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# How does increased retirement age affect women's employment and health? Evidence from Italy

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## Abstract

This paper uses a pension reform in Italy to estimate how increased retirement age affect employment and health for women on the cusp of retirement. Using variation between birth cohorts and employing a difference-in-difference design, I estimate that an increase in retirement age by 2.75 or 3.58 years, depending on month of birth, reduced retirement by 50 percentage points between ages 61 to 64. Reduced retirement increased employment by 15.4 percentage points. The small employment effect is mainly because Italian women had already left the labor market before retirement age, and increasing retirement age was not effective at making those women to participate again. In contrast, almost a third of the women employed pre-reform substituted their work with disability pension, unemployment insurance or inactivity due to increased retirement age. Such substitution was especially large for blue-collar workers and those with a sickness history. I also find distributional health effects, where the probability to die between 61 and 65 increased for blue-collar workers due to delayed retirement. My results show that concerns regarding how increased retirement age could have distributional consequences should be taken serious.

**Keywords:** Pension reform, Difference-in-difference, Blue-collar

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# 1. Introduction

As people live longer and longer and as fertility rates decline, the pension systems in Europe and elsewhere are put under increasing pressure. Almost all OECD countries have started to reform their systems to achieve financial stability.

The effects of an increased retirement age on public finances are, however, uncertain. It is e.g. not clear to what extent those who cannot retire as planned will instead use other social security systems, such as unemployment benefits and disability pension, rather than to stay in employment. Increasing the retirement age, some fear, may also cause health problems, especially for blue-collar workers<sup>1</sup>.

The purpose of this paper is to study how an increased retirement age affects employment and health among different groups of individuals. To estimate an effect, I take advantage of a pension reform implemented in late 2011 in Italy which goal was to increase the retirement age for women gradually from 60 years in 2011 to 67 years in 2019 (INPS, 2016).

As the reform was implemented by a new technocratic government less than a month after its introduction, it serves as an ideal setting to use as an exogenous shock without worrying about anticipation bias. If the reform is known well in advance or is expected, individuals could potentially adapt by e.g. by saving more or move to labor occupations with less physical strain. Such adaptation could cause a downward bias of the estimated effect (Carta & De Philips, 2019). This advantage can also serve as a disadvantage, where this paper estimates a direct impact on pension age, it's less suitable to tell how a reform will affect in the long-run where later cohorts can adapt.

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<sup>1</sup> See e.g. <https://www.byggnadsarbetaren.se/blogginlagg/hojd-pensionsalder-ar-som-en-fet-small/>

My identification strategy is to use the fact that women born 1951 were able to continue to retire under the old rules also after the reform but that women born 1952 got an immediate increase in their retirement old age for at least 2.75 years. Even if the birth cohorts are similar, there could be issues with unobserved characteristics that could infer the analysis. To further isolate the effect of the reform on employment, I employ a difference-in-difference design, using data from the two cohorts between age 56 to 64.

My main result is that the increased retirement age had a large and significant effect on retirement behavior. The share retired decreased by around 50 percentage points between age 61 – 64 due to the reform. However, the decrease in retirement only increased employment by 15.4 percentage points, where most individuals instead were outside the labor market due to the reform. Studying employed and inactive individuals at age 60 separately, I can conclude that the high degree of inactivity rates is because individuals outside the labor market remained inactive when not allowed to retire. I also find that employed women at age 60 mainly continued to work due to increased retirement age, but the increase also led to substitution effects, where almost a third of the employed women actively substitute employment with other social security programs or even chose to leave the labor market.

I also find an increase in premature death associated with the reform. This increase is large and significant for women with blue-collar work history. The effect is not significant for the population as a whole.

The paper is structured in the following way. Section 2 is a literature review of the recent findings on alterations in retirement eligibility and a short theory section about the mechanism behind retirement. Section 3 describes the institutional setting in Italy and give an in depth explanation of the reform used to estimate the impact of changes in retirement age. Section 4 discuss the data source and sample selection. Section 5 and

6 is about my identification and estimation strategy. Section 7 is results. I test how robust my results are in section 7. A concluding discussion follows in section 8.

## 2. Related Literature

### 2.1 Literature on employment

Several evidence has found that increases in retirement age is effective for women prolonging their working lives, but how effective depends on countries and reform. Cribb et al. (2014) estimate in UK that a 2 year increase in state pension from 60 to 62 for women increased employment by 5.9 percentage points at ages 60 and 61 post-reform. Morris (2018) find a smaller effect, where a step-wise increase in Australian pension age from 60 to 65 years increased employment by only 0.8 percentage points in the long run. Geyer & Welteke (2017) finds that a 3 year increase in early retirement age from 60 to 63 in Germany is associated with 14.1 percentage points higher employment for women. However, stricter eligibility for retirement is also associated with unemployment and inactivity, where estimates in general find that unemployed workers continue to be unemployed and employed individuals continue to be employed post a reform.

Evidence show that a pension reform can lead to higher uptake of disability insurance and disability pension. Duggan et al (2008) find that a two year increase in normal retirement age from 63 to 65 for US lead to higher enrollment for disability insurance by 2 percentage points in the long run. Similar results have been found for increases in early retirement age in Austria (Staubli & Zweimueller 2013), but with smaller magnitude. Higher uptake of disability pension could imply opportunistic behavior, which is hard to measure, or negative health effects due to a longer working life.

## 2.2 literature on health

The existing evidence on retirement and health is mixed, where retirement can both have a positive and negative association with health. Earlier papers use difference in pension schemes or targeted policies as instrument to make retirement behavior exogenous. Selection issues can infer with the analysis, where most reforms used in the IV-setting are targeted to a special group of individuals and individuals with bad health can adapt. Instead some papers have used pension reforms as variation for actual retirement, both under IV-design and quasi-natural experiments. Papers with instrument have found a variety of results with both positive, negative and no association<sup>2</sup>. A few studies have used social security data with mortality as outcome to estimate the direct effect on health from a pension reform instead of using it as an instrument for retirement. Rafael & Lalive (2014) connects a pension reform with mortality. They show in Switzerland that a 2 year increase in retirement age from 63 to 65 is shown to impact mortality for women but is not precisely estimated. In contrast, Hagen (2017) estimate a 2 year increase from 63 to 65 for women in Sweden's public sector and find no effects on premature death in the short run. Using the long run perspective, Rogne & Syse (2019) estimate that a Norwegian pension reform in 1973, that increased pension age by 3 years for almost the entire population, had no long run effects on mortality.

## 2.3 literature on distributional effects

Although the relationship with retirement, employment and health is supposed to affect workers different, only a handful papers have studied distribution effects in relationship with increases in retirement age. Morris (2019) show that an increase from

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<sup>2</sup> Kuhn et al (2018) show that retiring 1 year early is associated with 6.8% increase in risk of premature death for men, but they find no effect on women. Two papers find opposite results, where Bloemen et al. (2017) using data from Netherlands and finds that early retirement decreases the probability to die within 5 years by 2.6 percentage points. Hallberg et al (2015) also find an association between lower mortality rates and early retirement for officers in Sweden. Haernes et al (2013) use a pension reform, which lowered early retirement age, to instrument for retirement behavior and found no effect on premature death.

