives and examine their mortality responses.

[15] 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 the informal sector to the formal sector).

correct this measure by using the number of contribution years, which are better recorded because this information is used to calculate the pension benefit.[16] Figure A.1, in the Appendix, shows the distribution of starting years of contribution before and after the adjustment. This limitation is why we can not explore the Regression Discontinuity Design.[17]

## 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 within-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 last employment on mortality.

Within-cohort OLS Strategy

First, we estimate the following equation, where $Treated_{it}$ is a dummy that takes the value of one for individuals that started contributing to the Social Security in 1967 and zero for those that started contributing in 1966. The treated group can claim regular pensions voluntarily at age 65 (involuntarily at 61), while the control group can claim them as early as age 60.

$$R_{icmt} = \beta_0 + \beta_1 \delta_c + \beta_2 \mu_m + \beta_3 Treated_{it} + \gamma X_{icmt} + U_{icmt} \quad (1)$$

$R_{icmt}$ represents the outcome variable of individual *i* born in year *c* and month *m* who started contributing in the year *t* (1966 or 1967). The outcome variables include the age at last employment, the probability, and the age at which individuals claim the different pensions and pension benefits. $\delta_c$ is the year of birth, and $\mu_m$ is the month of birth fixed effects. $\beta_3$ measures the average treatment effect of the reform on the different outcomes.

$X_{imct}$ includes a list of fixed effects, such as highest occupation and industry sector between the ages 30 and 40, and a list of other predetermined covariates, including individuals' mean monthly contribution to the Social Security, the fraction 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 p-values in brackets in all tables.

[16] To correct the reported date of the first contribution, we subtract the total number of years contributed from the year they claimed a regular pension. If the corrected year of starting contributing is before the reported date of the first contribution, we make this correction. This correction is only possible for individuals who have claimed a regular pension, as only for them the total number of years contributed is reported.

[17] In Table A.15 in the Appendix, we perform a robustness check for our main results using the reported date of starting contributing without making any correction and show that the results are similar.

The estimates from Equation 1 provide us with the reduced-form reform effects and also the first stage estimates for the IV regression.

Instrumental Variable Strategy

The causal effect of age at last employment on mortality is estimated by the following equation, where age at last employment ($R_{icmt}$) is replaced by the predicted value ($\widehat{R_{icmt}}$) from Equation 1:

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

$M_{icmt}$ 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 ( $\delta_c$, $\mu_m$ and $X_{icmt}$). Additionally, we control for the individuals' labor market outcomes when they were between 45 and 55 (highest occupation and industry sector, mean monthly contributions, the fraction of days active, employed, and self-employed, and a proxy of their mean pension benefit).[18] The coefficient $\alpha_3$ captures the local average treatment effect of age at last employment on mortality among the individuals who delayed retirement because they were not able to claim a regular pension at age 60 (compliers).

*Assumptions*

The critical assumption for the treatment status to be a valid instrument for access to early retirement is that the year individuals started contributing to the Social Security 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. Secondly, we include the highest occupation, industry, birth year, and month of birth fixed effects, which allows us to estimate variations within occupation, industry, and birth year.

Furthermore, we check whether the characteristics of the treated and control groups are similar when they are between 30 and 40 years old.[19] Table A.2 shows the impact of the treatment on a

[18] We do not have information on pension benefits for individuals who never claimed any pension. Therefore, for all individuals in our sample, we construct a proxy of the mean pension benefit using monthly contributions and years of contribution (or years of employment and unemployment) using the Social Security formula to calculate pension benefits. The correlation between this proxy and the actual mean pension benefit is 0.87 for individuals that claim a regular pension, indicating that it is a good proxy. Moreover, in Table A.18, we show the effect of the reform on this proxy of the mean pension benefit.

[19] Ideally, we would like to check whether the characteristics of individuals in the treatment and control groups differ at the beginning of their career (before age 30). However, the data quality was not very good around 1967, and the labor market characteristics during the first years of their career might be wrongly recorded for some individuals. We,

list of predetermined variables, including the fraction of time spent in employment, activity, and self-employment between age 30 and 40; the probability of working in a blue-collar occupation and industry sectors; and average monthly contributions 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.[20] This suggests that there is no manipulation of the treatment status and that our control and treatment groups are very similar.

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 4.3.

To fulfill the exclusion restriction, we need to ensure that the treatment status affects mortality only through its impact on age at last employment. The only possible alternative channels through which the year individuals started contributing can affect mortality are changes in labor market outcomes close to retirement and changes in pension benefits. We, therefore, always control for these variables to wash out any possible income effect or any other effect driven by strategic decisions in the labor market before retirement.[21]

Finally, the monotonicity assumption requires that starting to contribute to the Social Security in 1967 instead of 1966 would not lead to earlier retirement. 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.

# 4 The Reform Effect on Retirement Outcomes

## 4.1 Descriptive Evidence

Table A.3 provides summary statistics for the main outcomes used in our analysis. There are three different pensions that individuals can claim. Table A.3 shows that 47% of individuals claim a regular pension (old-age pension), while 33% claim a disability pension and 4% of individuals choose a partial pension. Finally, some people in our sample never claim any pension due to reasons such as going into prolonged inactivity ($\sim$ 6%), dying before claiming ($\sim$ 8%), and being still active in the labor market in 2020 (0.3%). In our sample, 14% of individuals are in this category. Figure 2 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

therefore, look at their characteristics between the ages of 30 and 40.

[20] In Table A.14, we show that the effect of the reform on our main outcomes is robust to excluding from our sample individuals in one of the self-employed pension regimes.

[21] In Table A.19, we show how the inclusion of these control variables affects our IV estimates.

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 59.6 years old and claim regular pensions at 63.6 years old. Figure 3 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 3 shows that around 8% of individuals that started contributing in 1966 (control group, solid red 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 22% of the treated individuals exit the labor market at 65, while this number is only 17% of the control group. We see the same pattern in terms of age at claiming a regular pension. Figure 4 a) shows that 28% of people who started contributing in 1966 (control group, solid red line) claim a regular pension at age 60, and 32% 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 a regular pension at any age other than 65. Almost 70% of them claim a regular pension at 65. These figures provide visual evidence that the reform is binding, and individuals affected by the reform delayed their retirement timing.

In our sample, individuals, on average, claim disability pension at age 57 and partial pension at 61 years old. Figure 4 b) and Figure 4 c) shows that the distribution of these ages by treatment status. We observe that individuals who started contributing in 1967 (green dashed line) claim more disability insurance between 60 and 65 than those who started contributing in 1966. Moreover, individuals that started contributing in 1967 (green dashed line) claimed partial pensions at slightly earlier ages.

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 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 11%, and the hazard of dying between 70 and 79 is 16%.

## 4.2 Regression Results

Table 1 examines the impact of the reform on the different types of pensions individuals claimed. We find that individuals who started contributing to Social Security in 1967 are less likely to claim regular pension by 10 percentage points ($\sim$ 19%). Yet, their probability of taking disability insurance increases by 5.8 percentage points ($\sim$ 19%). In Table A.4 we further show that the reform impacted equally the probability of claiming a great or absolute disability and a partial or professional disability pension (by a 3.1 and 2.7 percentage point increase, respectively).[22] They

[22]There are four types of disability pensions. First, partial disability pensions are for individuals who have seen their functional capacity reduced by at least 33 percent. These individuals can continue working, even in the jobs they had

are also 1.9 percentage points ($\sim$ 54 %) more likely to take up a 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 a regular pension, by either claiming disability insurance or a partial pension.

We also observe that individuals contributing to the pension system in 1967 are 2.5 percentage points ($\sim$ 18 %) more likely to leave the labor market without any pension. In Table A.5, 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.5 indicates that the reform has only a minimal impact (an increase of 0.2 percentage points) on the probability of continuing working up to 2020 and no impact at all on the probability of becoming inactive. Interestingly, we find that individuals who started contributing in 1967 have a 1.6 percentage point ($\sim$ 22%) higher probability of dying before claiming any pension. This finding implies that premature death is the main driver for not claiming any pension. We further explore this effect in Section 5.

Table 2 examines the impact of the reform on the ages at which individuals leave the labor market and claim different types of pensions. The reform caused the treated ones to delay labor market exit by almost half a year[23] and delay claiming their first pension (regardless of the type) by 0.28 years (4 months). We find that early retirement is reduced by 1 year and 4 months for individuals that claim a regular pension.[24] 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. Table A.8, in the Appendix, shows that the reform only significantly increased the probability of claiming a disability pension between 60 and 65.[25] This result suggests that individuals affected by the reform use disability pensions as an early retirement scheme between 60 and 65, ages at which these individuals would have been able to retire with a regular pension if they had contributed in 1966. Moreover, it also

before applying for the pension. Professional disability is assigned to those workers who cannot resume their work activity but instead could carry out a different occupation. Thirdly, absolute pensions are thought for individuals who cannot carry out any type of work due to physical or mental deterioration. Finally, great disability occurs when the worker needs the support of another person to carry out their daily subsistence tasks.

[23]Table A.6, in the Appendix, shows the effect of the reform on the probability of exiting the labor market at different age brackets. The reform decreased the probability of leaving the labor market between 55 at 63 years old. As expected, the reform decreased the most ( by 4.1 percentage points or 37%) the probability of exiting the labor market at 60. Individuals who started contributing in 1967 also have a higher probability of leaving the labor market after 64. Again, the reform increased the most (by 7 percentage points or 42%) the probability of exiting the labor market at age 65.

[24]We observe in Table A.7 that the reform decreased by 10 percentage points ($\sim$ 67 %) the probability of claiming a regular pension at age 60 and between 2 and 3 percentage points ($\sim$ 48 % to 76%) the probability of claiming it between 61 and 64. On the other hand, the reform increased the probability of claiming a regular pension at age 65 by 9.5 percentage points ($\sim$ 50 %) and 3.6 percentage points after 65 ($\sim$ 32 %).

[25]We also show that this differential effect between 60 and 65 is still there when we restrict to great and absolute disability pensions (Table A.9) or partial or professional disability pensions (Table A.10).

indicates that the reform is not capturing differential ex-ante health conditions of individuals. If this were the case, the reform should have significantly increased disability pensions before 60.

In Table 3, we examine the reform impact on pension benefit amount. We expect the pension benefits to be affected because 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. Moreover, as more individuals claim disability insurance due to the reform, we expect the overall pension benefits to be lower as disability pension benefits are typically less generous. We find that the total pension benefit of individuals that started contributing in 1967 increased by 43€ ($\sim$ 4%). The increase in the pension benefit is driven by an increment in the base pension (without any financial adjustments) of 19€ ($\sim$ 1.6%) and an increase in the pension adjustment (due to later claiming) of 5 percentage points ($\sim$ 6%).[26]

## 4.3 Robustness and Placebo Tests

In this section, we perform several robustness checks on the reduced form effects of the reform. Moreover, we test the causality of our estimates by using placebo cut-off dates both before and after 1967.

Within-Age at First Contribution Fixed Effects Model

The baseline analysis compares individuals born in the same year (along with the highest occupation and industry sector fixed effects) who started contributing to the system one year apart (1966 vs. 1967). One potential confounding factor of this specification is the age when individuals started contributing. These individuals born in the same year but started contributing in 1966 and 1967 were at different ages when they started contributing. One reason for starting at different ages could be differences in educational attainment. Unfortunately, we do not have information on the education level of individuals in our database. Therefore, to test that the reform is not capturing differences in the level of educational attainment, we examine the reform impact by using age at first contribution fixed effect instead of birth year fixed effects in Table A.12. This robustness check estimates the impact of losing access to early retirement for people who start working at the same age but were born one year apart. 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.12 are very similar.

[26] It is important to note that the positive effects on pension benefits that we observe for all the sample that claimed any pension is driven mainly by those individuals that claimed a regular pension, as Table A.11 shows. In particular, individuals that claimed a regular pension and started contributing in 1967 received, on average, 73€ higher monthly pension benefit, which is driven by an increase of 31€ of the pension base and an 8.5 percentage point in the pension adjustments. We can also observe that the mean monthly pension benefit decreases by 26€ for affected individuals claiming a disability pension, while partial pension benefits are not significantly affected by the reform.

Cohorts Born between 1941 and 1949

In the baseline sample, we consider individuals born between 1939 and 1949. As it can be observed in Figure 1, for all individuals, independently of their year of birth or the year they started contributing, the statutory retirement age was set at 65. If they have contributed before 1967, independently of their year of birth, they can voluntarily retire early at age 60. On the other hand, if they contributed after 1967, they could only retire involuntarily between the ages of 64 to 61, depending on their birth year. This is due to the law introducing the figure of involuntary early retirement at age 61 passing in 2002 when the cohorts born from 1938 to 1940 were 64, 63, and 62, respectively.

Therefore, we perform a robustness check dropping the cohorts that were only partially affected by the law of 2002. Table A.13 reports the main reduced form results for the cohorts born between 1941 and 1949. If we compare them with the baseline results in Tables 1 and 2, we can see that the magnitude of the estimates is quite similar. These results demonstrate that our reduced form effects are not driven by the older cohort of individuals with later access to involuntary early retirement.

Dropping Self-Employed Individuals

Table A.2 shows the impact of the treatment on a list of labor market variables when the individuals were between 30 and 40 years old. Except for the fraction of time spent in self-employment, we do not find significant impacts, suggesting that there is no manipulation of the treatment status. A potential reason we find significant effects on individuals' fraction of time spent in self-employment is that self-employed individuals might have more flexibility in deciding when they want to start contributing to the social security system. In this robustness check, we want to check that our main baseline results are not driven by these individuals.

