Life-cycle Labour Supply Responses to Longer Working Lives: Evidence from a Pension Reform*

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Very preliminary

Abstract

The budget sustainability improvements of reforms that delay retirement age crucially depend on labour supply responses to a longer working horizon. The response may not only involve those who were very close to retirement and are forced to postpone it. It may also affect the incentives to work or search for a job throughout the entire life-cycle, since increases in the length of working lives boost the value of working. Moreover, when labour supply decisions are taken at the family level, one's labour supply may also react to increases in the working horizon of the spouse. We estimate both channels exploiting two recent Italian pension reforms which differently affected workers' eligibility criteria mainly depending on their gender, accrued years of contribution and year of birth. A longer working horizon strongly boosts the labour market participation of women at all ages (between 36 and 59 year-olds) but not that of men. Within families, a longer wife's working horizon induces the husband to participate more to the labour market, even if to a small extent.

Keywords: Economics of Gender; Labour Force Participation; Retirement
JEL Classification: J16; J22; J26

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1 Introduction

Aging is one of the major challenges faced by the developed economies in this century. It affects societies' ability to provide support for older generations and it threatens the sustainability of Pay As You Go pension systems, very popular especially among European countries. Since the '90s, governments responded by delaying workers' legal retirement age (LRA from now on) and by moving from defined benefit to defined contribution pension schemes, in addition to incentivizing private pension savings, which, by requiring a more structural change, takes longer time to be effective (OECD, 2015).

Delaying the LRA seems to be the easiest and most immediate way to enlarge the tax base by inducing individuals to work longer and by reducing the number of pension recipients. However, its effects on overall employment are not *a priori* obvious for several reasons. First, the positive labour supply effect on the elderly depends on the availability and generosity of other welfare programs (unemployment or disability benefits). Indeed, if a significant proportion of older workers are entitled to other assistance programs long before they reach the LRA, incentives to work are not affected by changes in pension eligibility rules (see Arpaia et al. (2009) for a discussion). Second, delaying the LRA might have potential spillover effects on employment of other age subgroups of the population. One channel operates through labour demand: pension reforms may induce firms to keep workers who would be entitled to pensions under the old system to stay in the payroll; this may change firms' labour demand and crowd out hirings of younger workers. Other channels operate through labour supply: delaying the LRA increases the value of working and searching for a job at all ages, thus it may boost individuals' labour supply over their entire life-cycle. Moreover, if labour supply and retirement decisions are taken at the family level there may be indirect effects, for all workers, coming from family interactions, depending on household specialization of labour and on the degree of leisure complementarity between partners.

This paper investigates the labour supply effect, over the entire life cycle, of delaying LRA on individuals exposed to pension reforms and on their spouses. We go beyond the estimation of the effect on those age classes who are directly forced to remain in the labour market due to the pension reforms and we look at the effect on other age classes and on other family members. Moreover, we estimate the implications on the aggregate unemployment rate, of an increase in the working horizon induced by changes in LRA. To address for the endogeneity between working life duration and labour supply decisions, we exploit two recent Italian pension reforms occurred in 2011 and 2012. The reforms increased the minimum retirement age (MRA) by, on average, four years; however, the increase was heterogeneous mainly depending on workers' gender,

contributory history and year of birth. By using the Italian Survey on Household Income and Wealth (SHIW), we estimate by gender and by age class a difference-in-differences model that exploits changes in distance to LRA only driven by the pension reforms; most of the variation in the policy-induced increase in the working horizon comes from the large heterogeneity across the Italian population of previously accrued years of contribution. Our identification strategy rests on a standard assumption in the literature, which requires trends in labour supply to be parallel among individuals with identical characteristics in terms of age and gender but differently affected by the new pension rules because of the heterogeneity in their contributory history.

We find that an increase in the working life set by a delayed LRA has positive effects on labour supply along the entire life-cycle, especially for women. This translates into an increase both in their employment and in their unemployment probability. Much smaller effects are found for men, in line with the literature which documents higher labour force attachment (Barron et al., 1993) and lower labour supply elasticity (among others, see Blundell et al. (2011)) of men with respect to women. We estimate that overall, the recent pension reforms, by increasing time to retirement by four years on average, explain about 40% of the increase in the activity rate of Italian 15-64 year-old women and 8% of the increase in the share of unemployed women observed between 2010 and 2014. At the family level we find that the wife's longer working horizon pushes her husband to work longer, even if to a small extent; while the contrary does not hold.