60 to 65 in the Australian Age Pension for women lead to regressive distributional effects and higher inequality. Where women in the 33% poorest households was experiencing negative income effects by the reform. Low-income individuals responded by more work due to changes in eligibility, but is also more likely to enroll other social security systems due to the reform. Similar evidence is shown in England, where an increase for women state pension age from 60 to 62 lead to £32 lower income per week, and where the low-income households where most affected (Cribb & Emmerson, 2019). Contrasting, Geyer et al (2017) studying Germany and finds no negative income effect by a 3 year increase in ERA for women. Despite mixed evidence, there could be stronger negative income effects for weaker groups, and that income loss could be a channel to e.g. worse health.

Staubli & Zweimueller (2013) don't estimate income effects, but estimate labor response by an increases in ERA for both men and women, and make separate analysis for low-income and high-income and healthy and unhealthy. They show that high-income individuals respond with higher employment, but also higher probability of unemployment than low-income, both in the healthy and unhealthy category. There is almost no difference in disability insurance enrollment between high-income and low-income due to the reform.

## 2.4 Mechanisms

A pension reforms success hinges on when individuals retire. Considering utility models, where individuals have different preference for leisure and consumption, retirement should be distributed on several different ages (De Bloom, 2007). In contrast to models predictions, most individuals retire as fast they reach retirement eligibility. Botazzi (2006) argues that the utility gain of reaching retirement is so high that individuals retire when reaching eligibility. Other papers show that behavior can impact, where social security state a retirement age and people are reference dependent (Behagel & Blau, 2012). Employment should increase by delayed retirement

according to the life-cycle hypothesis (e.g. Feldstein 1974). The core is that individuals are forward looking with perfect information, and smooth consumption under their life-time given an expected retirement date. There is thus a one-to-one ratio with retirement benefits and wealth. Delayed retirement due to an unexpected reform, leads to lower pension benefits and individuals would respond by more work due to the income loss<sup>3</sup>.

Given earlier literature, I state the following the following hypothesis:

*Hypothesis 1:* An increase in retirement age leads to a large decrease in retirement benefits.

Given that hypothesis 1 is fulfilled, earlier empirical literature suggest:

*Hypothesis 2:* The decrease in retirement leads instead to higher employment but can also lead to higher inactivity and substitution to social security program other than normal pension.

*Hypothesis 3:* An increase in retirement age effect on mortality is expected to be small or non-existent.

*Hypothesis 4:* An increase in retirement age is not equal across the population, where individuals with different occupation, income and health can be affected differently.

### 3. Institutional Background

The Italian pension system is based on a compulsory pay-as-you go plan, where one third of the contributions in the private sector is paid by the employee and two thirds

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<sup>3</sup> The hypothesis have been criticised where individuals don't have perfect information and are short sightened. See e.g. (Thaler 1994)

is paid by the employer. Before the reform, Italian women could retire with full benefits in two different ways, receiving pension at full retirement via old age pension scheme, or retire before old age requirements by a seniority pension scheme. The old age pension system was based on age. In year 2011, a woman could receive retirement benefits at age 61<sup>4</sup> given that she had 20 years of contribution. The second way, seniority pension, let women with long work careers, who contributed for at least 40 years<sup>5</sup> retire at any age. Besides old age and seniority pension, women had a way to retire early but with reduced benefits. This option called “opzione donna” and the rules allow women at age 57 with at least 35 years of contribution to retire early at a reduced benefit of 35%.

### 3.1. The Fornero Reform

To solve the sovereign debt, Italy’s new government introduced a reform in December 2011, which was in action already on 1 January 2012. The reform made several changes to the two current system. The old-age pension increased gradual for women, with the goal to be the same as men and reach minimum age 67 by the year of 2019. The seniority pension also got stricter, where the new contribution limit was supposed to reach 42 years to retire early. The “opzione donna” eligibility stayed the same after the reform. The rules in detail is given in table A1 in appendix.

Some were exempted for the new rules. People who, before December 31 2011, already were eligible to the old age or the seniority pension you weren’t affected by the new changes. This exception lead to a cutoff, were women who expected to reach old age eligibility in 2012 and later got increases in retirement age and those who reached old

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4 The old age retirement age was 60 for women, but Italy had a “waiting window” lasting 12 months, which meant if you were eligible at 60 you retired at actual age 61 (60 + 12 months).

5 Seniority pension also had a quota system, which let individuals in 2011 retire if they had a combination of age and seniority  $\geq 96$  with an age of  $\geq 60$  and contributions  $\geq 35$ . As the age was same for old age pension and quota, the majority of women retired via old age pension.



age eligibility in 2011 could still retire under old rules. Table 1 show the difference in retirement age due to the reform for those expected to retire via old age pension in 2012.

**Table 1** Retirement eligibility pre-reform and post-reform for women born 1952

Pension scheme:	Pre-reform		Post-reform	
	Actual age	Contribution	Actual age	Contribution
Old age	$\geq 61$	$\geq 20$	$\geq 63.75(64.58)$	$\geq 20$
Seniority		$\geq 40$		$\geq 42$
“Opzione donna”	$\geq 57$	$\geq 35$	$\geq 57$	$\geq 35$

The reform increased the retirement age for at least 2.75 years<sup>6</sup> for those women born in 1952.

### 3.2 Disability pension

An unintended consequence of raising pension eligibility to reduce social security expenses is that old individuals may use other welfare systems. One way to bridge the gap to retirement could possibly be via disability pension. It’s possible in Italy to receive such pension if you are unable to work and unable to retire. The requirement is to pass through a medical screening made by an INPS sanctioned doctor. The benefits last until one is eligible for retirement or is able to work again. Disability pension were 20 years ago very popular, and Italy have the last decade increased requirements for such pension. This has led to lower enrollment now than a decade ago (Brugiavini 1997, Bottazi et al 2006). Unlike normal retirement, the eligibility rules didn’t change for disability pension via the reform and individuals unable to retire via the new system could potentially try to bridge the gap via disability pension.

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<sup>6</sup> 2 years and 9 months if you were born between january – mars 1952 and 3 years and 7 months if you were born april – december 1952 (see A1.)

## 4. Data

Data underlying this paper is a sample of work histories containing Italian non-farm private employees who have worked under a period in between 1985 - 2016. The data is gathered yearly by the Ministry of Labor and Social Policies (MLPS) and the National Social Security Institute (INPS). Every Italian individual born the 1st and 9th every month are in the sample which consist of about 6.5% of the Italian working population in the private sector. Each employee has reported data on annual income, weeks and days worked, region of birth, year of birth, if the contract type is part time or full time, if the work contract is permanent or temporary and what kind of qualification the individual possess. From 1990, firm characteristics like firm size and industry are observed and the data allows for employer-employee linkage via firm and individual identification codes, which let me control for firm and industry. I combine firm and individual panel with information about what type of retirement benefits received (old age, survivor, disability etc), and at which date each individual entered such benefits. I also import precise data about unemployment benefit coverage.

Some papers regarding retirement reforms assume a contribution history by looking at years in employment. A plausible assumption in general, but for some individuals, which are under military service or maternity leave, also adds to contribution and are thus missing under such assumption. Voluntary contributions are another possible source that could bias such assumption. INPS provides an additional database covering all types of contributions made for each individual in my sample. The contribution history which let me calculate precise life-time contribution in years for each individual, even those contributions made before 1985 (calculations explained in the appendix). This is of great importance, as years of contributions determine how the Fornero reform affected retirement possibilities.

More info about the database can be found at (<https://www.cliclavoro.gov.it/Barometro-Del-Lavoro/Pagine/Microdati-per-la-ricerca.aspx> ).