Therefore, we perform a robustness check dropping those individuals that received a pension under the self-employed regime in Table A.14. If we compare them with the baseline results in Tables 1 and 2, we can see that the magnitude of the estimates is quite similar, indicating that our baseline reduced form effects are not driven by those individuals who were self-employed.

No Correction for the Starting Year of Contribution

As we mentioned before, one caveat of the administrative social security database that we are using is that the exact date of the first contribution is poorly recorded for some individuals, especially those who started contributing around 1967. In fact, Figure A.1 a), in the Appendix, shows that in the distribution of the start year of contribution, there is some bunching around 1965, 1966, and 1967. Fortunately, we have excellent information about the number of years of contribution and the exact date they claimed a pension for many of the individuals. Therefore, we correct the

reported date of the first contribution by subtracting the total number of years of contribution from the date they claimed a pension for those individuals that reported having started contributing in 1965, 1966, and 1967. If the corrected year of starting contributing is before the reported date of the first contribution, we make this correction. Figure A.1 b) shows how the distribution of starting year of contribution looks like after we made this correction, and we see that the bunching has been dramatically reduced.

In Table A.15, we perform a robustness check for our main reduced form results using the reported date of starting contributing without making any correction. We show that, if anything, the results are slightly stronger than in our main specification. First, individuals in the uncorrected sample seem to react more to the reform by using different ways to leave the labor market before claiming a regular pension. The reform increased by 7.5 percentage points, instead of 1.9, the probability that the individuals claimed a partial pension, and by almost the same amount (7.4 percentage points instead of 5.8) the probability of claiming a disability pension. They also delayed leaving the labor market by 0.67 years instead of 0.4 and by 1.43 instead of 1.31 for individuals that claimed a regular pension.

Placebos

A 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.[27] 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.

# 5 Right to Retire Early and Mortality

## 5.1 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 at different age brackets (conditional on having survived until that age). Panel 1 reports the simple OLS estimation

[27] We do not perform the placebo test on years that are too close to the actual treatment year (1965, 1966, and 1968), given that the start year of contribution is not well defined around that time, and we use the years of contribution to correct for it.

where we regress age at last employment over mortality. For all our estimations, delaying retirement is negatively and significantly correlated with mortality. This correlation probably captures the fact that 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 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 of 60 to 69. In particular, individuals who contributed in 1967 die between those ages with a 2.1 percentage points higher probability ($\sim$ 22%). We also find a minor increase in mortality after 80 (0.4 percentage points). Figure 6 shows that all the placebo estimates for overall mortality after age 50 and between 60 and 69 are insignificant and close to zero. This confirms 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 8.3 percentage points ($\sim$ 27%), 5 percentage points ($\sim$ 50%) between 60 and 69, and 0.7 percentage points ($\sim$ 30%) after 80. In Table A.16, 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 4.3 percentage points ($\sim$ 76%). This result indicates that the negative effect of delaying retirement on mortality is driven mainly by the short-term effect of losing access to the early retirement schemes.

It is important to note that the F-statistic of the first stage regression for all our IV estimates in Table 4 are above the rule-of-thumb threshold of 10. Our instrument (the year individuals started contributing) is relevant and correlated with the endogenous variable that we are instrumenting (age at last employment).

Compared with the reduced-form estimates, the IV results are more than double. This is consistent with the estimated almost half a year increase in age at last employment (Table 2). In addition, the IV estimates control for other effects of the reform that could potentially impact mortality through different channels. In particular, in the IV strategy, we also control for the labor market outcomes of individuals before retirement (between the ages of 45 and 55)[28] and the proxy of the mean pension benefit.[29] Table A.19 shows the IV estimates of the effect of age at last employment

[28]Table A.17 shows that the reform had an impact on the labor market outcomes of individuals between the ages of 45 and 55. We observe that individuals that started contributing in 1967 spent 1.85 percent more time employed during these years, while they spent 0.67 percent less time self-employed. We also find that the individuals affected by the reform have 1.5 percentage points higher probability of having a blue-collar occupation. They also have 1.9 percentage points lower probability of working in the trade or transportation sector, 2.7 percentage points of working in the public, health, or education sectors, and 0.8 percentage points of working in the services, hostelry, and housekeeping sectors.

[29]As we do not have information on pension benefits for individuals that never claimed any pension, we construct

on mortality between the ages 60 and 69 with different control variables. We observe that an increase of one year in the age at last employment increases by 4.2 percentage points the probability of dying between 60 and 69 when we do not control for the proxy of pension base or the labor market outcomes of individuals before retirement. When we add all these controls, the estimate increases up to 5 percentage points. This indicates that the reform's effect on income and labor market outcomes before retirement drives the reduced-form estimates on mortality slightly 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.

## 5.2 Mechanisms

This section tries to shed light on some of the potential mechanisms explaining why losing access to early retirement increases mortality. We focus on two types of heterogeneities: labor market conditions prior to retirement and the possibility of flexible retirement.

Labor Market Conditions Prior to Retirement

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). In this paper, we acknowledge that the burden of a job may be multi-dimensional, and we examine four characteristics of the individuals' labor environment before retirement: physical burden, psychosocial burden, and self-value at work in the last industry individuals were employed before retirement, as well as individuals' last occupation's skill level. Table 5 reports the heterogeneity results for the probability of dying between 60 and 69 (conditional on surviving to 60)[30] by all these four measures.

On the one hand, retirement enables individuals to enjoy more leisure time and eliminates work-related stress and exposure to job-specific accidents, potentially positively impacting individuals' mental and physical health and wellbeing. Thus, retirement may be particularly beneficial for those who work in strenuous occupations, either physically or mentally. Actually, labor unions have heavily used this argument in their opposition to increases in the statutory retirement age. Therefore, we first classify individuals' last industry depending on their physical and psychoso-

a proxy of the monthly pension base. We use the history of the monthly contributions and follow the formula of the Social Security to calculate the pension base. The correlation between this proxy and the actual mean pension base is 0.87 for individuals that claim a regular pension, indicating that it is a good proxy. Moreover, in Table A.18, we show that the reform impacted this proxy of the mean pension base positively. Though, the effect of the reform on the proxy is larger than the effect on the actual pension base of Table 3.

[30] We focus on this age bracket as it is where we observe the majority of the action in our main results. As the reform has no impact on the probability of dying before 60, the sample used in this regression is not selected.

cial burden to analyze if the adverse effects of delaying retirement on mortality differ by these characteristics.

Previous literature has already established that physically demanding occupations lead to adverse health effects (see Case et al. (2005) and Ravesteijn et al. (2013) for a summary). To measure physical burden at work, we can use the Spanish Register of Workplace Accidents between 2003 and 2019, which has information about the total number of workplace accidents that individuals in our sample (cohorts born between 1938 and 1949) experienced in different industries sectors they were employed. Figure A.2 shows the distribution of industry sectors depending on their incidence of workplace accidents. We link individuals' last industry to this aggregate industry-level data and divide our sample by the median of the workplace incidence. After this division, the manufacturing, energy, water, sanitation, and construction sectors are considered to have a high incidence of workplace accidents, and the rest are included in the low incidence group.

Columns 1 and 2 of Table 5 show that the increase in mortality is stronger for those individuals who worked in sectors with a higher incidence of workplace accidents before retirement. Delaying the age at last employment by one year increases the probability of dying between 60 and 69 by 6.7 percentage points ($\sim$ 57%) in sectors with a high incidence of workplace accidents. At the same time, the effect is only 3 percentage points in sectors with a low incidence of workplace accidents. Therefore, this heterogeneity confirms that individuals in more physically demanding jobs will benefit the most from having access to early retirement.

Next, we examine the heterogeneity effect of delaying retirement on mortality by the mental and social stress that individuals were experiencing before retirement. Unfortunately, we do not have a good measure of occupations or industries by this measure for the Spanish context. Thus, we measure psychosocial exposure by adopting occupational indexes based on the Job Exposure Matrices constructed by Kroll (2011) using a large-scale representative survey of working conditions of about 20,000 employees in Germany. In particular, we use their measure of psychosocial burden, which is based on mental stress, social stress, and temporal loads. Figure A.3 shows a distribution of industry sectors by this psychosocial exposure index. We link individuals' last industry with this aggregate occupation-level data[31] and divide our sample by the median of this index.

Columns 3 and 4 of Table 5 report that a delay of one year increases the probability of dying by 5.3 percentage points ($\sim$ 50%) for individuals with occupations in industries with a high psychosocial burden. In contrast, the increase is smaller (3.6 percentage points) for those with occupations

[31]The psychosocial burden occupational index elaborated by Kroll (2011) is linked to individuals' last industry following these steps. First, we group all the industries defined in CNAE09 into 21 different groups. Using the Labor Force Survey of 2011, we observe which occupations (defined by CNO11) are most often performed in each of the 21 industries groups and with what frequency. Finally, we link the psychosocial index with each industry depending on which occupations usually are performed within each industry, using the frequencies as weights to calculate the mean psychosocial burden in each sector.

in industries with less psychosocial exposure. These results imply that losing the right to retire early can kill individuals, not only in physically demanding jobs but also with high exposure to psychosocial burdens.

On the other hand, previous literature has pointed out that retirement can negatively impact individuals' wellbeing, as they often lose the social network of their coworkers and may feel less valuable to society when they enter retirement (Szinovacz et al., 1992). Therefore, we want to test this hypothesis by looking at the heterogeneous effect of delaying retirement on mortality based on how individuals felt useful in their job before retirement.

As we do not have a good proxy of usefulness at work in the Spanish context, we utilize the Occupational Information Network (O*NET) collected by the US Department of Labor. We use the work value classification to measure self-value at the workplace, which includes two elements: a sense of achievement and recognition at the workplace. Figure A.4 shows distribution of industry sectors by this self-value index. In our sample, we link individuals' last industry with this aggregate occupational-level data[32] and divide the sample by the index's median.

We find, in columns 5 and 6 of Table 5, strong evidence that the mortality effects between 60 and 69 are driven by people working in low self-value industries. Delaying labor market exit by one year increases the probability of dying between 60 and 69 by 6.4 percentage points ($\sim 60\%$) for individuals working in these sectors, while the impact is small and insignificant for people working in sectors with high self-value. Therefore, this result indicates that individuals that feel achieved and recognized at their job do not experience a negative mortality effect due to a delay in the exit of the labor market.

Finally, previous literature has heavily relied on heterogeneity differentiating between blue- and white-collar jobs, typically based on each occupation's assumed skill level (Coe et al., 2012). Following this previous literature, we also look at the differential effect of age at last employment on mortality for individuals working in white- and blue-collar occupations in columns 7 and 8 of Table 5. Contrary to (Mazzonna and Peracchi, 2017), we find that this heterogeneity is very similar to the one based on the physical burden. Delaying retirement by one year increases the probability of dying between 60 and 69 by 6.6 percentage points ($\sim 68\%$) for individuals with a blue-collar job, while it is 3.2 for the rest. This result indicates that, in this context, skills capture differences in physical burden across occupations.

Possibility of Gradual Retirement

Reducing the possibility of early retirement, as the one examined here, seems to be a good strategy to cope with population aging as it does prolong older workers' working careers. However, we

[32]We link the occupational index of self-value with individuals' last industry following the same steps as for the psychosocial burden index.

have shown that this type of policy leads to serious adverse effects on individuals' life expectancy. A potential solution to incentivize workers to stay longer in the labor force without having such a negative impact on their health is to allow these workers to gradually reduced their working time at the end of their career.

As we have already explained in Section 2, from 2002, the Spanish pension system introduced the possibility of individuals partially retiring after the age of 60, allowing them to combine income from work with old-age pension benefits. They were allowed to claim up to 85% pension while reducing working from 85% to 15% of the original contract. However, this option, which is also subject to the agreement with the firm, was only available for workers with at least 33 years of contribution and six years of tenure in the same company.

In this section, we want to analyze if having the option to claim a partial pension can mitigate the negative impact of delaying the age at which individuals leave the labor market on mortality. As we observe that the reform affected the probability of individuals claiming a partial pension, we cannot just directly look at the mortality effect of those individuals that chose this retirement scheme. Therefore, we will take advantage of the fact that only individuals with at least 33 years of contribution have access to this scheme.

Table 6 shows that an increase of one year in the age at last employment increases mortality between 60 and 69 by 8.9 percentage points ($\sim$ 81%) for individuals with less than 33 years of contributions, which could not access to partial retirement. On the other hand, the effect is much smaller (1.6 percentage points or 18%) for individuals with more than 33 years of contributions that could potentially access the partial retirement scheme.

This result indicates that introducing the possibility of reducing the working time for older workers at the end of their career can help mitigate the adverse effects on health of delaying retirement.

# 6 Conclusion

This paper studies the effect of delaying retirement on mortality. We exploit a reform in 1967 in Spain that eliminated the access to voluntary 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. However, individuals who have not contributed by that date can only retire voluntarily at the statutory retirement age of 65 (although, under certain circumstances, some individuals could involuntarily retire early at age 61).

Focusing on cohorts born between 1938 and 1949, we use Spanish administrative Social Security data 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-cohort OLS regression controlling for gender and the individuals' employment history between 30 and 40. We

find that individuals who started contributing after 1967 delayed labor market exit by almost 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 by 19%, an increase in the probability of claiming a partial pension by 54%, and disability insurance by 19%. This indicates that individuals did not fully comply with the rise in statutory retirement age and utilized other ways to leave the labor market before claiming a regular pension. 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 5 percentage points (50%). The mortality responses are the strongest between 60 and 64 years old (76%) when public pensions are no longer accessible for individuals that started contributing after 1967. This suggests that the negative effect of delaying retirement on mortality is driven mainly by the immediate effect of losing access to the early retirement schemes.