The previous literature investigating the labour supply response to changes in the working life duration over the entire life-cycle is quite scarce. To our knowledge, only Hairault et al. (2010) exploit pension reforms in France to analyze the effect of the longer working horizon on the probability of being unemployed over the life cycle. Their analysis, run only for men, finds a small positive effect: the longer working life duration increases returns to job and thus boosts job search effort.[1] We extend their analysis to women, whose labour supply is more elastic and whose response may be different. Italy is a particularly well suited case to study because Italian women in the last pension reforms have experienced a large increase in stated expected retirement age (Figure 1). Moreover, we couple the analysis at the individual level with that on family interactions. So far the literature on household spillovers has focused mainly on partners' joint retirement decision and their time allocation after retirement. Hospido and Zamarro (2014) show that, in European countries, the responsiveness of women's retirement decision to own pension eligibility requirements decreases when controlling for their spouses' working

[1]Similar mechanisms explain the positive effect that the longer working horizon has on older male workers' participation to training programs (Montizaan et al., 2010; Brunello and Comi, 2015) and on healthy behavior of middle-age workers (Bertoni et al., 2016): workers try to take advantage of the increased returns to job.

status. The joint retirement effect holds only for women. Coile (2004) finds the opposite result for American families. Stancanelli and Soest (2012) analyze the effect of retirement on partners' time devoted to home production. They find that time devoted to home production for French married men, but not for women, increases after their own retirement but it decreases once the female partner retires. With SILC data for Italy, Ciani (2016) finds that retirement significantly increases time devoted to housework by women and single men. To our knowledge, our paper is the first to analyze labour supply responses at the family level to changes in pension eligibility conditions.

The remainder of the paper is organized as follows: Section 2 introduces a conceptual framework that informs our empirical analysis and some motivating stylized facts; Section 3 provides a short description of the dataset and illustrates the main features of our sample; Section 4 introduces the Italian pension system and describes the reforms undertaken in the last decade; our empirical strategy is then explained and discussed in Section 5; in Section 6 we report the results of the empirical analysis. Section 7 concludes.

2 Motivating evidence and conceptual framework

In Italy labour force participation as well as average retirement age have constantly increased in the last decades, especially for women. The expected retirement age claimed by the Italian population has increased by almost 9 years from the early '90s, especially right after the implementation of two major pension reforms in 1995 and 2012 (Figure 1). Focusing on the most recent pension reforms, Figure 2 shows that also the labour force participation rate increased aroung the year of the implementation of the reform.The Figure shows, separately for men and women, the dynamics of the the 55-64 and 45-54 age class participation rates and of the average minimum ratirement age (MRA), according to the rules at place in each considered year. There is a striking jump in the participation rate for women in 2012, when the reform increased the minimum retirement age by 4 years on average. The jump involves not only the oldest age group but also other age classes not immediately affected by the pension reform. This suggests that increasing LRA may have effects which go beyond the most obvious link between participation and retirement age of the oldest workers, who would have retired few years later and need to work longer to be eligible for public pensions.

These facts motivated us to investigate how much the LRA increase could explain the observed labour force participation developments for all age classes and to take Italy as the specific case to study.

There are several channels through which the delayed LRA affects participation

throughout the entire life-cycle.[2] First, as stated before, there is an immediate effect on older workers whose eligibility age requirements become stricter and, in the absence of private pension schemes or alternative welfare programs (unemployment and disability benefits), have to increase their labour supply (see Staubli et al. (2013) and Geyer and Welteke (2017) for a discussion).

Second, minimum LRA increases may have an effect on labour supply of individuals not in the labour force belonging to younger age classes, which is the focus of this paper. In a model with endogenous search, LRA acts as a deadline and search effort is lower close to the retirement age because, by working fewer residual periods, the returns to job search are smaller. In this setting the longer working life determined by delayed LRA increases the value of working with positive effects in terms of participation and job effort for all age classes. Heterogeneous responses across ages may arise either because search costs are age-dependent or because other alternative welfare programs are available for specific age groups.

Finally, within a household model of labour supply, an increase in the individual labour supply may affect the partner's behaviour: if, on one side, the household's labour specialization drives the spouse to reduce her labour supply, the existence of leisure complementarity may increase it. The overall effect on participation is ambiguous. To investigate these different channels we rely on the empirical analysis.