#### 4.1 Data limitations

Although the benefit of a large sample size, precise measures and details about social security, the data has limited information about demography. Neither education nor more detailed occupations are present in the dataset, which is of great importance relating labor supply. The dataset only included year of birth instead of date of birth, which is less precise. As new eligibility ages are by age in years and months (e.g. 63 years and 9 months) I can't distinguish if individuals got 2.75 or higher increase in age pension and are estimating the total reform effect instead of by yearly change. As the individual leaves the data set when they leave employment and social security, I have no information of income received from other sources. Last, as the dataset trace every individual, I don't have any data on household, only on the individual level<sup>7</sup>.

### 5. Identification strategy and descriptive statistics.

This paper wants to isolate an increase in retirement old age and see how such increase affect employment, unemployment and uptake of social security. Ideal would be to compare two individuals with same characteristics except one of them got their retirement age raised and the other didn't. Similar to other papers I identify treated and control groups by birth cohorts. I start by retaining every woman born 1951 and 1952<sup>8</sup> who contributed to the private pension system. The reasoning goes, if you are

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<sup>7</sup> Retirement decisions is associated with family characteristics, and are especially important for women. I proxy data on maternity leave for a measurement on number of kids, but have no way to account for spouses. it shouldn't bias my results as women born 1951 and 1952 most likely have similar household situations on aggregate level.

<sup>8</sup> It would be possible to use a larger control group by including older birth cohorts. I choose to restrict the sample to include only individuals born 1951 and 1952 to make them as similar as possible and to avoid bias due to differences between years. Earlier pensions reforms made small changes to the pension system which affected those born 1950 and earlier different than those in 1951. Due to few years in the post-period, I don't include treated individuals born 1953 and forward.

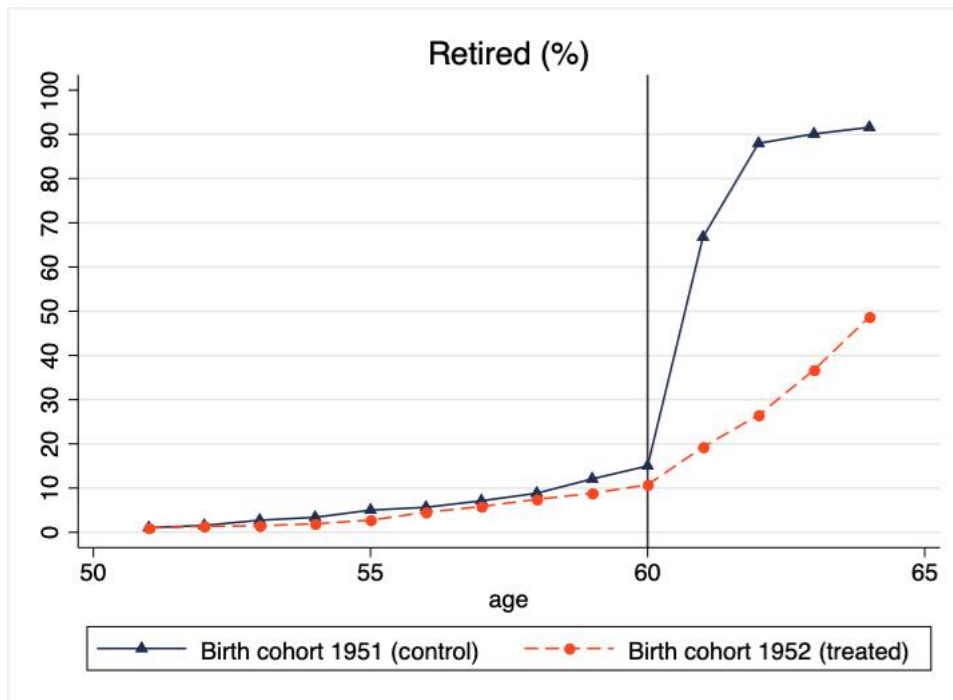
born 1951 you reached age 60 and was eligible for old age pension in 2011. If you are born 1952 you reached year 60 and was able to retire via old age pension pre-reform in 2012. When the reform occurred everyone born 1952 got their eligibility changed but because those who were born 1951 already was eligible for old age pension, they kept the old eligibility pre-reform. The exception is individuals with lower than 20 years of contributions, which were not allowed to retire via old age pension at 60. I select only individuals who made 19 years of contribution 1 year pre old age-eligibility to avoid individuals far from retirement. Both birth cohorts had potential to retire early via seniority pension or “opzione donna”, if they contributed for at least 35 years. Almost 40 percent of the sample use this option, and to estimate effect of those expecting to retire via old age pension, I include only individuals with lower than 35 years of contributions 1 year before old age eligibility. I also omit every worker who have died when studying employment effects<sup>9</sup>.

Those born 1951 is exactly one year older at every time period compared to those born 1952, and age is a very strong predictor for employment and health for my group of interest. Instead of comparing my two groups between time by years, I instead compare them at the same age. Every individual born 1952 is thus measured at year + 1 with those born 1951. Figure 1 show at what age individuals born 1951 respective 1952 started to benefit from retirement and indicate how strong the pension reforms effect was on retirement behaviour.

**Figure 1** Share of retired by birth cohort from age 56 to 64

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<sup>9</sup> In my estimation of health, I retain everyone that died between age 61 and 65.



A clear shift in retirement benefits occur after age 60. The reform delayed retirement and is largest at age 62 when almost 90% of those born 1951 have retired but only about 25% of those born 1952. At the end of year 64 which the last age in my estimation, 51% of those born 1952 have not retired yet compared to only 8.25%. The share of retired start to increase post 60 for our treated group, and I discuss four different reasons for such increase. (1) some individuals in my treatment group could have grandfathering clauses and could still retire under the old rules, (2) individuals close to 35 years of contributions could continue to work and reach opzione donna requirements in the post-period. (3) As the rules were implemented, and under assumption that individuals birth dates are distributed under the whole year, 1/4 of all individual have reached the new old age retirement eligibility by age 63, and 5/12 have reached the new old age retirement eligibility by age 64.

About 10% for treated group and 15% for our control group have retired pre-reform, which are not expected. This should mainly be due to omitted data on contributions. Recall that the database on contributions extract from as far back as 1965. Women

close to 35 years of contribution in my data may actually have 35 and is allowed to retire before 60.

Table give background characteristics for my sample at age 59, before the reform was introduced.

**Table 2** Descriptive statistics main sample at age 59

	Born 1952 (Treated)	Born 1951 (Control)
Annual income (€)	17680	17076
Seniority past 26 years	15.1	14.9
Full-time seniority past 26 years	10.6	10.6
Blue collar	0.55	0.59
White collar	0.43	0.39
Average days on Sickness insurance	37.5	41.9
Northern Italy	0.61	0.58
Southern Italy	0.16	0.18
Middle Italy	0.23	0.24
Contribution years	26.2	26.2
Number of individuals	2,894	3,030

Individuals display relative similarities in background characteristics for important determinants of retirement, but they are not exactly similar. The treated group have at average higher annual income. The difference is likely explained by the higher degree of white-collar workers, which is 4 percentage points higher for our treated group. Differences between cohorts can infer with the analysis, and in next section I explain how to account for such differences. Due to the restriction of only including women

with less than 35 years of contributions at age 59, labor history is not intact for both birth cohorts. Women work at average 15 of the 26 past years and about 11 of them are full-time.

## 6. Estimation Strategy

My goal with this paper is to evaluate how the reform affected workers close on the cusp to retirement. I create five variables that represents different states an individual can be in. (1) Retired, (2) employed, (3) on disability pension, (4) unemployment insurance or (5) being inactive. Each state range from 0 to 1 with the restriction that total sum of all states equals to 1.