We explore several mechanisms to explain the detrimental effects of delaying retirement on health. First, we show that individuals' workplace conditions before retirement are essential. Moreover, we show that allowing workers to gradually reduce their working time at the end of their career, making partial retirement an option, can incentivize workers to stay longer in the labor force without harming their health.

The applicability and relevance of our findings extend further than the Spanish setting. Delaying statutory retirement and closing early retirement options is a pertinent policy agenda in many countries. However, the existing empirical evidence on mortality effects of retirement rests almost exclusively on estimates of policy experiments that allowed for earlier retirement. Given that it is unclear if there is a symmetry impact of advancing or delaying retirement age, our findings on the mortality effect of delaying retirement are particularly relevant.

Second, the heterogeneous mortality impacts of delaying retirement raise discussions on the distributional consequences of raising the statutory retirement age. We find that individuals that have strenuous jobs, both physically and mentally (with a lot of stress), are the ones that suffer the most from a delay in retirement. The reform also had more substantial effects on individuals with jobs where they felt less achieved and had less recognition. Combining results on partial retirement, our finding suggests that it is crucial to provide options for gradual retirement and flexible retirement while raising statutory retirement ages.

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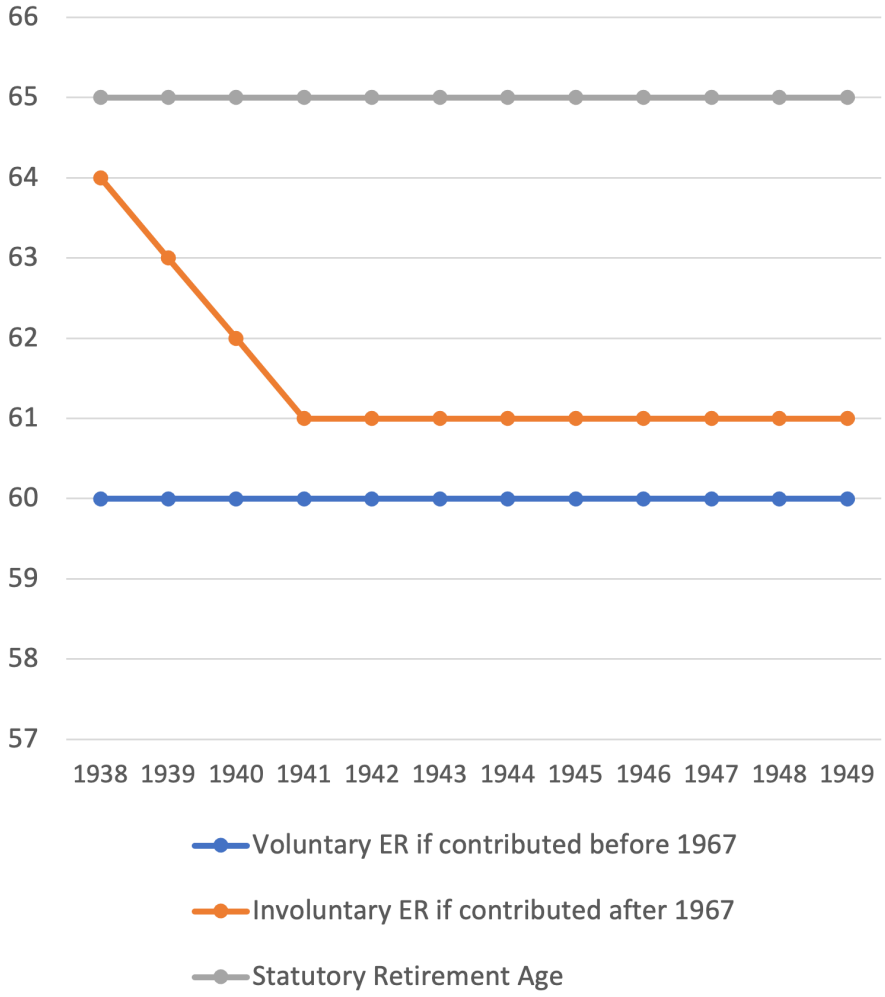
# 7 Figures and Tables

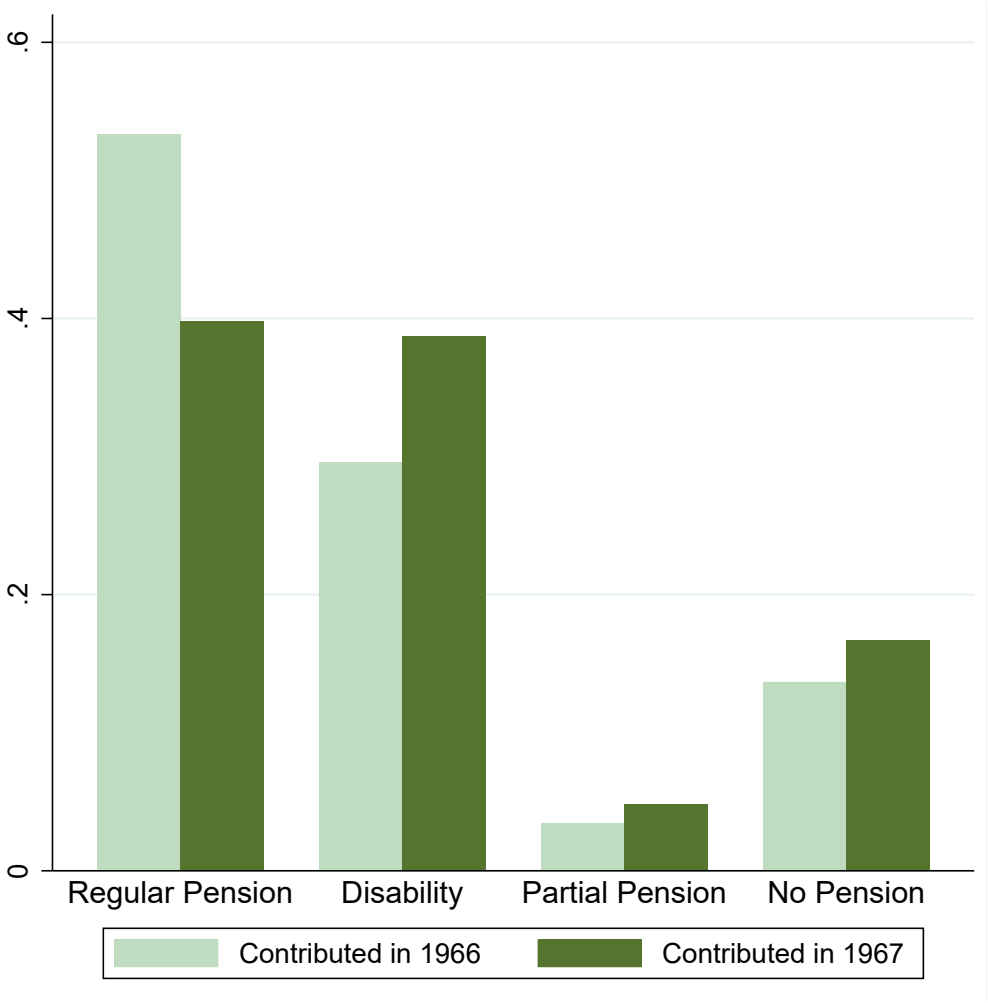
Figure 1: Retirement Age by First Year of Contribution and Cohort




*Source:* Authors' own construction according to the pension laws.

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

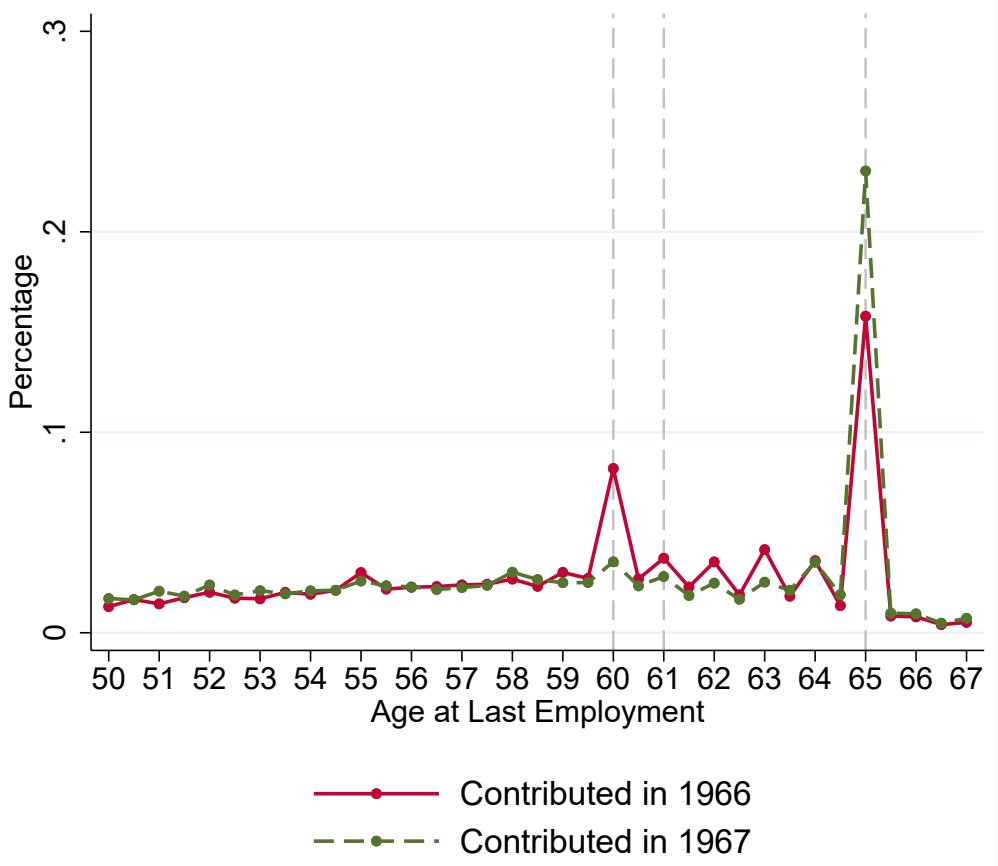
Figure 2: Types of Pension by Treatment Status




*Source:* MCVL, cohorts 1938-1949.

*Notes:* This figure plots the percentage of individuals by the different types of pension claimed (regular pension, disability insurance, partial pension, or no pension). The light green bars show the density for individuals that started contributing in 1966, while the dark green bars show the density for those who started contributing in 1967.

Figure 3: Density of Age at Last Employment by Treatment Status

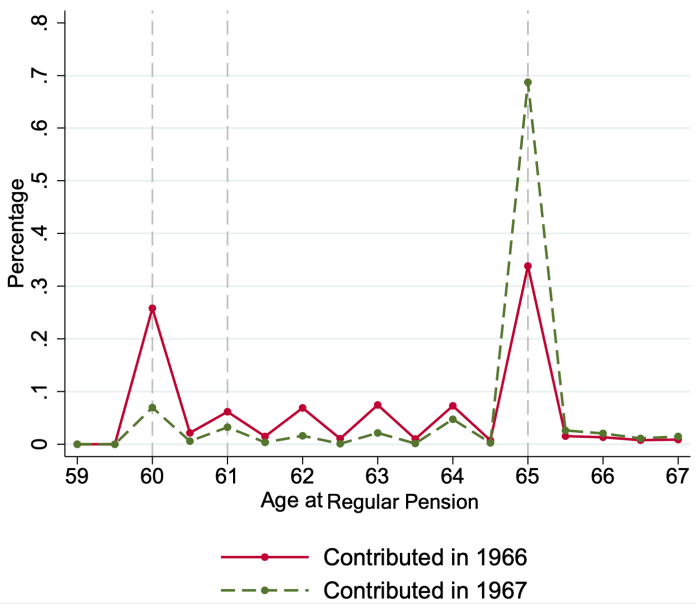



*Source:* MCVL, cohorts 1938-1949.

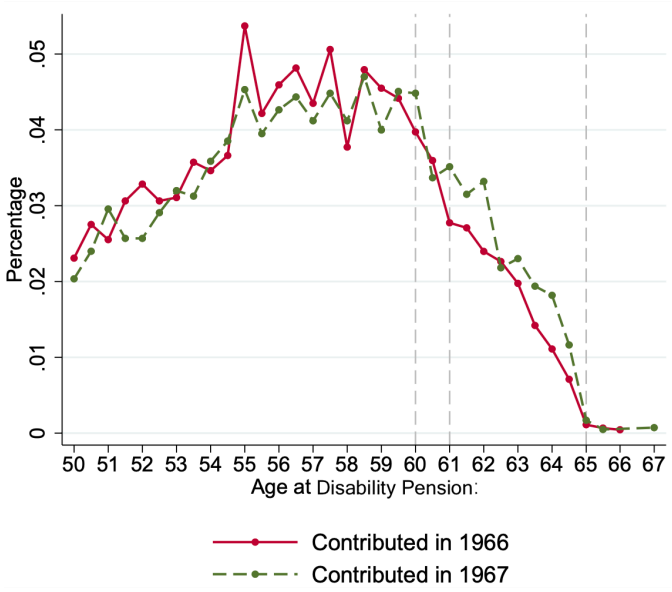
*Notes:* This figure plots the percentage of individuals by the age at which they finished their last employment. The solid red line shows the density for individuals who started contributing in 1966, while the green dashed line shows those who started contributing in 1967.