3 Data

In our analysis, information on labour status and expected distance to retirement is obtained from the Italian Survey of Household Income and Wealth (SHIW). SHIW is a biannual survey administered by the Bank of Italy to a sample of Italian household and it is the main source of information about family income and wealth in Italy. The Survey is conducted since 1960; however we use the most recent waves, from 2008 to 2014, which include the years around the pension reforms used in our empirical analysis. The sample of the most recent surveys comprises about 8,000 households (20,000 individuals).

SHIW data allow us to construct pension eligibility criteria because they include information on age, gender, sector and type of employment and accrued years of contribution which allow us to build, for each individual, the legal retirement age on the basis of the eligibility rules at place in each year.

Despite there is a panel component, for our analysis we only use repeated cross sections, because the panel is short and covers only half of the original sample.

[2] We should keep in mind that the association between LRA and participation arises only when public pension is available.

4 The Italian pension system

The Italian pension system is based on two types of benefits linked to the working activity: old-age and seniority pensions. In our empirical analysis we take advantage of the last pension reforms which took place in Italy at the end of 2010 and 2011 (respectively, Law 30 July 2010 n. 122, known as "Sacconi Reform", and Law 22 December 2011 n. 201, known as "Fornero Reform") and introduced stricter eligibility pension rules.

As for old age pension, before the reforms the LRA for women was 60 while for men 65 years. Individuals who had started to work before January 1 1996 were under the defined benefit pension scheme and they were required to have accrued at least 20 years of contribution to be eligible for a public pension. The requirement of accrued years of contribution for those who had started to work after January 1 1996, under the defined contribution scheme, was 5. The pension reforms increased both the LRA for old age pension and the number of accrued years of contribution required for those under the defined contribution scheme. The Sacconi reform suddenly raised the LRA from 60 to 65 for women in the public sector, in compliance with an EU Directive according to which gender difference in retirement age would not be acceptable. The Fornero Reform[3] smoothly increased the LRA for all workers up to 67 by 2020 and required 20 accrued years of contribution also for those under the defined contribution scheme (it was 5 under the previous rules). The reform also introduced pension benefits for short working histories, whose eligibility requires 70 years old and 5 years of accrued contribution. The different retirement age by gender, cohort, sector and previously accrued years of contribution implies that individuals have been differently affected by the reforms in terms of length of residual working period before retirement.

In order to qualify for seniority pensions, before the Fornero reform, it was necessary to achieve either 40 years of contributions (irrespective of age) or a mix of age and years of contributions, the so called "quota system" (for instance the sum of age and years of contributions should have been 96 in 2006, with at least 59 years of age and 36 of contributions; see Table 1). The Fornero reform abolished the "quota system" and raised the minimum years of paid contributions in 2012 from 40 to 42 for men, to 41 for women; in 2013 to 43 for men and 42 for women; and from 2014 onwards to 44 for men and 43 for women. A reduction of the pension benefit for those who retire under the seniority pension rule before reaching age 62 was introduced. Workers who were already eligible for a public pension when the bill passed could still retire with the pre-reform rules.

[3]The reform passed by decree and could not be anticipated by workers and firms; moreover, it became effective on the 1st of January 2012, ten days after its approval.

5 Identification and empirical strategy

Several identification issues hinder the estimation of the causal effect of a longer working life on labour supply. First, the two variables are jointly determined: individuals highly attached to the labour market are both more likely to be active and to expect to work over a longer period of time. Second, it is difficult to separately identify the effects on the decision to participate in the labour market of age, working experience and length of the working life, since these variables tend to be multi-collinear.

We solve these endogeneity problems by exploiting the fact that in Italy actual retirement age strongly depends on the minimum retirement age and that two recent pension reforms exogenously changed the latter. Similarly to Battistin et al. (2009); Ciani (2016); Manacorda and Moretti (2006) we compute for each individual her distance to retirement, defined as the difference between the retirement age at which she could retire depending on the rules in place at the time of the interview and her age; then, we use variations in the MRA exclusively induced by the pension reforms to identify the labour supply effect of lengthening one's working life.[4]

We exploit the fact that MRA changed because of the 2011 and 2012 reforms in a different way depending on four characteristics: gender, previous working history (accrued years of contribution), year of birth and sector of employment. Our identification strategy is based on a difference-in-difference analysis that compares before and after the reform the average labour supply of individuals belonging to cells - that from now on we will denote as q-, based on the full interaction of the four dimensions mentioned above, which were more or less affected by the new rules, depending on the way the reform was designed.