Retirement is gathered from a database tracking every individuals date when they start to get pension benefits. The variable ranges from 0 to 1 depending on how late in the year you retired<sup>10</sup>.

Employment is created by using data on number of days worked per year, a variable ranging from 0 to 312 days worked, where 0 is unemployed and 312 is equivalent to full-time work. I create a variable that range from 0 to 1 based on days worked.

An alternative way to normal retirement is by retiring via disability pension, which is described in the institutional background section. The data separates if the worker is retiring via disability pension or normal retirement and I create a dummy variable taking value between 0 to 1 dependent on when and if the individual has enrolled disability pension. If a women enrolled disability pension, the dummy continues to take value 1 until individual's start to receive normal pension or start to work again.

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<sup>10</sup> I can only see the start year for retirement, and not follow individuals for several years. I make the assumption that individuals continue to be retired as long they don't show up as employed in the data again.

Italy have different social security insurance if you are unemployed. I pool the number of days being on different insurance schemes and create a variable ranging from 0 to 1 where 0 is no insurance benefit and 1 is the whole year on insurance benefit.

To study how increases in retirement age is related to unemployment / leaving of the workforce, I create an inactive group, consisting of every worker leaving the dataset. In other words, not working in private sector, not retired, not contributing to the pension system and not on unemployment insurance or other social security / welfare. The inactive group is unprecise as it doesn't explain if the worker is just unemployed and searching for work or left the work force in total, but nevertheless the best I can do with the data given. As my data only follows private workers, individuals working for the public or in the shadow economy can possible be included in the inactive group.

This paper estimate health impacts of a retirement reform. To capture how the reform is related to health I study if there is an association between increased retirement age and the probability to be dead at age 65. The data records eventual year of death for every individual that's included in my dataset. I create a dummy variable taking value 1 if you died that year or any past year and 0 if you haven't died. Using mortality as an indicator for health effects is commonly applied in studies using administrative data, nevertheless it leaves out more detailed information.

How a worker contribute to the pension system is most likely correlated with preferences for retirement, and unobserved determinants exist that could bias. Examples are health, life-style preferences and family situation. Even if I have some ways to control for such variables, problems with endogeneity could be present. To isolate the reforms effect, I employ a difference-in-difference estimation (Angrist & Pischke, 2009) which is commonly applied in policy evaluations. The core concept is by taking the difference in outcomes before and after a reform's implementation for two different group and then take the difference between those two differences. Take



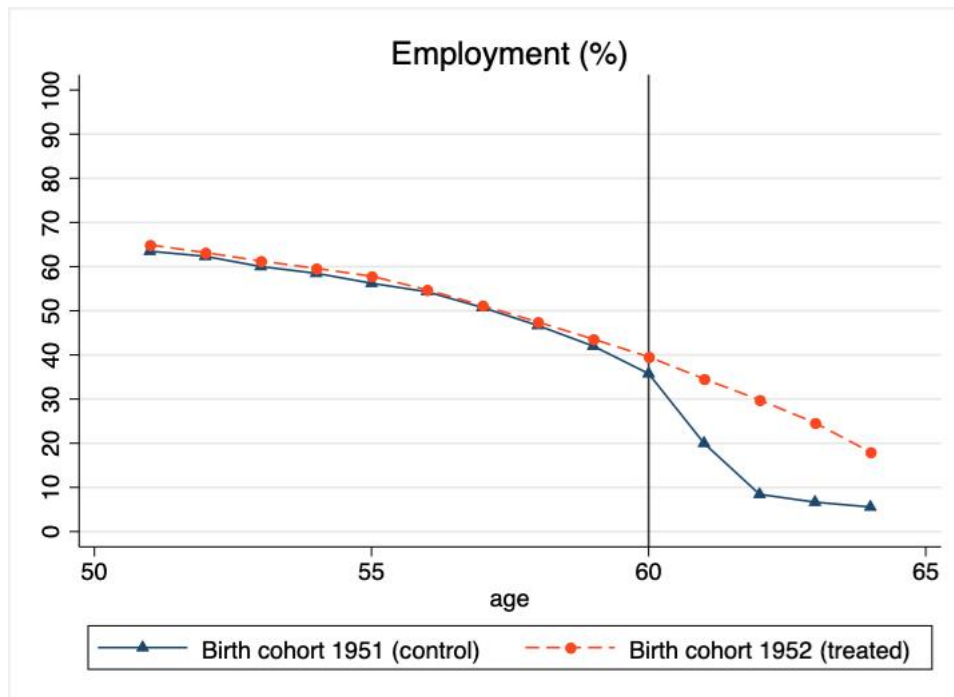
for example average employment for the group with  $T = 1$  and those with  $T = 0$   $\bar{y}_{T=1}$  and  $\bar{y}_{T=0}$ .

$$DD: \beta = (\bar{y}_{T=1,post} - \bar{y}_{T=0,pre}) - (\bar{y}_{T=1,pre} - \bar{y}_{T=0,pre})$$

$\beta$  gives us in this case the exogenous effect of the reforms increases in retirement age given a critical assumption, that treated individuals share a parallel trend in the outcome of interest before the reform. If workers share parallel trends before the reform, other unobserved determinants are not likely explaining the change in trend occurred post reform. If unobserved determinants not explain the relationship between the pension reform and our outcome of interest, we have solved the endogeneity problem and estimated the exogenous effect of an increase in retirement age. Recall, the assumption doesn't require identical levels pre-reform, but they need to evolve in similar fashion.

To evaluate pre-reform trends and give a first indication how the reform affected employment, figure 2 to 5 display how different outcomes evolve from age 51 to 64. I use age 51 is first age, as that age is the first age I can trace all my outcomes of interest.

**Figure 2** Share of employed by birth cohort from age 51 to 64



Employment for women is similar in trends before the reform, where over 60% work at age 51. Employment is trending downwards already from the first year of my analysis, indicating that old women leave employment before reaching retirement. Individuals who experienced increases in retirement eligibility is at average working more in the post-period compared to the control group, where the trend is at the same downward pace. Employment start to change drastic at 61 and 62, where the control group start to retire. At age 64, the control group have less than 10% of individuals in employment. Looking at figure 2, we can predict that the reform is associated with higher employment for the treated group, where those in the control group who not retire at eligibility continue to work.