## Figure 4: Density of Pension Ages by Treatment Status

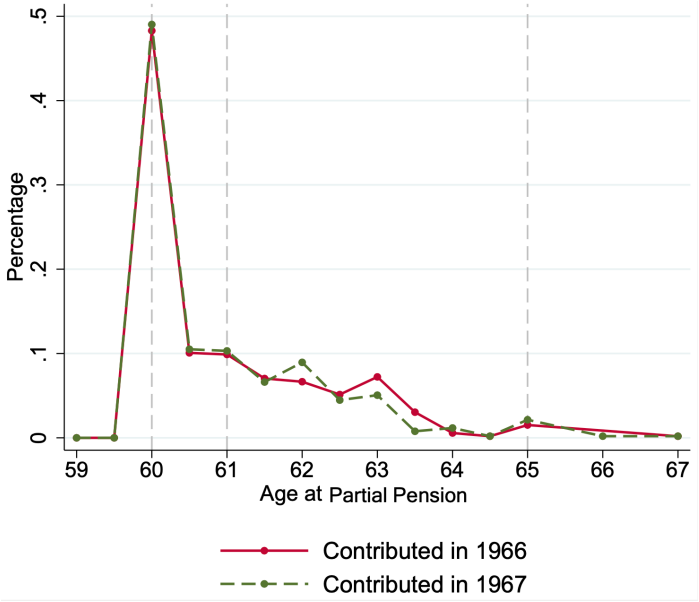
(a) Age at Regular Pension




(b) Age at Disability Pension



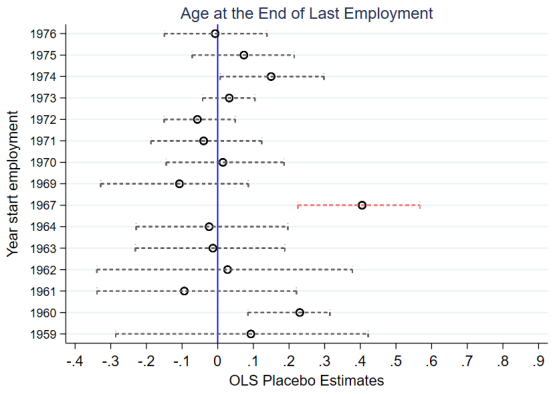

(c) Age at Partial Pension



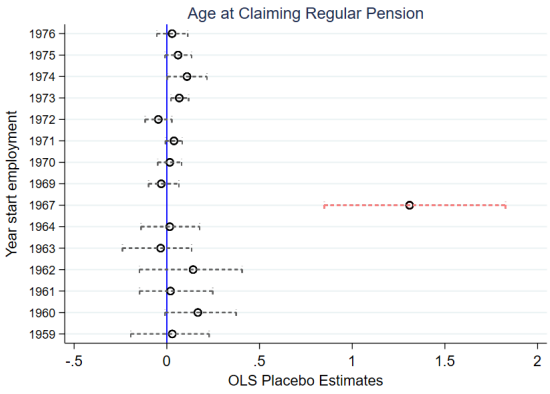

*Source:* MCVL, cohorts 1938-1949.

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

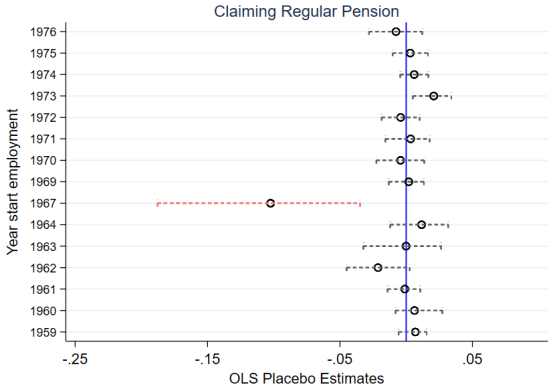
# Figure 5: Placebo Tests: Using Other Cutoffs



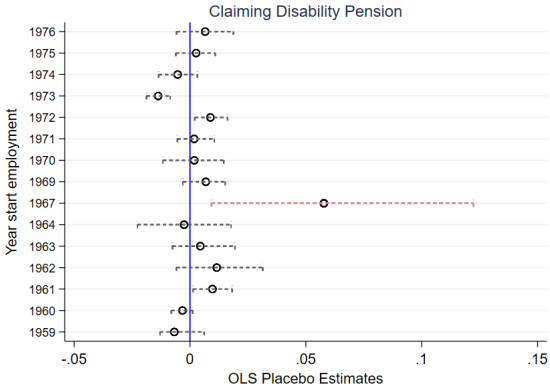

(a) Age at last employment



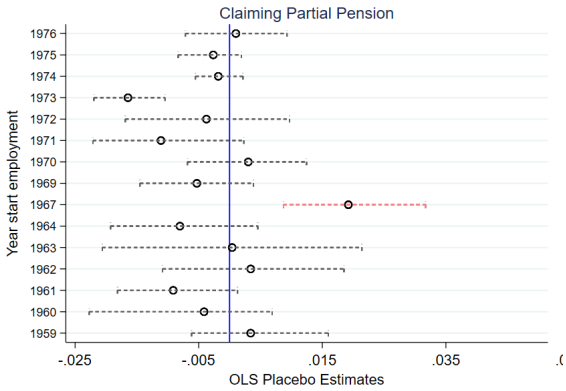

(b) Age at claiming regular pension



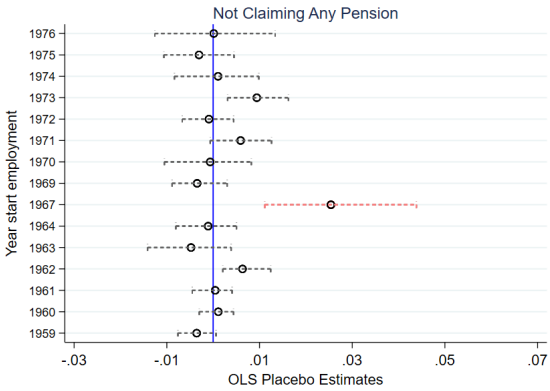

(c) Probability of claiming regular pension




(d) Probability of claiming disability pension




(e) Probability of claiming partial pension



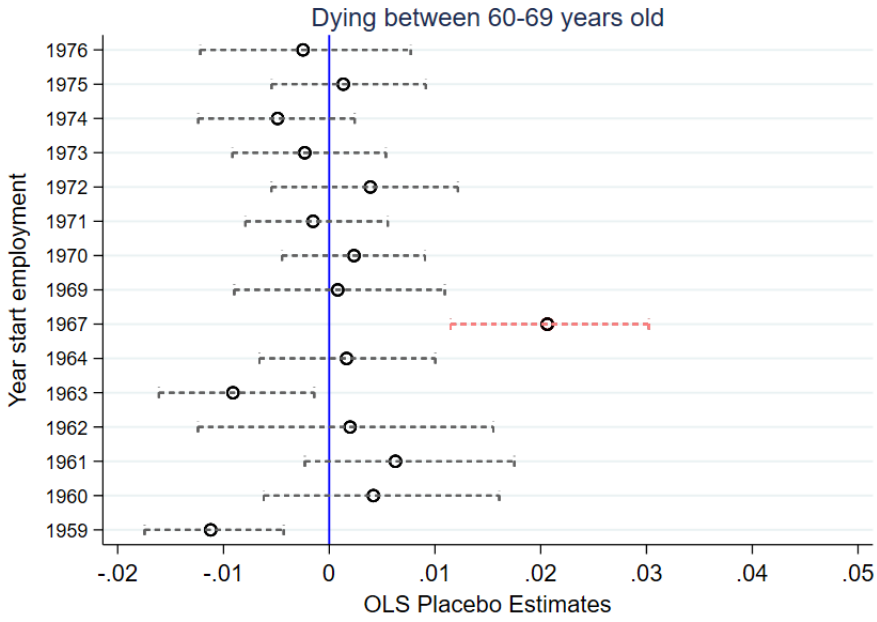

(f) Probability of not claiming any pension

*Source:* MCVL, cohorts 1938-1949.

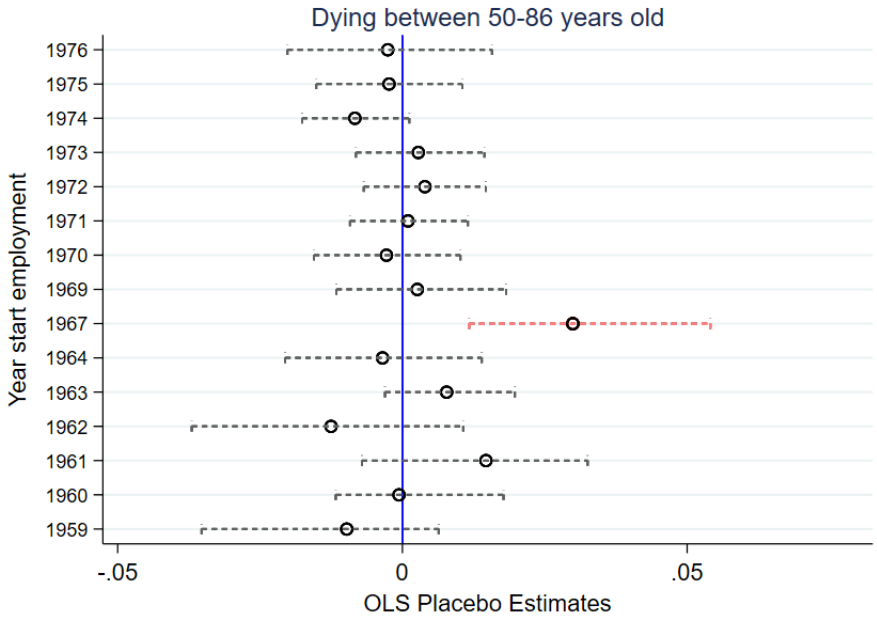
*Notes:* This figure shows the estimates and the 95 percent confidence intervals of a list of placebos, estimating regression 1 using the years of the y-axis as the cutoff. The red estimate corresponds to the estimation of the regression 1 on the real cutoff: 1967. The outcomes considered are displayed 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, cohorts 1938-1949.

*Notes:* This figure shows the estimates and the 95 percent confidence intervals of a list of placebos, estimating regression 1 using the years of the y-axis as the cutoff. 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.

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

| | First Pension Claimed | | | |
|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension |
| Contributed in 1967 | -0.102*** | 0.019*** | 0.058** | 0.025*** |
| | (0.032) | (0.005) | (0.024) | (0.007) |
| | [0.006] | [0.002] | [0.029] | [0.003] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.140 | 0.067 | 0.091 | 0.054 |
| Mean Dep. (Treated) | 0.398 | 0.048 | 0.387 | 0.167 |
| Mean Dep. (Control) | 0.533 | 0.035 | 0.296 | 0.137 |

*Source:* MCVL, 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), partial pension (Column 2), disability pension (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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported 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 | 0.405*** | 0.279** | 1.310*** | 0.288** | -0.153*** |
| | (0.073) | (0.107) | (0.207) | (0.067) | (0.054) |
| | [0.003] | [0.041] | [0.001] | [0.023] | [0.005] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 22,040 | 12,367 | 8,633 | 1,040 |
| $R^2$ | 0.083 | 0.106 | 0.220 | 0.035 | 0.245 |
| Mean Dep. (Treated) | 59.858 | 61.049 | 64.641 | 57.352 | 61.101 |
| Mean Dep. (Control) | 59.401 | 60.889 | 63.036 | 56.986 | 61.134 |

*Source:* MCVL, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported 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 | 43.777*** | 19.112** | 5.039*** |
| | (10.913) | (6.570) | (1.014) |
| | [0.003] | [0.015] | [0.001] |
| Month-Year Birth FE | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ |
| Observations | 22,040 | 22,040 | 22,039 |
| $R^2$ | 0.377 | 0.410 | 0.155 |
| Mean Dep. (Treated) | 1177.066 | 1203.640 | 86.099 |
| Mean Dep. (Control) | 1089.755 | 1150.027 | 78.796 |

*Source:* MCVL, 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 for those individuals in our sample that claim any pension. 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. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table 4: 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 | -0.013*** | -0.012*** | -0.004*** | -0.003*** | -0.000 |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| | [0.001] | [0.001] | [0.001] | [0.001] | [0.622] |
| **Reduced form:** | | | | | |
| Contributed in 1967 | 0.030*** | 0.010 | 0.021*** | 0.001 | 0.004* |
| | (0.009) | (0.006) | (0.004) | (0.007) | (0.002) |
| | [0.002] | [0.115] | [0.001] | [0.840] | [0.059] |
| **IV:** | | | | | |
| Age last employment | 0.083* | 0.023 | 0.049*** | 0.003 | 0.007** |
| | (0.041) | (0.018) | (0.012) | (0.013) | (0.003) |
| | [0.055] | [0.255] | [0.005] | [0.836] | [0.016] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 23,987 | 21,009 | 17,516 |
| Mean Dep. (Treated) | 0.369 | 0.085 | 0.131 | 0.184 | 0.036 |
| Mean Dep. (Control) | 0.297 | 0.066 | 0.098 | 0.154 | 0.023 |
| F-stat FS | 21.563 | 21.563 | 46.819 | 50.895 | 63.375 |

*Source:* MCVL, 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 correlation of age at last employment on mortality (OLS), and the second panel shows the effect of the reform on mortality (reduced form effect using regression 1). 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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. The IV estimation also controls for a proxy of base pension and the labor market outcomes when the individuals were between 45 and 55 years old. All standard errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