In particular, we estimate the following empirical model, separately for men and women for different age classes. Let Y_{iqt} be a variable that indicates individual i's labour force status in year t within the same cell q, i.e. combination of age, sector of employment (whether they used to work in the private or in the public sector and whether they were employees or self-employed) and years of contribution. The reduced form specification for individual i's labour force status is:

$$Y_{iqt} = \beta_1 T_q * post2011_t + \beta_2 W_{iqt} + \alpha_t + \alpha_q + \epsilon_{iqt} \quad (1)$$

[4]We take the minimum retirement age between the one implied by the old age regime and the one implied by the seniority pension regime. To estimate minimum retirement age according to the seniority system, especially for young individuals, we need to make assumptions about total contribution years at the end of their working career. Throughout the paper we assume that individuals will accumulate years of contribution continuously from the year of the interview onward. In this way we are overestimating their probability of retiring under the seniority system but we are excluding from the computation of policy-induced variations in MRA endogenous labour supply responses which may modify total years of contribution and actual MRA.

where T_q is a time invariant identifier of those cells q more affected by the new rules, i.e. it indicates the cell-specific change in distance to retirement exclusively induced by the 2011 reform; $post2011_t$ is a dummy that indicates the post reform period; W_{iqt} is a vector of controls at the individual level (marital status, region of residence, usual sector of employment[5]); α_t are year fixed effects and α_q are the fixed effects for each cell q. Finally, ϵ_{iqt} is an error term. Standard errors are clustered at the cell q level, which together define the cross sectional level of variability of the treatment. The coefficient β_1 therefore estimates the labour supply differences between cells more and less affected by the reform before and after the policy.

Figure 3 describes the variation across cells in the size of the shock, which defines our variable T_q and identifies which is our control group for the difference-in-differences analysis. The figure displays the distribution of the changes in distance to retirement between the 2008 and 2012 rules across individuals. The size of the shock differs strongly both among women and among men.

Where does this variation come from? Since we run regressions by age classes and gender, the main source of heterogeneity in the shock to distance to retirement across individuals comes from the amount of accrued years of contribution, which depends on the regularity of their previous working life. Figure 4 shows the evolution of the average MRA for men and women according to both the old age and the seniority pension regime, and depending on the observed distribution of accrued years of contribution among the population of women and men. For women, the largest shock is observed for those who were retiring at age 60, under the old age regime before the reform, who will have to postpone retirement either at age 67 or at least till they acquire eligibility for retiring under the seniority regime, on average at age 65. This implies that treated women are those with more fragmented working lives, who have to wait longer to achieve the contributory requirements to retire under the seniority system. For men the picture is different because their working lives are more continuous and the new rules affected the seniority regime more than the old age one. Among men, the ones more affected by the reform were those who would have retired under the seniority regime in the old system, at age 63 on average, who after 2011 have to wait till they achieve requirements to retire under the old age system, at age 67. Among men, those more affected by the reform are therefore the ones who accrued more years of contribution, who would have retired under the seniority system before and now have to wait longer given the new rules.[6]

In order to capture changes in labour force status of individuals who were actually

[5] We use the sector the individuals actually work in or that where they used to work.

[6] Most men where retiring under the quota system before, i.e. after having accrued 35 years of contribution, after 2011 to retire under the seniority system they need instead to achieve 42 years of contribution.

forced to postpone retirement by the new pension rules, we exclude from the sample those who could have already retired (we keep individuals whose $MRA_{qt} < age_{qt}$). This means we exclude both those who have already retired and those who could have retired but chose not to, because they represent a very selected sample of the population. Moreover, since our identification is based on the comparison of participation rates of individuals of the same age but under different pension rules depending on the year they were interviewed, we exclude from the sample women older than 59 and men older than 64, because there is no sample for the pre-reform period for those individuals (there are no observations with $MRA_{qt} < age_{qt}$ for the years before 2011). Finally, in our regressions we only consider individuals belonging to cells q, i.e. combinations of age and accrued years of contribution, reasonably close to retirement: we exclude women with less than 10 and men with less than 20 years of contribution as well as women with younger than 35 and men younger than 40. Our results are robust to changes in the considered sample.