**Figure 3** Share on disability pension by birth cohort from age 51 to 64

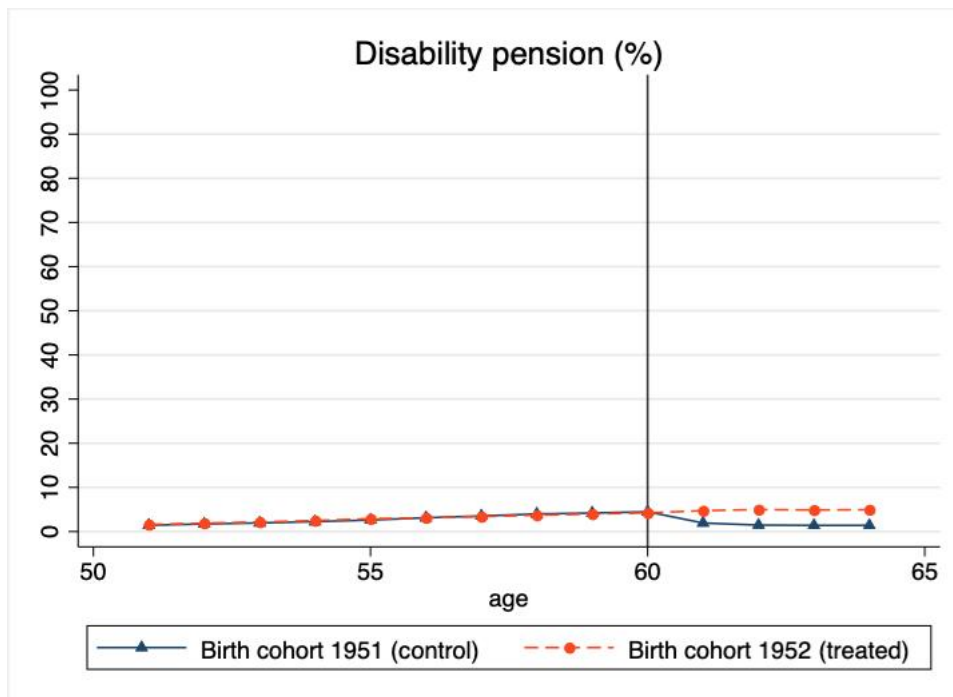
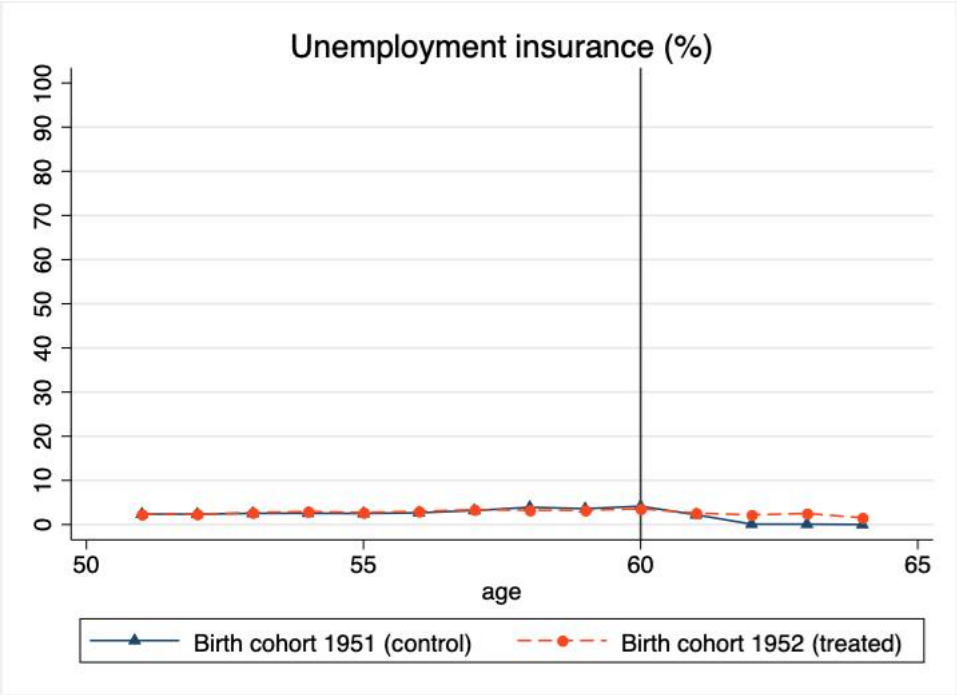


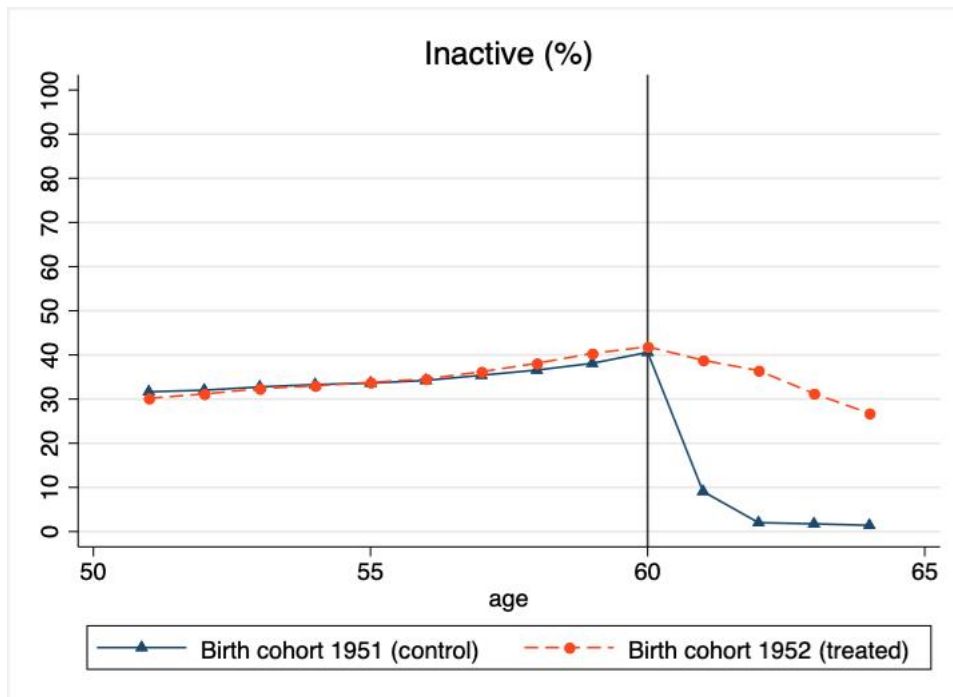
Figure 3 show the share taking disability pension for our both birth cohort. Under the whole period, the share on disability pension is below 10% of the sample. As individual's health and capability of work decreases with age, the share of individuals on disability pension increase under the whole period. At age 60 where our control group is allowed to retire via old age pension, disability pension goes down. Meanwhile the share of disability retirees goes up for our treated group unable to retire after age 60, supporting earlier evidence that increased retirement age lead to higher uptake of disability pension.

**Figure 3** Share on unemployment insurance by birth cohort from age 51 to 64



There is a similar trend for shares on unemployment insurance between the two birth cohorts. Women on unemployment insurance is low at age 51, then slowly rises until age 60, where it starts to decline again. In similarity with my other outcomes, the decrease is sharper for our control group where the treated continue to be insured at ages 61 to 64. The figure predicts a small increase in unemployment insurance due to the reform.

**Figure 3** Share inactive individuals by birth cohort from age 51 to 64



Over 30 % of our sample is inactive at age 51, and the inactivity rates increase to 40% at age 60. A notable group women leave work before retirement and statistics for EU show that it's for other reasons than family or personal matters<sup>11</sup>. The inactive group are prone to retire as fast they reach eligibility and inactivity shrinks from 40 % to almost 0 % from age 60 to 62 for out control group. The trends indicate a large effect on remaining inactivity due to the reform.

Figure 1 to 5 indicates an association between the reform and my outcomes of interest, but the shift in trend and magnitude could be due to confounding factors and not the reform itself. Take as example, if individuals in certain industries is more likely to continue work and at the same time is more likely to receive increased retirement age, the shift is upward biased. Differences between birth cohort could also affect the

<sup>11</sup> See "People outside the labor market" <https://ec.europa.eu/eurostat/statistics-explained/pdfscache/8849.pdf>

magnitude of change. To further investigate how delayed retirement eligibility affects my outcomes of interest, I employ the following economic specification for my DD:

$$y_{it} = \beta_1(post_t * T_i) + \beta_2post_t + \beta_3T_i + X_{it} + \delta_t + \varepsilon_{it}$$

Where subscript  $i$  stands for individual and subscript  $t$  for age.  $y_{it}$  is the different states, which is explained in more detail above, that an individual can be in after the reform.  $\beta_1$  is the DD coefficient which captures the isolated effect of the increased retirement age.  $T$  is the treatment variable, consisting of a dummy taking value 1 if an individual got their eligibility changed and 0 if you still was able to retire via the old eligibility rules.  $post$  is a dummy taking value 0 when age is 60 years or below and value 1 if age is over 60.  $X_{it}$  is observed characteristics that are determinants of my outcomes of interest.  $\delta_t$  is age and year specific shocks which affect the labor market that are common to all individuals in my estimation, and  $\varepsilon_{it}$  is the error term. The regression is estimated with robust standard errors<sup>12</sup>.