# Table 5: Impact on Mortality by Labor Market Conditions Before Retirement

| | Probability of Dying between 60 and 69 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Last Industry | | | | | | Last Occupation | |
| | Workplace Accidents | | Psychosocial Exposure | | Self-value | | Blue-collar | |
| | High | Low | High | Low | High | Low | Yes | No |
| **OLS:** | | | | | | | | |
| Age last employment | -0.003*** | -0.004*** | -0.003*** | -0.004*** | -0.003*** | -0.004*** | -0.004*** | -0.004*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) |
| | [0.003] | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] |
| **Reduced form:** | | | | | | | | |
| Contributed in 1967 | 0.029*** | 0.017*** | 0.027*** | 0.018** | 0.011 | 0.027*** | 0.024*** | 0.016** |
| | (0.008) | (0.005) | (0.006) | (0.007) | (0.008) | (0.006) | (0.005) | (0.007) |
| | [0.016] | [0.007] | [0.002] | [0.028] | [0.150] | [0.003] | [0.001] | [0.040] |
| **IV:** | | | | | | | | |
| Age last employment | 0.067* | 0.030*** | 0.053*** | 0.036** | 0.014 | 0.064*** | 0.066** | 0.032** |
| | (0.031) | (0.009) | (0.014) | (0.016) | (0.010) | (0.020) | (0.022) | (0.015) |
| | [0.081] | [0.001] | [0.002] | [0.048] | [0.204] | [0.007] | [0.019] | [0.040] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 7,941 | 12,991 | 10,580 | 10,352 | 6,025 | 14,907 | 15,929 | 8,058 |
| Mean Dep. (Treated) | 0.158 | 0.122 | 0.148 | 0.126 | 0.112 | 0.146 | 0.133 | 0.129 |
| Mean Dep. (Control) | 0.117 | 0.094 | 0.105 | 0.100 | 0.095 | 0.106 | 0.096 | 0.102 |
| F-stat FS | 21.170 | 23.142 | 29.918 | 18.906 | 14.556 | 18.618 | 22.370 | 21.496 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of age at last employment on the probability of dying between the ages of 60-and 69 by the labor market conditions experienced by the individual just before retirement. Individual's last industry is classified depending on their workplace accident incidence for our cohorts between 2003 and 2019 (Columns 1 and 2), by the psychosocial exposure (mental stress, social stress, and temporal load) following Kroll (2011) (Columns 3 and 4), and by their self-value index (sense of achievement and recognition) constructed using O*NET (Columns 5 and 6). We also differentiate if individuals' last occupation pertains to a white or a blue-collar occupation (Columns 7 and 8). The first panel reports the correlation of age at last employment on mortality (OLS), and the second panel shows the effect of the reform on mortality (reduced form effect using regression 1). 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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. The IV estimation also controls for a proxy of base pension and the labor market outcomes when the individuals were between 45 and 55 years old. All standard errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table 6: Impact on Mortality by Availability of Flexible Retirement

| | Probability of Dying between 60 and 69 | |
|---|---|---|
| | Years of Contribution | |
| | More 33 | Less 33 |
| **OLS:** | | |
| Age last employment | -0.004*** | -0.000 |
| | (0.001) | (0.001) |
| | [0.003] | [0.685] |
| **Reduced form:** | | |
| Contributed in 1967 | 0.016** | 0.022*** |
| | (0.007) | (0.004) |
| | [0.019] | [0.005] |
| **IV:** | | |
| Age last employment | 0.016* | 0.089*** |
| | (0.008) | (0.030) |
| | [0.051] | [0.015] |
| Month-Year Birth FE | ✓ | ✓ |
| Controls | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ |
| Observations | 11,782 | 12,205 |
| Mean Dep. (Treated) | 0.108 | 0.155 |
| Mean Dep. (Control) | 0.087 | 0.109 |
| F-stat FS | 25.726 | 12.578 |

*Source:* MCVL, cohorts 1938-1949.
*Notes:* This table reports the impact of age at last employment on the probability of dying between the ages of 60-and 69 for individuals with less (Column 1) or more than 33 years of contribution (Column 2). Only individuals with more than 33 years of contribution when claiming a pension can access the partial retirement scheme. The first panel reports the correlation of age at last employment on mortality (OLS), and the second panel shows the effect of the reform on mortality (reduced form effect using regression 1). 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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. The IV estimation also controls for a proxy of base pension and the labor market outcomes when the individuals were between 45 and 55 years old. All standard errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.
*** p<0.01, ** p<0.05, * p<0.1.

# The Right to Retire Early and Mortality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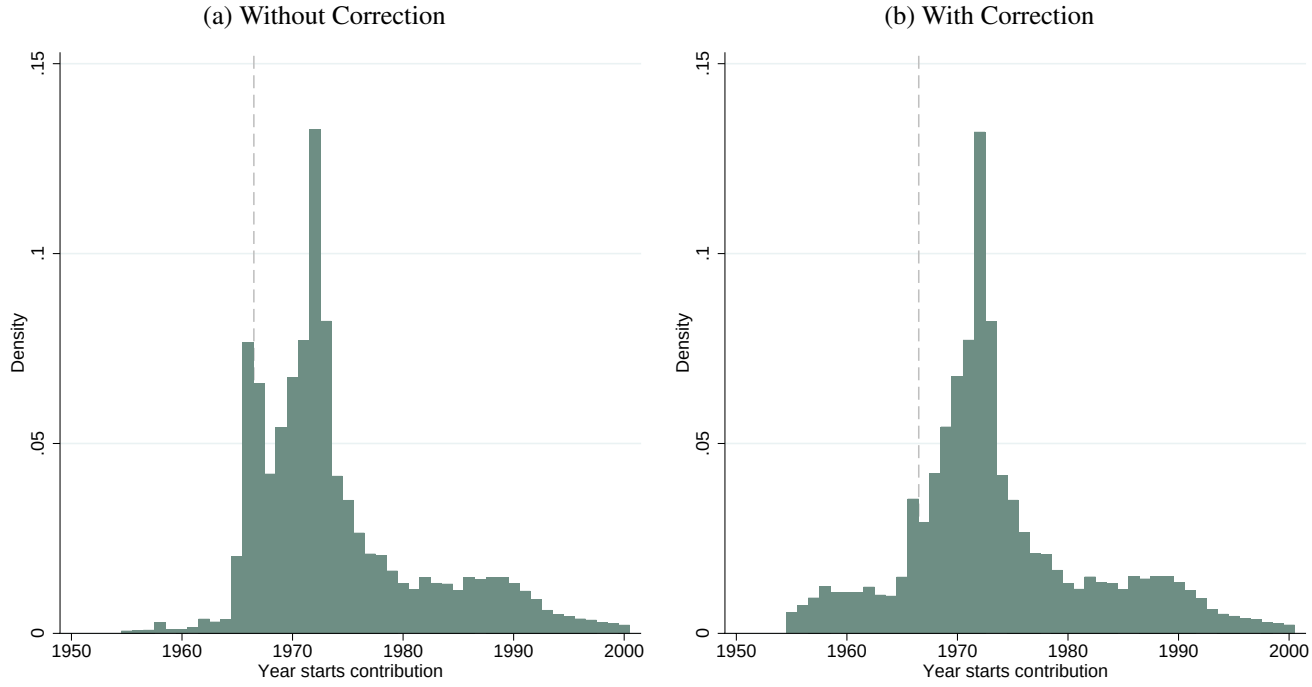
# Online Appendix

## A Appendix Tables and Figures

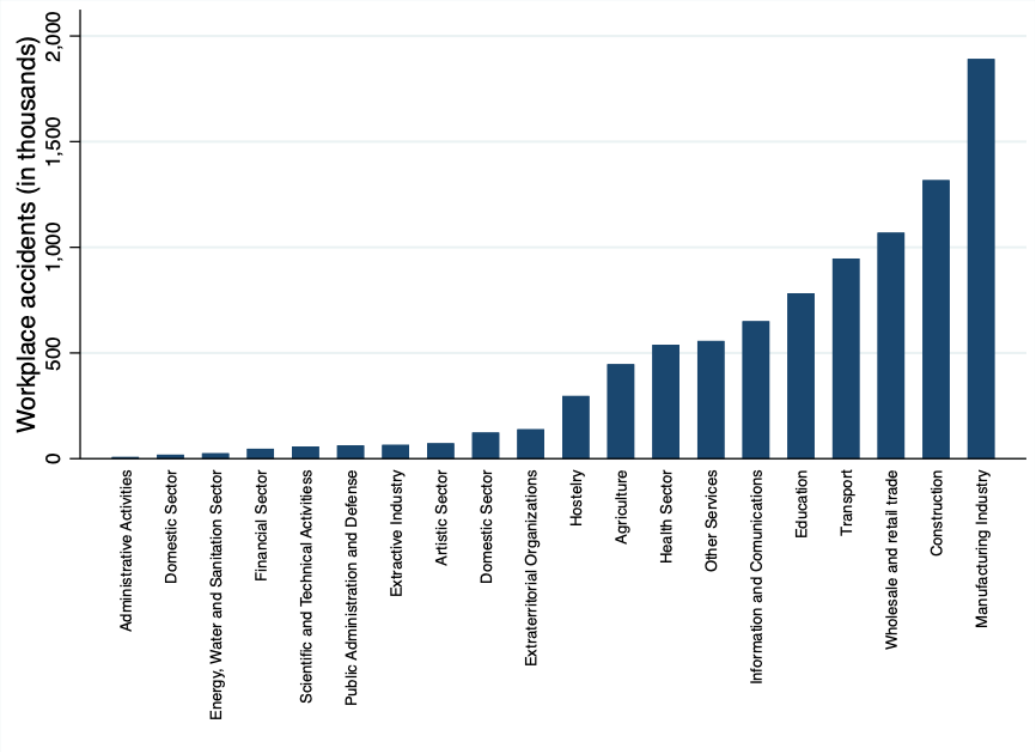
Figure A.1: Correction of Year Started Contributing




*Source:* MCVL, cohorts 1938-1949.

*Notes:* This figure plots the density of date started contributing without correction (Graph a) and with correction (Graph b). The correction uses the number of years of contribution and the date starting a regular or partial pension (years of contribution are not available for individuals that claim a disability pension) to correct for the date of starting contributing for those whose year of started contributing was between 1965 and 1967.

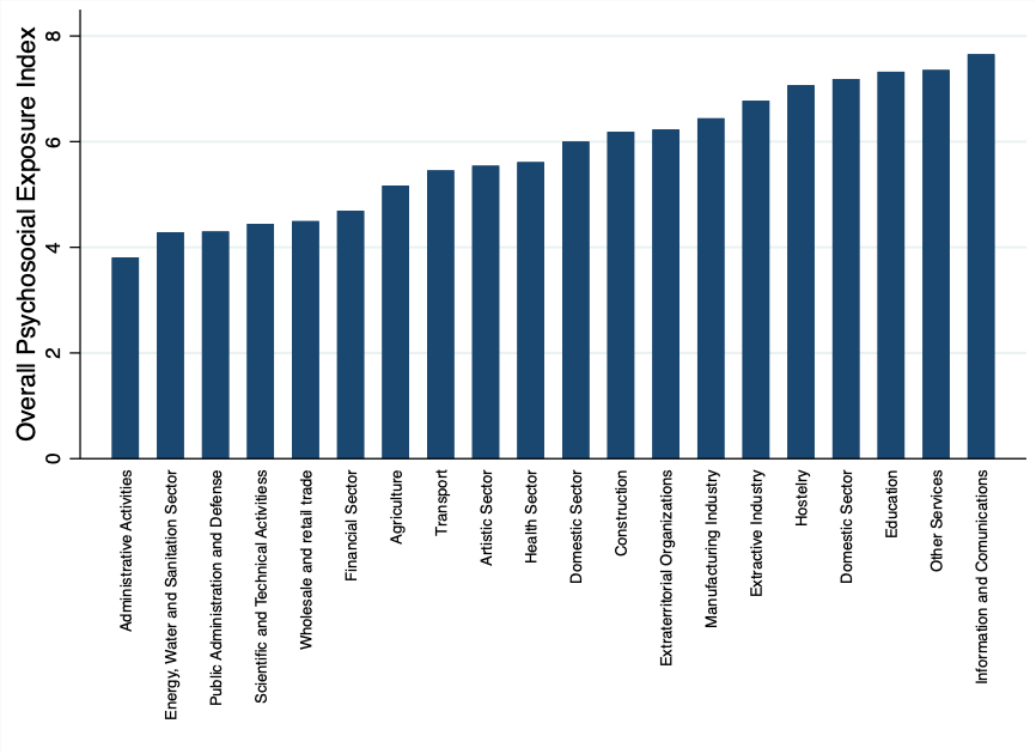
Figure A.2: Classification of Industries by Incidence of Workplace Accidents




*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 in the industry sector the workers were working at the moment of the accident.

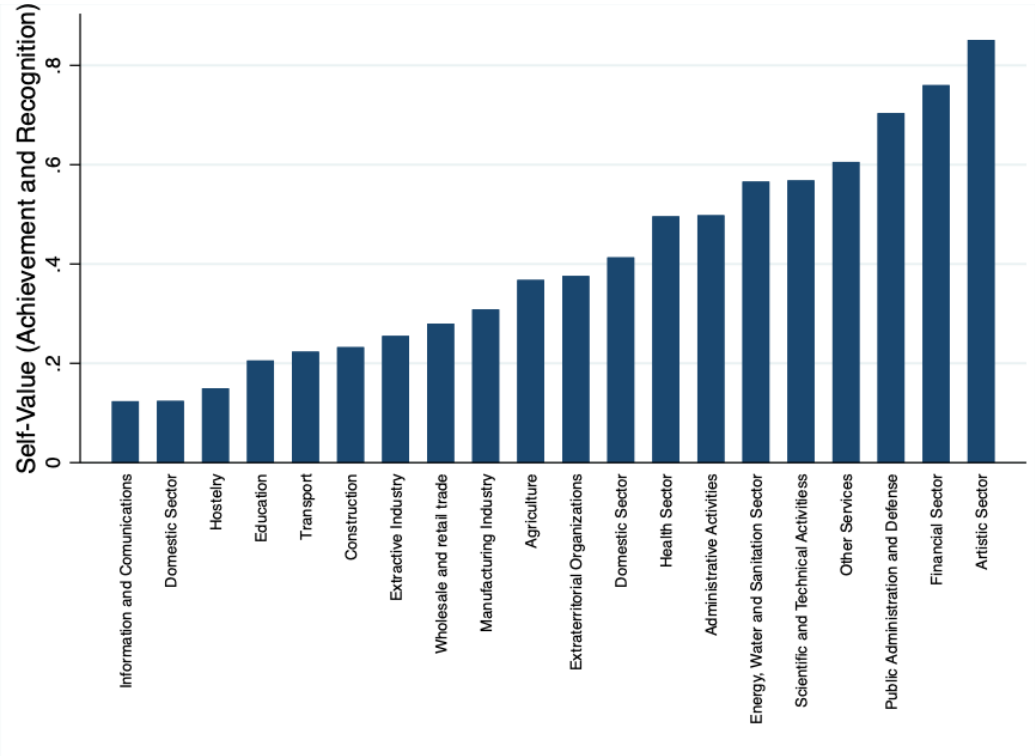
Figure A.3: Classification of Industries by Psychosocial Exposure




*Source:* MCVL, cohorts 1938-1949.

*Notes:* This figure plots the different industry sectors classified by the degree of psychosocial pressure (mental, social stress, and temporal load) individuals working in these sectors are exposed to. We follow Kroll (2011) for the definition of psychosocial exposure.

Figure A.4: Classification of Industries by Self-value Index




*Source:* MCVL, cohorts 1938-1949.

*Notes:* This figure plots the different industry sectors classified by the degree of self-value (sense of achievement and recognition) that individuals working in these sectors are exposed to. We follow the O*NET for the definition of the self-value index.

Table A.1: Sample Selection

| | Sample Selection | |
|---|---|---|
| | Observations dropped | Mortality Dropped Obs |
| Contributed in 1967 | -0.021 | 0.016 |
| | (0.012) | (0.013) |
| | [0.100] | [0.246] |
| Month-Year Birth FE | ✓ | ✓ |
| Controls | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ |
| Observations | 30,888 | 6,385 |
| $R^2$ | 0.030 | 0.203 |
| Mean Dep. (Treated) | 0.189 | 0.393 |
| Mean Dep. (Control) | 0.220 | 0.313 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of not being in the main sample due to having stopped contributing to the Social Security system before age 50 or not having at least 8 years of contribution (Column1). Column 2 reports the effect of the reform on mortality for the sample of individuals dropped from the main sample, 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, and month of birth fixed effects. All standard errors are clustered at the birth year level, and wild-bootstrap p-values are reported in brackets.

Table A.2: Smoothness of the Covariates

| | Labor Market between the Ages of 30 and 40 | | | | |
|---|---|---|---|---|---|
| | Fraction active | Fraction employed | Blue-collar occ | Av. monthly contribution | Fraction selfempoyed |
| Contributed in 1967 | 0.108 | 0.581 | -0.007 | 30.190* | 2.602*** |
| | (0.362) | (0.519) | (0.009) | (16.300) | (0.537) |
| | [0.754] | [0.344] | [0.493] | [0.098] | [0.002] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.170 | 0.193 | 0.063 | 0.243 | 0.006 |

| | Industry between the Ages of 30 and 40 | | | | | |
|---|---|---|---|---|---|---|
| | Agriculture Minery Construction | Manufacturing | Trade Transportation | Public Health Education | Science Administrative | Services Hostelry Housekeeping |
| Contributed in 1967 | 0.002 | -0.004 | -0.002 | -0.006 | -0.000 | 0.000 |
| | (0.007) | (0.002) | (0.002) | (0.007) | (0.001) | (0.003) |
| | [0.769] | [0.128] | [0.382] | [0.374] | [0.847] | [0.912] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.045 | 0.012 | 0.008 | 0.044 | 0.004 | 0.004 |

*Source:* MCVL, 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), the fraction of time spent employed (Column 2), probability of having been employed in a blue-collar occupation (Column 3), average monthly contribution (Column 4), the fraction of time self-employed (Column 5), and probability of being employed in the agriculture, minery or construction sectors (Column 6), manufacturing sector (Column 7), trade or transportation sectors (Column 8), public, health or educational sectors (Column 9), scientific or administrative sectors (Column 10), or services, hostelry or housekeeping sectors (Column 11). 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 errors are clustered at the birth year level, and wild-bootstrap p-values are reported in brackets.

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

Table A.3: Descriptive Statistics

| Dependent Variables | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Regular Pension | 25,903 | 0.47 | 0.49 | 0 | 1 |
| Partial Pension | 25,903 | 0.04 | 0.19 | 0 | 1 |
| Disability Pension | 25,903 | 0.33 | 0.47 | 0 | 1 |
| No Pension | 25,903 | 0.14 | 0.35 | 0 | 1 |
| Age Last Employment | 25,903 | 59.58 | 5.43 | 18.75 | 82.91 |
| Age First Pension | 22,040 | 60.95 | 4.25 | 50 | 79.41 |
| Age Regular Pension | 12,367 | 63.58 | 2.29 | 60 | 74 |
| Age Disability Pension | 8,633 | 57.16 | 3.76 | 50 | 79.41 |
| Age Partial Pension | 1,040 | 61.11 | 1.33 | 60 | 70.08 |
| Dying 50-86 y.o. | 25,903 | 0.32 | 0.46 | 0 | 1 |
| Dying 50-59 y.o. | 25,903 | 0.07 | 0.26 | 0 | 1 |
| Dying 60-69 y.o. | 23,987 | 0.11 | 0.31 | 0 | 1 |
| Dying 70-79 y.o. | 21,009 | 0.16 | 0.37 | 0 | 1 |
| Dying 80-86 y.o. | 17,516 | 0.02 | 0.16 | 0 | 1 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports summary statistics for the main outcome variables. The sample corresponds to individuals born between 1938 and 1949, registered in the Social Security (contributive workers and pensioners) at any point of their lives till 2020. We further restrict the same to individuals contributing to the Social Security system at age 50 with at least 8 years of employment.

Table A.4: Impact of the Reform on the Type of Disability

| | Type of Disability | |
|---|---|---|
| | Great or Absolute | Partial or Professional |
| Contributed in 1967 | 0.031** | 0.027* |
| | (0.012) | (0.013) |
| | [0.013] | [0.066] |
| Month-Year Birth FE | ✓ | ✓ |
| Controls | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ |
| Observations | 25,903 | 25,903 |
| $R^2$ | 0.040 | 0.051 |
| Mean Dep. (Treated) | 0.180 | 0.207 |
| Mean Dep. (Control) | 0.133 | 0.162 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of claiming absolute or great disability (Column 1) and partial or professional disability (Column 2), 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.5: 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 | 0.025*** | 0.002* | 0.007 | 0.016*** |
| | (0.007) | (0.001) | (0.005) | (0.005) |
| | [0.003] | [0.091] | [0.141] | [0.007] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.054 | 0.007 | 0.080 | 0.031 |
| Mean Dep. (Treated) | 0.167 | 0.004 | 0.065 | 0.098 |
| Mean Dep. (Control) | 0.137 | 0.003 | 0.064 | 0.070 |

*Source:* MCVL, 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), continuing 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.6: Impact of the Reform on Age at Last Employment (in Brackets)

| | Last Employment at Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 50-54 | 55-59 | 60 | 61 | 62 | 63 | 64 | 65 | After 65 |
| Contributed in 1967 | 0.011 | -0.011* | -0.041*** | -0.011** | -0.011** | -0.011*** | 0.006** | 0.070*** | 0.016*** |
| | (0.008) | (0.005) | (0.013) | (0.005) | (0.004) | (0.003) | (0.002) | (0.012) | (0.004) |
| | [0.222] | [0.068] | [0.009] | [0.026] | [0.011] | [0.005] | [0.023] | [0.001] | [0.004] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.033 | 0.041 | 0.020 | 0.007 | 0.007 | 0.012 | 0.009 | 0.076 | 0.049 |
| Mean Dep. (Treated) | 0.198 | 0.247 | 0.059 | 0.047 | 0.041 | 0.046 | 0.054 | 0.240 | 0.086 |
| Mean Dep. (Control) | 0.176 | 0.253 | 0.109 | 0.060 | 0.054 | 0.060 | 0.049 | 0.166 | 0.066 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of leaving the labor market between the ages of 50-54 (Column 1), 55-59 (Column 2), at 60 (Column 3), at 61 (Column 4), at 62 (Column 5), at 63 (Column 6), at 64 (Column 7), at 65 (Column 8), and after age 65 (Column 9), 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.7: Impact of the Reform on Age at Regular Pension (in Brackets)

| | Regular Pension at Age | | | | | | |
|---|---|---|---|---|---|---|---|
| | 60 | 61 | 62 | 63 | 64 | 65 | After 65 |
| Contributed in 1967 | -0.100*** | -0.020*** | -0.032*** | -0.032*** | -0.020*** | 0.095*** | 0.036*** |
| | (0.024) | (0.005) | (0.005) | (0.006) | (0.005) | (0.014) | (0.008) |
| | [0.001] | [0.005] | [0.001] | [0.001] | [0.001] | [0.001] | [0.003] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.088 | 0.029 | 0.023 | 0.028 | 0.019 | 0.107 | 0.139 |
| Mean Dep. (Treated) | 0.030 | 0.014 | 0.007 | 0.009 | 0.020 | 0.284 | 0.159 |
| Mean Dep. (Control) | 0.149 | 0.041 | 0.042 | 0.045 | 0.043 | 0.188 | 0.112 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of claiming a regular pension between the ages of 50-54 (Column 1), 55-59 (Column 2), at 60 (Column 3), at 61 (Column 4), at 62 (Column 5), at 63 (Column 6), at 64 (Column 7), at 65 (Column 8), and after age 65 (Column 9), 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.8: Impact of the Reform on Age at Disability Pension (in Brackets)

| | Disability at Age | | | |
|---|---|---|---|---|
| | 50-54 | 55-59 | 60-65 | After 65 |
| Contributed in 1967 | 0.012 | 0.017 | 0.028*** | 0.000* |
| | (0.009) | (0.012) | (0.005) | (0.000) |
| | [0.170] | [0.176] | [0.001] | [0.092] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.026 | 0.045 | 0.017 | 0.006 |
| Mean Dep. (Treated) | 0.113 | 0.167 | 0.106 | 0.001 |
| Mean Dep. (Control) | 0.091 | 0.136 | 0.068 | 0.001 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of claiming a disability pension between the ages of 50-54 (Column 1), 55-59 (Column 2), 60-56 (Column 3), and after age 65 (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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.9: Impact of the Reform on Age at Great/Absolute Disability Pension (in Brackets)

| | Great/Absolute Disability at Age | | | |
|---|---|---|---|---|
| | 50-54 | 55-59 | 60-65 | After 65 |
| Contributed in 1967 | 0.007 | 0.009* | 0.015*** | 0.000 |
| | (0.005) | (0.005) | (0.003) | (0.000) |
| | [0.134] | [0.083] | [0.001] | [0.431] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.015 | 0.019 | 0.011 | 0.007 |
| Mean Dep. (Treated) | 0.053 | 0.070 | 0.057 | 0.001 |
| Mean Dep. (Control) | 0.041 | 0.056 | 0.037 | 0.000 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of claiming an absolute or great disability pension between the ages of 50-54 (Column 1), 55-59 (Column 2), 60-56 (Column 3), and after age 65 (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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.10: Impact of the Reform on Age at Partial/Professional Disability Pension (in Brackets)

| | Professional/Partial Disability at Age | | | |
|---|---|---|---|---|
| | 50-54 | 55-59 | 60-65 | After 65 |
| Contributed in 1967 | 0.005 | 0.008 | 0.014*** | 0.000 |
| | (0.005) | (0.008) | (0.003) | (0.000) |
| | [0.289] | [0.347] | [0.001] | [0.404] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.017 | 0.032 | 0.014 | 0.002 |
| Mean Dep. (Treated) | 0.060 | 0.097 | 0.049 | 0.001 |
| Mean Dep. (Control) | 0.050 | 0.080 | 0.031 | 0.000 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of claiming partial or professional disability pension between the ages of 50-54 (Column 1), 55-59 (Column 2), 60-56 (Column 3), and after age 65 (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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.11: 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, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.12: 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 | -0.097*** | 0.025*** | 0.051** | 0.020** | 0.529*** | 1.362*** | 0.329*** | -0.241** |
| | (0.032) | (0.006) | (0.021) | (0.009) | (0.165) | (0.154) | (0.109) | (0.103) |
| | [0.014] | [0.005] | [0.024] | [0.039] | [0.021] | [0.001] | [0.040] | [0.048] |
| Age Start Contributing FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 12,367 | 8,633 | 1,040 |
| $R^2$ | 0.136 | 0.069 | 0.086 | 0.054 | 0.081 | 0.219 | 0.033 | 0.228 |
| Mean Dep. (Treated) | 0.398 | 0.048 | 0.387 | 0.167 | 59.858 | 64.641 | 57.352 | 61.101 |
| Mean Dep. (Control) | 0.533 | 0.035 | 0.296 | 0.137 | 59.401 | 63.036 | 56.986 | 61.134 |

*Source:* MCVL, 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), partial pension (Column 2), disability pension (Column 3), not claiming any pension (Column 4), age at last employment (Column 5), age at claiming regular pension (Column 6), age at claiming disability pension (Column 7), and age at claiming partial pension (Column 8), using age at first contribution fixed effects. This robustness check estimates the impact of losing access to early retirement for people that 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 and age at first contribution fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the age of the first contribution, and wild-bootstrap p-values are reported in brackets.