## 6.1. Control variables

Your preference for work and retirement are largely connected to age and I expect a non-linear relationship whereas older you are the more important is age for employment. Hence, I add dummies for both age and year. I also control for how many years contributed to the pension schemes. A women work career and income are strong predictors of how people respond to increased retirement age. I add controls on average income adjusted by inflation since age 34, seniority since age 34 and how much of those years spent in full time work and in blue-collar occupations. A change in pension age is not only affecting the supply for labor but also the demand (e.g. Bovini & Paradisi 2019, Vigtel 2018). Labor position is thus an important determinant

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<sup>12</sup> Difference-in-difference estimation can be troubled with serial correlation, where which understate my standard errors (Bertrand et al. 2004).

Im not able to allow for such correlation by cluster at age level where i have to few clusters (Kezdi 2004). In my robustness checks I apply another approach to control for serial correlation and my estimations are not sensitive to understated serial correlations.

for retirement behavior. I control for individual's main industry and firm worked for pre-reform.

Papers working with administrative data usually try to account for different health by controlling for sickness history. In Italy, sickness benefits are paid by the employer the first 4 days and then administrated by INPS, and as my data only tracks involvement in social security, I can only control for sick days after those 4 days. In other words, workers with many sick days taken in small episodes at a time, will have few or zero days in my dataset, where a worker with one or more long periods of sickness will have more days recorded in the data. There is a skewness where a large part of my sample have 0 days in sickness benefits, but most likely been sick some days in their work history. Correlations for this variable is positive for disability pension and mortality and negative for seniority and wage, which is reasonable directions. Even if the variable doesn't give full information, it's the best available and controlled for later in my estimations.

## 7. Results

### 7.1 Employment

I run 5 estimations to capture the effect on employment due to increase retirement age. The decrease in retirement from equation 1 lead to increases either employment, disability pension, unemployment insurance or inactivity. Table 3 show estimations where the reform coefficient  $\beta$  captures the increase in pension age due to the reform.

**Table 3** Reform effect

Variables	(1) Retirement	(2) Employment	(3) Disability pension	(4) Unemployme nt insurance	(5) Inactivity
A. Baseline					
$\beta_1(post_t * T_i)$	-50.7*** (0.578)	15.4*** (0.627)	3.55*** (0.317)	1.82*** (0.216)	30.0*** (0.641)
Observations	53,316	53,316	53,316	53,316	53,316
R-squared	0.516	0.345	0.023	0.031	0.303

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

The fornero reform significantly decreased pension benefits by 50.7 percentage points between age 61-64 for women expected to retire via old age pension. where less than a third of the decrease lead to higher employment (15.4 percentage points). The employment response is low, which is similar to earlier research on women and retirement<sup>13</sup>. Compared to earlier research which mostly focused on early retirement, the retirement response is much higher and thus is the relative effect on employment lower given the high decrease in retirement. A relatively small effect on employment is likely due to the high degree of women outside the labor market at age 60. If these individuals can't retire and remains inactive, the reform effect will increase inactivity rates between 61-64. The estimates in our baseline regressions A support this intuition, where increased retirement age lead to higher inactivity by 30 percentage points, almost twice as high as the increase in employment. Besides higher inactivity, individuals facing delayed retirement is on a larger extent on disability pension (3.55 pp) and unemployment insurance (1.82 pp). I use robust standard errors. Standard errors are possibly understated due to serial correlation. I have too few time periods to cluster by age. I test if low standard errors is give biased results in my robustness section.

<sup>13</sup> 11 percentage points in Austria, 14.4 percentage points in Germany for similar increases in retirement (Staubli & Zweimueller, 2013, Geyer & Welteke, 2017).



As mentioned, the baseline results don't give full information on how increased retirement age affect transitions from one state or another, where most of the estimated effect can be because employed individuals continue to remain employed and inactive individuals continue to be inactive. To capture potential transition effects, I retain all workers employed at age 60 in regressions B, and to capture potential transition from inactivity to other states, I retain all individuals inactive at age 60 in regressions C.

**Table 4** Transition effects

Variables	(1) Retirement	(2) Employment	(3) Disability pension	(4) Unemployme nt insurance	(5) Inactivity
B. Employed age 60					
$\beta_1(post_t * T_i)$	-51.7*** (0.733)	33.6*** (0.898)	2.12*** (0.212)	3.38*** (0.310)	12.7*** (0.648)
Observations	23,769	23,769	23,769	23,769	23,769
R-squared	0.593	0.420	0.025	0.028	0.105
C. Inactive age 60					
$\beta_1(post_t * T_i)$	-66.4*** (0.757)	1.82*** (0.478)	0.0563 (0.0571)	0.150 (0.212)	64.4*** (0.883)
Observations	19,161	19,161	19,161	19,161	19,161
R-squared	0.719	0.174	0.002	0.043	0.603

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

Estimates show a transition effect for employed workers. The reform decreased retirement by 51.7 percentage points between age 61 – 64. The majority of the individuals continue to work when not available to retire (33.6 pp), but the reform lead to substitution into other social security programs, where disability pension increased by 2.12 percentage points and unemployment insurance by 3.38 percentage points. 12.7 went from employment to inactivity between age 61 and 64. Higher transition to

inactivity than unemployment insurance indicates that individuals facing longer work horizons may choose to end their work career voluntarily<sup>14</sup>.

Unlike the employed sample, substitution effects are small or non-existent in the inactive sample. To start with, the reform decreased retirement between age 61 and 64 for inactive individuals (66.4 pp). The decrease is larger in magnitude compared to the employed sample. Larger magnitude is expected as inactive individuals are more likely to retire as fast they reach eligibility compared to employed, who instead may continue to work despite delayed retirement eligibility. Almost the whole decrease in retirement due to the reform leads to extended inactivity (64.4 pp). Increased retirement age had a significant and positive employment effect by 1.82 percentage points, which shows that only a few inactive went back to the labor market. No substitution to unemployment insurance is expected, as you need to have a job to get insurance. No effect on disability pension is also somewhat expected, as individuals can apply for disability pension if they are unable to work. Individuals that were unable to work have most likely tried to enroll disability pension already before the reform, and those inactive at age 60 would be individuals that actively went inactive or didn't go through the screening process for disability pension before 60.

## 7.2. Employment effects by subsamples

Health and labor market position is important for labor decisions (e.g. Staubli 2011, Blau and Gilliespie 2001) and individuals with weak labor market attachment and health problems might be affected more negatively by increased retirement compared to others. To give insight how pension reforms could affect workers differently, I repeat the baseline estimation but dividing my sample in different subsamples. First,

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<sup>14</sup> Unemployment insurance in Italy is only given to those who involuntarily lose their job.

I run an estimation on individuals who worked with mainly blue collar<sup>15</sup> occupations in their work career. To further evaluate how increases in retirement affect workers with different work backgrounds, I make another estimation but instead of separating by occupation, I run a separate analysis for individuals with a sickness history<sup>16</sup>.