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

Table A.13: Robustness: Cohorts 1941 to 1949

| | Type of Pension | | | | Age at | | | |
|---|---|---|---|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension | Last Employment | Regular Pension | Disability Pension | Partial Pension |
| Contributed in 1967 | -0.156*** | 0.025*** | 0.095*** | 0.035*** | 0.395*** | 1.666*** | 0.187* | -0.163** |
| | (0.022) | (0.006) | (0.016) | (0.006) | (0.130) | (0.060) | (0.095) | (0.054) |
| | [0.002] | [0.002] | [0.000] | [0.004] | [0.006] | [0.000] | [0.262] | [0.035] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 18,288 | 18,288 | 18,288 | 18,288 | 18,288 | 9,605 | 5,340 | 995 |
| $R^2$ | 0.130 | 0.061 | 0.087 | 0.063 | 0.074 | 0.269 | 0.042 | 0.200 |
| Mean Dep. (Treated) | 0.408 | 0.068 | 0.371 | 0.153 | 60.080 | 64.832 | 57.307 | 61.014 |
| Mean Dep. (Control) | 0.601 | 0.046 | 0.241 | 0.113 | 59.591 | 62.860 | 57.056 | 61.097 |

*Source:* MCVL, cohorts 1941-1949.

*Notes:* This table reports the impact of the reform on the probability of leaving the labor market through regular pension (Column 1), partial pension (Column 2), disability pension (Column 3), not claiming any pension (Column 4), age at last employment (Column 5), age at claiming regular pension (Column 6), age at claiming disability pension (Column 7), and age at claiming partial pension (Column 8), obtained from the estimation of regression 1 restringing the sample to cohorts born between 1941 and 1949. 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. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.14: Robustness: No Selfemployed

| | Type of Pension | | | | Age at | | | |
|---|---|---|---|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension | Last Employment | Regular Pension | Disability Pension | Partial Pension |
| Contributed in 1967 | -0.110*** | 0.024*** | 0.049** | 0.037*** | 0.470*** | 1.563*** | 0.314*** | -0.152** |
| | (0.030) | (0.006) | (0.021) | (0.007) | (0.098) | (0.169) | (0.077) | (0.053) |
| | [0.002] | [0.000] | [0.034] | [0.000] | [0.004] | [0.000] | [0.026] | [0.045] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 21,468 | 21,468 | 21,468 | 21,468 | 21,468 | 9,337 | 7,231 | 1,037 |
| $R^2$ | 0.160 | 0.067 | 0.113 | 0.068 | 0.057 | 0.185 | 0.032 | 0.245 |
| Mean Dep. (Treated) | 0.338 | 0.060 | 0.394 | 0.208 | 59.141 | 64.334 | 57.141 | 61.099 |
| Mean Dep. (Control) | 0.499 | 0.041 | 0.299 | 0.161 | 58.797 | 62.618 | 56.792 | 61.131 |

*Source:* MCVL, 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), partial pension (Column 2), disability pension (Column 3), not claiming any pension (Column 4), age at last employment (Column 5), age at claiming regular pension (Column 6), age at claiming disability pension (Column 7), and age at claiming partial pension (Column 8), obtained from the estimation of regression 1 restringing the sample to individuals that are not in one of the self-employed pension regimes. 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. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.15: Robustness: No Correction of the Year Start Contributing

| | Type of Pension | | | | Age at | | | |
|---|---|---|---|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension | Last Employment | Regular Pension | Disability Pension | Partial Pension |
| Contributed in 1967 | -0.177*** | 0.075*** | 0.074*** | 0.029*** | 0.676*** | 1.432*** | 0.256** | -0.323*** |
| | (0.028) | (0.013) | (0.012) | (0.005) | (0.201) | (0.269) | (0.108) | (0.069) |
| | [0.000] | [0.000] | [0.000] | [0.001] | [0.007] | [0.002] | [0.040] | [0.001] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 54,692 | 54,692 | 54,692 | 54,692 | 54,692 | 38,296 | 9,069 | 3,464 |
| $R^2$ | 0.061 | 0.075 | 0.028 | 0.038 | 0.058 | 0.172 | 0.029 | 0.207 |
| Mean Dep. (Treated) | 0.600 | 0.097 | 0.214 | 0.088 | 61.149 | 64.000 | 57.496 | 61.207 |
| Mean Dep. (Control) | 0.759 | 0.043 | 0.137 | 0.060 | 60.437 | 62.534 | 57.189 | 61.400 |

*Source:* MCVL, 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), partial pension (Column 2), disability pension (Column 3), not claiming any pension (Column 4), age at last employment (Column 5), age at claiming regular pension (Column 6), age at claiming disability pension (Column 7), and age at claiming partial pension (Column 8), obtained from the estimation of regression 1 without correcting for the year of starting contributing reported in the afiliation data. 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. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.16: 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 | -0.013*** | -0.007*** | -0.006*** | -0.002*** | -0.002*** | -0.002*** | -0.002*** | -0.000 |
| | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] | [0.622] |
| **Reduced form:** | | | | | | | | |
| Contributed in 1967 | 0.030*** | 0.003 | 0.007 | 0.018*** | 0.007** | 0.001 | 0.001 | 0.004* |
| | (0.009) | (0.002) | (0.005) | (0.004) | (0.002) | (0.006) | (0.005) | (0.002) |
| | [0.002] | [0.155] | [0.187] | [0.004] | [0.011] | [0.901] | [0.897] | [0.059] |
| **IV:** | | | | | | | | |
| Age last employment | 0.083* | 0.005 | 0.016 | 0.043*** | 0.015* | 0.001 | 0.002 | 0.007** |
| | (0.041) | (0.007) | (0.013) | (0.010) | (0.007) | (0.011) | (0.009) | (0.003) |
| | [0.055] | [0.511] | [0.268] | [0.004] | [0.058] | [0.948] | [0.855] | [0.016] |
| Observations | 25,903 | 25,903 | 25,223 | 23,987 | 22,383 | 21,009 | 19,174 | 17,516 |
| Mean Dep. (Treated) | 0.369 | 0.030 | 0.057 | 0.082 | 0.069 | 0.095 | 0.099 | 0.036 |
| Mean Dep. (Control) | 0.297 | 0.023 | 0.044 | 0.056 | 0.056 | 0.083 | 0.078 | 0.023 |
| F-stat FS | 21.563 | 21.563 | 24.397 | 46.819 | 44.196 | 50.895 | 66.159 | 63.375 |

*Source:* MCVL, 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 correlation of age at last employment on mortality (OLS), and the second panel shows the effect of the reform on mortality (reduced form effect using regression 1). 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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. The IV estimation also controls for a proxy of base pension and the labor market outcomes when the individuals were between 45 and 55 years old. All standard errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

# Table A.17: Impact of the Reform on Labor Market Outcomes between the Ages of 45 and 55

| | Labor Market between the Ages of 45 and 55 | | | | |
|---|---|---|---|---|---|
| | Fraction active | Fraction employed | Blue-collar occ | Av. monthly contribution | Fraction selfempoyed |
| Contributed in 1967 | 0.410 | 1.858** | 0.015*** | 5.109 | -0.676* |
| | (0.230) | (0.647) | (0.004) | (13.201) | (0.364) |
| | [0.108] | [0.010] | [0.009] | [0.710] | [0.093] |
| Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.116 | 0.128 | 0.411 | 0.432 | 0.304 |
| Mean Dep. (Treated) | 95.656 | 86.537 | 0.469 | 1165.975 | 17.623 |
| Mean Dep. (Control) | 92.975 | 81.659 | 0.436 | 1099.951 | 15.984 |

| | Industry between the Ages of 45 and 55 | | | | | |
|---|---|---|---|---|---|---|
| | Agriculture Minery Construction | Manufacturing | Trade Transportation | Public Health Education | Science Administrative | Services Hostelry Housekeeping |
| Contributed in 1967 | 0.001 | 0.001 | -0.019*** | -0.027** | -0.006 | -0.008** |
| | (0.005) | (0.004) | (0.004) | (0.008) | (0.003) | (0.003) |
| | [0.823] | [0.885] | [0.002] | [0.019] | [0.102] | [0.027] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 |
| $R^2$ | 0.249 | 0.078 | 0.046 | 0.094 | 0.042 | 0.068 |
| Mean Dep. (Treated) | 0.135 | 0.141 | 0.088 | 0.314 | 0.058 | 0.030 |
| Mean Dep. (Control) | 0.123 | 0.136 | 0.110 | 0.344 | 0.077 | 0.044 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on a list of labor market outcomes when the individual is between 45 and 55 years old: fraction of time spent active (Column 1), the fraction of time spent employed (Column 2), probability of having been employed in a blue-collar occupation (Column 3), average monthly contribution (Column 4), the fraction of time self-employed (Column 5), and probability of being employed in the agriculture, minery or construction sectors (Column 6), manufacturing sector (Column 7), trade or transportation sectors (Column 8), public, health or educational sectors (Column 9), scientific or administrative sectors (Column 10), or services, hostelry or housekeeping sectors (Column 11), 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.18: Impact of the Reform on the Proxy of Pension Base

| | Proxy Base Pension | | | | |
|---|---|---|---|---|---|
| | All | Regular pension | Disability | Partial | No pension |
| Contributed in 1967 | 125.338*** | 129.858*** | 59.089*** | 1113.952*** | 22.711 |
| | (15.256) | (10.469) | (10.747) | (38.217) | (20.901) |
| | [0.001] | [0.001] | [0.006] | [0.001] | [0.306] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 12,367 | 8,633 | 1,040 | 3,863 |
| $R^2$ | 0.310 | 0.294 | 0.352 | 0.670 | 0.409 |
| Mean Dep. (Treated) | 1198.645 | 1089.888 | 1235.633 | 1684.707 | 1231.647 |
| Mean Dep. (Control) | 1028.190 | 946.471 | 1182.150 | 558.740 | 1132.367 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the proxy of the pension base (calculated using years of contribution for those individuals that claimed regular pension and total years of activity for the rest) for all individuals (Column 1), for those that claimed regular pension (Column 2), for those that claimed disability pension (Column 3), for those that claimed partial pension (Column 4), and those that do not claim any 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.19: Impact of Age at Last Employment on Mortality with Different Controls

| | Probability of dying between the ages 60 and 69 | | | |
|---|---|---|---|---|
| | No controls | LM 45-55 | LM 45-55 Contribution 45-55 | LM 45-55 Contribution 45-55 Proxy base |
| Age last employment | 0.042*** | 0.048*** | 0.049*** | 0.049*** |
| | (0.010) | (0.013) | (0.013) | (0.012) |
| | [0.001] | [0.009] | [0.007] | [0.005] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ |
| Observations | 23,987 | 23,987 | 23,987 | 23,987 |
| Mean Dep. (Treated) | 0.131 | 0.131 | 0.131 | 0.131 |
| Mean Dep. (Control) | 0.098 | 0.098 | 0.098 | 0.098 |
| F-stat FS | 50.211 | 37.650 | 39.026 | 46.819 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of age at last employment on the probability of dying between the ages of 60 and 69 with no controls (Column 1), controlling for labor market outcomes when the individuals were between 45 and 55 years old (Column 2), also controlling for the mean average contribution between those ages (Column 3), and also controlling for the proxy of base pension (Column 4), obtained from the estimation of regression 2. 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. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.20: Impact of the Reform on Mortality after March 2020

| | Probability of dying after March 2020 | | | | |
|---|---|---|---|---|---|
| | All | Men | Women | High skilled | Low skilled |
| Contributed in 1967 | -0.000 | 0.002 | -0.004 | -0.002 | 0.001 |
| | (0.003) | (0.003) | (0.003) | (0.004) | (0.003) |
| | [0.993] | [0.531] | [0.127] | [0.636] | [0.723] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 17,952 | 11,830 | 6,122 | 6,162 | 11,790 |
| $R^2$ | 0.010 | 0.006 | 0.009 | 0.016 | 0.011 |
| Mean Dep. (Treated) | 0.032 | 0.039 | 0.010 | 0.027 | 0.034 |
| Mean Dep. (Control) | 0.027 | 0.036 | 0.014 | 0.025 | 0.028 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on the probability of dying after the Covid Pandemic started (March of 2020) for all individuals (Column 1), fore men (Column 2), for women (Column 3), for while-collar workers (Column 4), and blue-collar workers (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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.21: Heterogeneity by Industries' Workplace Accident Incidence

| | 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 WP acc | -0.120** | 0.024*** | 0.064* | 0.031*** | 0.336** | 1.270*** | 0.293** | -0.139 |
| | (0.040) | (0.007) | (0.032) | (0.009) | (0.121) | (0.249) | (0.123) | (0.088) |
| | [0.009] | [0.001] | [0.066] | [0.007] | [0.039] | [0.006] | [0.058] | [0.097] |
| Contributed in 1967*Low WP acc | -0.084** | 0.020** | 0.045* | 0.019** | 0.623*** | 1.370*** | 0.347*** | -0.108 |
| | (0.030) | (0.007) | (0.021) | (0.008) | (0.110) | (0.182) | (0.101) | (0.103) |
| | [0.012] | [0.009] | [0.048] | [0.021] | [0.001] | [0.001] | [0.017] | [0.335] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 22,592 | 22,592 | 22,592 | 22,592 | 22,592 | 10,686 | 7,424 | 1,040 |
| $R^2$ | 0.165 | 0.073 | 0.112 | 0.070 | 0.110 | 0.228 | 0.058 | 0.296 |
| Mean Dep. High WP acc (Treated) | 0.307 | 0.066 | 0.471 | 0.156 | 59.020 | 64.304 | 57.303 | 60.994 |
| Mean Dep. High WP acc (Control) | 0.506 | 0.042 | 0.300 | 0.152 | 59.551 | 63.427 | 57.170 | 61.156 |
| Mean Dep. Low WP acc (Treated) | 0.454 | 0.050 | 0.318 | 0.179 | 60.326 | 64.735 | 57.512 | 61.198 |
| Mean Dep. Low WP acc (Control) | 0.479 | 0.045 | 0.332 | 0.144 | 59.190 | 63.157 | 57.108 | 61.090 |
| P-value difference | 0.098 | 0.542 | 0.293 | 0.310 | 0.026 | 0.418 | 0.765 | 0.856 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on types of pension and age at claiming different pensions by individual's last industry classified depending on their workplace accident incidence, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.22: Heterogeneity by Industries' Psychosocial Exposure

| | Type of Pension | | | | Age at | | | |
|---|---|---|---|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension | Last Employment | Regular Pension | Disability Pension | Partial Pension |
| Contributed in 1966* High Psychosocial | -0.115*** | 0.033*** | 0.051* | 0.031*** | 0.398*** | 1.384*** | 0.153 | -0.119 |
| | (0.035) | (0.010) | (0.028) | (0.006) | (0.108) | (0.229) | (0.123) | (0.081) |
| | [0.006] | [0.001] | [0.081] | [0.002] | [0.006] | [0.003] | [0.237] | [0.152] |
| Contributed in 1966* Low Psychosocial | -0.088** | 0.010** | 0.057** | 0.021 | 0.588*** | 1.304*** | 0.536*** | -0.188 |
| | (0.032) | (0.004) | (0.021) | (0.012) | (0.136) | (0.178) | (0.168) | (0.136) |
| | [0.021] | [0.023] | [0.023] | [0.084] | [0.010] | [0.001] | [0.021] | [0.237] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 22,592 | 22,592 | 22,592 | 22,592 | 22,592 | 10,686 | 7,424 | 1,040 |
| $R^2$ | 0.162 | 0.077 | 0.105 | 0.066 | 0.106 | 0.225 | 0.058 | 0.295 |
| Mean Dep. High Psychosocial (Treated) | 0.332 | 0.078 | 0.409 | 0.181 | 59.542 | 64.593 | 57.307 | 60.995 |
| Mean Dep. High Psychosocial (Control) | 0.509 | 0.038 | 0.308 | 0.145 | 59.443 | 63.342 | 57.165 | 61.182 |
| Mean Dep. Low Psychosocial (Treated) | 0.458 | 0.034 | 0.351 | 0.157 | 60.051 | 64.603 | 57.524 | 61.343 |
| Mean Dep. Low Psychosocial (Control) | 0.477 | 0.049 | 0.323 | 0.151 | 59.315 | 63.260 | 57.114 | 61.078 |
| P-value difference | 0.008 | 0.030 | 0.667 | 0.467 | 0.245 | 0.391 | 0.154 | 0.697 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on types of pension and age at claiming different pensions by individual's last industry classified by its psychosocial exposure (mental stress, social stress, and temporal load) following Kroll (2011), 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.23: Heterogeneity by Industries' Self-value Index

| | 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 Self-value | -0.071* | 0.011 | 0.047** | 0.013 | 0.910*** | 1.411*** | 0.619*** | -0.153 |
| | (0.033) | (0.006) | (0.019) | (0.018) | (0.208) | (0.143) | (0.197) | (0.132) |
| | [0.048] | [0.084] | [0.024] | [0.452] | [0.002] | [0.001] | [0.031] | [0.219] |
| Contributed in 1967*Low Self-value | -0.112*** | 0.026*** | 0.056* | 0.029*** | 0.334*** | 1.284*** | 0.233** | -0.156** |
| | (0.033) | (0.007) | (0.028) | (0.005) | (0.095) | (0.227) | (0.086) | (0.066) |
| | [0.006] | [0.001] | [0.054] | [0.001] | [0.001] | [0.003] | [0.027] | [0.018] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 22,592 | 22,592 | 22,592 | 22,592 | 22,592 | 10,686 | 7,424 | 1,040 |
| $R^2$ | 0.161 | 0.073 | 0.103 | 0.069 | 0.110 | 0.232 | 0.071 | 0.289 |
| Mean Dep. High Self-value (Treated) | 0.455 | 0.045 | 0.328 | 0.172 | 60.053 | 64.710 | 57.012 | 61.088 |
| Mean Dep. High Self-value (Control) | 0.475 | 0.046 | 0.329 | 0.150 | 59.388 | 63.376 | 57.226 | 61.121 |
| Mean Dep. Low Self-value (Treated) | 0.371 | 0.060 | 0.401 | 0.168 | 59.695 | 64.546 | 57.531 | 61.105 |
| Mean Dep. Low Self-value (Control) | 0.515 | 0.040 | 0.299 | 0.146 | 59.367 | 63.217 | 57.019 | 61.126 |
| P-value difference | 0.023 | 0.010 | 0.573 | 0.402 | 0.021 | 0.343 | 0.115 | 0.984 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on types of pension and age at claiming different pensions by individual's last industry classified by its self-value index (sense of achievement and recognition) constructed using O*NET, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.24: Heterogeneity by Industries' Self-value Index

| | 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 Self-value | -0.071* | 0.011 | 0.047** | 0.013 | 0.910*** | 1.411*** | 0.619*** | -0.153 |
| | (0.033) | (0.006) | (0.019) | (0.018) | (0.208) | (0.143) | (0.197) | (0.132) |
| | [0.048] | [0.084] | [0.024] | [0.452] | [0.002] | [0.001] | [0.031] | [0.219] |
| Contributed in 1967*Low Self-value | -0.112*** | 0.026*** | 0.056* | 0.029*** | 0.334*** | 1.284*** | 0.233** | -0.156** |
| | (0.033) | (0.007) | (0.028) | (0.005) | (0.095) | (0.227) | (0.086) | (0.066) |
| | [0.006] | [0.001] | [0.054] | [0.001] | [0.001] | [0.003] | [0.027] | [0.018] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 22,592 | 22,592 | 22,592 | 22,592 | 22,592 | 10,686 | 7,424 | 1,040 |
| $R^2$ | 0.161 | 0.073 | 0.103 | 0.069 | 0.110 | 0.232 | 0.071 | 0.289 |
| Mean Dep. High Self-value (Treated) | 0.455 | 0.045 | 0.328 | 0.172 | 60.053 | 64.710 | 57.012 | 61.088 |
| Mean Dep. High Self-value (Control) | 0.475 | 0.046 | 0.329 | 0.150 | 59.388 | 63.376 | 57.226 | 61.121 |
| Mean Dep. Low Self-value (Treated) | 0.371 | 0.060 | 0.401 | 0.168 | 59.695 | 64.546 | 57.531 | 61.105 |
| Mean Dep. Low Self-value (Control) | 0.515 | 0.040 | 0.299 | 0.146 | 59.367 | 63.217 | 57.019 | 61.126 |
| P-value difference | 0.023 | 0.010 | 0.573 | 0.402 | 0.021 | 0.343 | 0.115 | 0.984 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on types of pension and age at claiming different pensions by individual's last industry classified by its self-value index (sense of achievement and recognition) constructed using O*NET, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.25: Heterogeneity by Occupation

| | Type of Pension | | | | Age at | | | |
|---|---|---|---|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension | Last Employment | Regular Pension | Disability Pension | Partial Pension |
| Contributed in 1967* Whilte-collar | -0.100*** | 0.023** | 0.051* | 0.026* | 0.494*** | 1.413*** | 0.546*** | -0.303* |
| | (0.031) | (0.009) | (0.025) | (0.012) | (0.079) | (0.177) | (0.118) | (0.145) |
| | [0.008] | [0.008] | [0.061] | [0.047] | [0.001] | [0.001] | [0.006] | [0.096] |
| Contributed in 1967* Blue-collar | -0.104*** | 0.017*** | 0.059** | 0.028*** | 0.360*** | 1.247*** | 0.206** | -0.037 |
| | (0.033) | (0.004) | (0.024) | (0.008) | (0.100) | (0.227) | (0.089) | (0.091) |
| | [0.006] | [0.001] | [0.024] | [0.005] | [0.010] | [0.001] | [0.068] | [0.658] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 12,367 | 8,633 | 1,040 |
| $R^2$ | 0.145 | 0.073 | 0.096 | 0.059 | 0.092 | 0.231 | 0.043 | 0.293 |
| Mean Dep. Whilte-collar (Treated) | 0.425 | 0.061 | 0.328 | 0.186 | 60.407 | 64.761 | 57.587 | 61.211 |
| Mean Dep. Whilte-collar (Control) | 0.485 | 0.037 | 0.334 | 0.144 | 59.466 | 63.431 | 57.098 | 61.095 |
| Mean Dep. Blue-collar (Treated) | 0.385 | 0.042 | 0.415 | 0.158 | 59.601 | 64.579 | 57.265 | 61.027 |
| Mean Dep. Blue-collar (Control) | 0.513 | 0.039 | 0.302 | 0.146 | 59.585 | 63.297 | 57.106 | 61.156 |
| P-value difference | 0.768 | 0.382 | 0.275 | 0.857 | 0.298 | 0.117 | 0.050 | 0.253 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on types of pension and age at claiming different pensions by individual's last occupation classified as blue-collar or white-collar, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.26: Heterogeneity by Year of Contribution

| | Type of Pension | | | | Age at | | | |
|---|---|---|---|---|---|---|---|---|
| | Regular Pension | Partial Pension | Disability Pension | No Pension | Last Employment | Regular Pension | Disability Pension | Partial Pension |
| Contributed in 1967* More 33 years contr | -0.119*** | 0.038*** | 0.059** | 0.022*** | 0.618*** | 1.024*** | 0.287** | -0.157** |
| | (0.028) | (0.009) | (0.020) | (0.006) | (0.123) | (0.167) | (0.129) | (0.058) |
| | [0.006] | [0.005] | [0.020] | [0.006] | [0.002] | [0.001] | [0.045] | [0.003] |
| Contributed in 1967* Less 33 years contr | -0.086*** | 0.002 | 0.053** | 0.030*** | 0.238*** | 1.938*** | 0.291*** | 0.104*** |
| | (0.027) | (0.002) | (0.021) | (0.009) | (0.069) | (0.345) | (0.077) | (0.016) |
| | [0.003] | [0.125] | [0.018] | [0.003] | [0.014] | [0.001] | [0.023] | [0.261] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 12,367 | 8,633 | 1,040 |
| $R^2$ | 0.303 | 0.110 | 0.196 | 0.107 | 0.306 | 0.257 | 0.330 | 0.303 |
| Mean Dep. More 33 years contr (Treated) | 0.578 | 0.091 | 0.244 | 0.087 | 62.475 | 64.729 | 60.031 | 61.088 |
| Mean Dep. More 33 years contr (Control) | 0.451 | 0.027 | 0.357 | 0.166 | 58.824 | 63.198 | 56.641 | 61.145 |
| Mean Dep. Less 33 years contr (Treated) | 0.211 | 0.003 | 0.536 | 0.249 | 57.141 | 64.391 | 56.087 | 61.468 |
| Mean Dep. Less 33 years contr (Control) | 0.545 | 0.049 | 0.282 | 0.124 | 60.208 | 63.508 | 57.678 | 61.112 |
| P-value difference | 0.061 | 0.001 | 0.678 | 0.415 | 0.023 | 0.001 | 0.982 | 0.001 |

*Source:* MCVL, cohorts 1938-1949.

*Notes:* This table reports the impact of the reform on types of pension and age at claiming different pensions for individuals that contributed more or less than 33 years to the social security system, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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

Table A.27: Heterogeneity by Gender

| | 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 | -0.087** | 0.015*** | 0.054* | 0.018*** | 0.200 | 1.016*** | 0.292*** | -0.159** |
| | (0.030) | (0.004) | (0.025) | (0.005) | (0.120) | (0.191) | (0.086) | (0.060) |
| | [0.008] | [0.003] | [0.045] | [0.004] | [0.149] | [0.001] | [0.027] | [0.006] |
| Women contributed in 1967 | -0.155*** | 0.031*** | 0.077*** | 0.047** | 0.968*** | 1.909*** | 0.267 | -0.046 |
| | (0.038) | (0.008) | (0.020) | (0.015) | (0.101) | (0.230) | (0.186) | (0.132) |
| | [0.008] | [0.001] | [0.015] | [0.016] | [0.001] | [0.001] | [0.184] | [0.730] |
| Month-Year Birth FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contributed 1966-1967 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 25,903 | 25,903 | 25,903 | 25,903 | 25,903 | 12,367 | 8,633 | 1,040 |
| $R^2$ | 0.151 | 0.077 | 0.098 | 0.059 | 0.094 | 0.235 | 0.042 | 0.333 |
| Mean Dep. Men (Treated) | 0.359 | 0.046 | 0.421 | 0.174 | 59.699 | 64.631 | 57.362 | 61.170 |
| Mean Dep. Men (Control) | 0.437 | 0.037 | 0.363 | 0.164 | 59.418 | 63.440 | 57.004 | 61.210 |
| Mean Dep. Women (Treated) | 0.562 | 0.059 | 0.245 | 0.134 | 60.529 | 64.667 | 57.280 | 60.875 |
| Mean Dep. Women (Control) | 0.732 | 0.030 | 0.157 | 0.080 | 59.366 | 62.538 | 56.901 | 60.943 |
| P-value difference | 0.031 | 0.011 | 0.220 | 0.083 | 0.001 | 0.000 | 0.915 | 0.491 |

*Source:* MCVL, 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, and month of birth fixed effects. Each regression also includes the following controls measured when the individuals were 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 errors are clustered at the year of birth, and wild-bootstrap p-values are reported in brackets.

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