**Table 5** Reform effect by labor and health background

Variables	(1) Retirement	(2) Employment	(3) Disability pension	(4) Unemployme nt insurance	(5) Inactivity
A. Baseline					
$\beta_1(post_t * T_i)$	-50.7*** (0.578)	15.4*** (0.627)	3.55*** (0.317)	1.82*** (0.216)	30.0*** (0.641)
Observations	53,316	53,316	53,316	53,316	53,316
R-squared	0.516	0.345	0.023	0.031	0.303
D. Blue-collar					
$\beta_1(post_t * T_i)$	-55.3*** (0.727)	17.1*** (0.797)	4.64*** (0.441)	2.12*** (0.290)	31.5*** (0.840)
Observations	31,446	31,446	31,446	31,446	31,446
R-squared	0.551	0.359	0.027	0.038	0.310
E. Unhealthy					
$\beta_1(post_t * T_i)$	-48.1*** (1.61)	12.7*** (1.66)	9.26*** (1.15)	2.57*** (0.652)	23.5*** (1.61)
Observations	7,128	7,128	7,128	7,128	7,128
R-squared	0.485	0.356	0.039	0.033	0.247

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

Table 5 supports earlier evidence that changes in a pension reform can have distributional consequences. The reform on blue-collar individuals lead to a larger decrease in retirement compared to the main sample, which lead to 1.7 percentage

<sup>15</sup> Italy have different broad work categories, where I use “operaio” which translates to blue-collar /manual work and “impiegato” which is closer to white-collar work, In the analysis I retain every individual who worked as “operaio” for more than half of their work career between age 34 - 60.

<sup>16</sup> Everyone that have obtained at least 6 weeks of sickness insurance via INPS in their work career.

points higher employment (17.1 pp compared to 15.4). The employment increase was modest relative to higher increases in both disability pension, unemployment insurance and inactivity compared to our baseline estimation. When estimating the reforms effect on the unhealthy group, increases in retirement age leads to lower employment compared to the main sample, instead are unhealthy to a much larger extent on disability insurance (9.26 pp). Individuals with a sickness history is also more likely to be on unemployment insurance and less likely to be inactive due to the reform.

### 7.3 Health effects

To study short-run health effects of increased retirement age, I use mortality rates between 61 and 65. The sample is thus the same, with the addition of individuals who died between 61 and 65. To control for other confounding factors, I want to estimate the following linear probability model:

$$M_i = \beta_1 T_i + X_i + \varepsilon_i$$

Where the dependent variable  $M_i$  is taking value 1 if an individual died between age 61 and 64.  $T_i$  is our treatment variable where those born 1952 take value 1 and those born 1951 take value 0.  $X_i$  control for similar background characteristics described in section 6.1. Equation don't account for potential differences in health that are similar to birth cohorts. To address that issue, I include everyone from birth cohort 1951 and 1952 who had 40 or more years of contributions at age 59. The reasoning goes that those individuals where already eligible to retire before the reform and didn't receive any increase in retirement age. To account for potential differences between birth cohorts, I estimate another regression where I compare the difference in mortality rates between those born 1951 and 1952 and the difference in mortality rates between those high and low years of contribution:

$$M_i = \beta_1(T_i * Clow_i) + \beta_2Clow_i + X_i + \varepsilon_i$$

Where variable  $Clow_i$  taking value 1 if contributions made in age 59 is below 35 and taking value 0 if contributions is 40 or more.

**Table 6** Health effects

Variables	(1) Full sample	(2) Blue collar	(3) Sickness history
F. LPM			
$\beta_1 T_i$	0.544 (0.353)	1.20** (0.464)	1.04 (1.15)
Observations	6,456	3,779	941
R-squared	0.002	0.003	0.023
G. DD			
$\beta_1(T_i * Clow_i)$	0.542 (0.353)	1.20** (0.464)	1.04 (1.15)
$\beta_2 Clow_i$	0.849 (0.724)	0.0928 (1.02)	-0.352 (2.59)
Observations	7,467	4,157	941
R-squared	0.002	0.003	0.023

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

The increase in retirement age is associated with 0.54 percentage points higher mortality between age 61 and 65, but are insignificant at conventional levels. More disturbing, the association between higher retirement age and mortality is much stronger for women with many years in blue collar occupations. In that group I estimate a 1.2 percentage points increase in mortality between age 61 and 65 due to the reform, and the result are significant at the 95% level. The health penalty is also higher for women with a sickness history, where the reform led to 1.04 percentage points

higher mortality rates, but the result is not significant at the 90% level. The estimation is high for women, where most earlier papers who find negative effects focus on men (e.g. Bloemen et al. 2017).

Although I don't find or know of any coinciding factors that would affect the treated cohort's health different from the control group between age 61 and 65, the reform itself could impact health. In such scenario, it's not only the retirement increase, but also the shock that impact health. There is no good way to control for that impact, and given the short notice and large increase in retirement age, the reforms introduction itself could partly explain the deteriorating health.

Limitations in my estimation is partly using only two birth cohorts. Despite trying to control for potential differences between birth cohorts by including the group with 40 or more years of contributions, it's not a perfect setting. Later studies should focus on more cohorts to give higher reliability.

## 8. Robustness checks

### 8.1 Placebo test

Quasi-natural experiments can be troubled with specification bias. A common approach to test how well for example a difference-in-difference behave is to do a placebo test, where you compare two untreated groups. If the effect is very small or non-existent, one can be more confident that the quasi-experiment is robust. I run a similar test, and have everyone born 1950 as treatment and those born 1949 as my control group. Birth cohort 1950 reached old age pension in 2010 and those born 1949 reached old age pension in 2009 and wasn't affected by the pension changes<sup>17</sup>.

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<sup>17</sup> I use birth cohorts 49 and 50 as they had similar early retirement possibilities and was affected similar to older pension reforms. See rules for appendix.

**Table 7** Placebo test

Variables	(1) Retirement	(2) Employment	(3) Disability Benefits	(4) Social Insurance	(5) Inactivity
F. Placebo test					
$\beta(\text{post} * T)$	-0.428 (0.680)	-0.179 (0.840)	0.186 (0.203)	0.435 (0.330)	0.199 (0.599)
Observations	26,307	26,307	26,307	26,307	26,307
R-squared	0.600	0.489	0.014	0.046	0.095

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

Table show equation (1) for our placebo equation. As expected pension benefits were altered by an insignificant amount in the post age-period. There is no significant result on our other incomes and the magnitude is small for all 5 estimations. The placebo-test make my main identification and DD estimation more robust.

## 8.2 Serial correlation

Retirement, employment display high serial correlation between years, and my standard errors is probably understated, which yield high t-statistics. A possible solution is by aggregating the age characteristics pre-retirement and the age characteristics post-retirement into two periods, and decrease serial correlation substantial (Bertrand et al. 2004). I repeat the baseline estimation but aggregate all characteristics from 56-60 into one period (pre) and all characteristics from age 61-64 into a second period (post).

**Table 8** two aggregated periods

Variables	(1) Retirement	(2) Employment	(3) Disability Benefits	(4) Social Insurance	(5) Inactivity
G. Two periods					
$\beta(post * T)$	-0.507*** (1.05)	0.154*** (1.31)	0.0355*** (0.649)	0.0182*** (0.327)	0.300*** (1.25)
Observations	11,848	11,848	11,848	11,848	11,848
R-squared	0.562	0.227	0.017	0.043	0.291

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Notes: All coefficients are multiplied by 100

Looking at regressions G, standard errors is larger when only using two aggregate periods instead of 10 periods, and error terms is understated due to serial correlation in the main estimation. Nevertheless, when correcting for serial correlation, all 5 estimations are still significant.

### 8.3 Sample selection

When estimating effects on blue collar workers, I set an arbitrary threshold, where 50% of the work history is doing blue collar work. In this section, I adjust the threshold to 75% and 90% to evaluate how the previous threshold affected the results.

**Table 9** Different thresholds for blue collar workers

Variables	(1) Retirement	(2) Employment	(3) Disability pension	(4) Unemployme nt insurance	(5) Inactivity
D. Blue-collar					
$\beta(post * T)$	-55.3*** (0.727)	17.1*** (0.797)	4.64*** (0.441)	2.12*** (0.290)	31.5*** (0.840)
Observations	31,446	31,446	31,446	31,446	31,446
R-squared	0.551	0.359	0.027	0.038	0.310
H. 75% threshold					
$\beta(post * T)$	-55.4*** (0.745)	17*** (0.811)	4.59*** (0.456)	2.11*** (0.294)	31.8*** (0.862)
Observations	30,006	30,006	30,006	30,006	30,006



R-squared	0.552	0.361	0.027	0.039	0.313
I. 90% threshold					
$\beta(post * T)$	-55.3*** (0.763)	16.8*** (0.826)	4.52*** (0.472)	2.22*** (0.303)	31.7*** (0.881)
Observations	28,728	28,728	28,728	28,728	28,728
R-squared	0.550	0.362	0.026	0.040	0.312

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

Adjusting the threshold don't lower the sample size by much, which indicate that most workers have worked by a majority in blue collar occupations. Results are almost identical regardless of threshold used.

**Table 10** different threshold for blue-collar on mortality

Variables	(1) 50%	(2) 75%	(3) 90%
J. Mortality			
$\beta_1(T_i * Clow_i)$	1.20** (0.464)	1.26*** (0.48)	1.04** (0.48)
Observations	4,157	3,925	3,765
R-squared	0.003	0.004	0.004

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: All coefficients are multiplied by 100

My estimation on mortality rates is sensitive to what thresholds used. When estimating the effect with only the women whose work history consisted of 90% blue collar occupations, the estimation of increased retirement age is 0.16 percentage points lower compared to retaining everyone who had 50% of blue-collar work history.

## 9. Conclusion

To solve problems with high social security expenses, Italy introduced a pension reform in late 2011, with the goal to increase women old age pension from 60 to 67 until year 2020. The increase was implemented at a high pace and individuals close to retirement received an immediate increase in old age retirement by between 2.75 and 3.58 years. This paper analyzes how the reform affected women on the cusp of retirement. As the reform only affected workers who was ineligible to retirement, individuals eligible to retire just before the reform are used as a control group. Using a difference-in-difference design, I estimate the reforms effect on employment. In similarity with earlier studies, there is no one-to-one substitution between retirement and employment. In fact, increases in retirement age led to almost twice as high inactivity rates (30 pp) as employment (15.4 pp), and individuals were also more likely to benefit from disability pension (3.6 pp) and unemployment insurance (1.8 pp).

Low employment responses due to increase in retirement age is arguably from high inactivity pre-reform. In fact, when estimating the reform on individuals inactive at age 60, employment increased by a tiny margin due to the reform. Instead, almost everyone remained inactive after the reform. At the same time, individuals employed at age 60 mainly continued to work post-reform. But unlike inactive, employed transitioned from employment due to the reform. In the employed sample about a 1/3 substituted work with disability pension, unemployment insurance and inactivity.

I also find potential distributional effect due to the reform. The reforms effect on uptake of disability pension and unemployment insurance were higher for both blue-collar workers and individuals with a sickness history. My estimations show a first indication that blue collar women's health is negatively affected by increased retirement age. Given both negative health and substitutions effects for blue collar workers, my results raise the question whether future pensions reforms should be implemented with differentiated eligibilities depending on background.

This study has data limitations, namely the lack of household information, which is of high relevance for studies on retirement. Another limitation is that the reform is relatively new and I only have data until age 64<sup>18</sup>, and with worrying trends, especially in mortality rates, future research should revisit the topic and see how increases in retirement age affects health in the long-run.

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<sup>18</sup> Data on mortality rates at age 65 for both my cohorts.

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## Appendix

A1

## Changing rules for the fornero reform<sup>19</sup>

Panel A: Old-age pension					
		Men		Women	
		Pre-reform	Post-reform	Pre-reform	Post-reform
<i>Age requirement</i>					
2011	65YA	Not in place		60YA	Not in place
2012	65YA	66YA		60YA	62YA
2013	65YA+3MA	66YA+3MA		60YA+3MA	62YA+3MA
2014	65YA+3MA	66YA+3MA		60YA+4MA	63YA+9MA
2015	65YA+3MA	66YA+3MA		60YA+6MA	63YA+9MA
2016	65YA+7MA	66YA+7MA		61YA+1MA	65YA+7MA
2017	65YA+7MA	66YA+7MA		61YA+5MA	65YA+7MA
2018	65YA+7MA	66YA+7MA		61YA+10MA	66YA+7MA
<i>Contribution requirement</i>					
	20YC	20YC		20YC	20YC
<i>Waiting window</i>					
	12 months	No		12 months	No

Panel B: Seniority pension					
		Pre-reform		Post-reform	
		Both genders		Men	Women
2011	Quota 96	(60YA	and 35 YC)	or 40 YC	Not in place
2012	Quota 96	(60YA	and 35 YC)	or 40 YC	42YC+1MC 41YC+1 MC
2013	Quota 97.3	(61YA+3MA	and 35 YC)	or 40 YC	42YC+5MC 41YC+5MC
2014	Quota 97.3	(61YA+3MA	and 35 YC)	or 40 YC	42YC+6MC 41YC+6MC
2015	Quota 97.3	(61YA+3MA	and 35 YC)	or 40 YC	42YC+6MC 41YC+6MC
2016	Quota 97.6	(61YA+7MA	and 35 YC)	or 40 YC	42YC+10MC 41YC+10MC
2017	Quota 97.6	(61YA+7MA	and 35 YC)	or 40 YC	42YC+10MC 41YC+10MC
2018	Quota 97.6	(61YA+7MA	and 35 YC)	or 40 YC	42YC+10MC 41YC+10MC
<i>Waiting window</i>					
		12 months			No

*Note:* The table reports requirements to claim old-age (Panel A) and seniority (Panel B) pensions under pre-reform rules - had they remained in place - and under post-reform rules, over the period 2012-2018. It takes into account the anticipated upward adjustments due to increased life expectancy that took place in 2013 and 2016. YA and MA flag the age requirement in terms of years and months, respectively. YC and MC flag the contribution requirement in terms of years and months, respectively.

Some exemptions to the main rules were introduced. Mainly for my treated group. If you had 20 years of contributions and were 60 years old at 2012, you got to retire at age 64 years and 7 months regardless of future raises. My treated group thus had two different retirement increases. 63 years and 9 months for everyone that was born in January to just before April. The rest could retire at 64 years and 7 months.

<sup>19</sup> Table is gathered from Paradisi & Bovini (2019), more information on the changes can be found at INPS (2016) or <https://www.inps.it/nuovoportaleinps/default.aspx?sPathID=%3b0%3b45138%3b&lastMenu=45545&iMenu=1&p4=2>