5.1 Checks to the identification strategy

Our estimation strategy relies on two main identifying assumptions. That changes in minimum retirement age affect actual retirement age, i.e. that individuals tend to retire close to minimum retirement age. Second, as all difference-in-differences models, that the trends in participation would have been the same for individuals more or less affected by the shock, absent the change in the pension rules.

Figure 5 tests the first hypothesis and shows that a large fraction of individuals retire as soon as they become eligible (i.e. when $MRA = age$), meaning that changes in minimum retirement age translate into changes in actual retirement age. The figure plots the probability of being a pensioner, depending on each individual's distance to retirement ($MRA - age$) in year t, for women and men separately. It displays a sharp increase in the probability of retiring around 0 (see also Battistin et al. (2009)).[7]

In order to test for the second identifying assumption, that the trend in labour force status of individuals belonging to combinations q of age-sector-years of contribution more exposed to the change in pension rules would have been the same of that of individuals less exposed absent the pension reform, we show that the difference in the labour supply behaviour of individuals more and less exposed to the shock was constant before 2011 and starts changing exactly after the introduction of the new pension rules, in 2011.

We show results obtained by estimating the following equation for men and women

[7]The two vertical lines report the interval between -2 and 2. We highlight this interval because, given the existence of the so-called "finestre mobili" (moving window) most times individuals stay at work one or two year longer because they perceive the retirement benefits with one or one and a half years of delay.

separately:

$$Y_{iqt} = \sum_{r=2006}^{2014} \gamma_r \left(T_q * \delta_r\right) + \gamma W_{iqt} + \delta_q + \delta_t + \eta_{iqt} \tag{2}$$

where all variables are defined as above and δ_r are year dummies.

The coefficients γ_r show how the difference in the outcomes Y_{iqt} between individuals belonging to the most and the least affected cells q evolves over time, with respect to the omitted group (the interaction with the 2006 year dummy). If the parallel trend assumption holds, the coefficients should be close to zero for the years before the reform, implying that the difference in the outcomes is constant when compared to 2006, and positive after the reform, if higher retirement age boosts individuals' labour supply.

6 Results

Table 2 shows some descriptive statistics on the groups more and less affected by the changes in the pension rules in our sample.[8] As stated above, we only consider individuals close enough to retirement, i.e. we exclude for instance women who have never worked. This explains the high average women activity rate displayed in columns 3 and 4 of Table 2. Moreover, the table confirms that the most affected among men are the ones with more continuous working lives (with more years of contribution on average); among women, the ones most affected by the shock in retirement age are those with more fragmented working lives (who accrued less years of contribution).

Figure 6 displays the coefficients γ_r and the corresponding confidence intervals obtained from estimating equation 2 for women and men. It shows that for both women and men, the trend was parallel before the 2011 reform, which supports the assumption that the trend would have been parallel absent the reform. Moreover it is clear from the figure that after 2011 the labour supply of women more affected by the reform increased relative to that of less affected women, while that of men did not change differentially.

Table 3 reports the results obtained from estimating equation 1 with different dependent variables: a dummy for activity, a dummy for employment and a dummy for unemployment. Moreover, we study the nature of the changes in employment probability: we look at the probability of being employed in a part time or a full time job and in a permanent or temporary job. Since women and men had different legal retirement age before the Fornero and Sacconi reforms and tend to have heterogeneous labour supply responses, we choose to split our analysis by gender. We also consider different age classes: columns (1),

[8] We divide the sample in the following way: those more exposed to the shock are those whose variation in MRA due to the pension rules was ≥ 7 years for women and ≥ 4 years for men.

(2) and (3) report results for women aged 52-59, 44-51 and 36-43, respectively; columns (4), (5) and (6) report results for men aged 57-64, 49-56 and 41-48. We differentiate age classes by gender because we want to keep the age groups close enough to retirement before the reform (men would have retired at most at age 65 and women at age 60, under the old age system, before the reform).

We find that increasing the length of the working life has a positive effect on female labour force participation for all age classes, especially for those at the end of their working life. In particular we find that if the length of the working life increases by one year, the labour supply of women age 52-59 increases by 2.3 percentage points (3% over the mean) and by 0.8 per cent (0,9% over the mean) for younger women. Also depending on the demand for workers, the increased labour supply translates into higher unemployment and into higher employment. The type of employment is also heterogeneous across age classes: older women are more likely to find employment in full time, permanent contracts while younger women, if anything, tend to find temporary contracts. This may depend on the type of women at the margin of participating in the labour market by age class: middle-age women are more likely to participate in any case and for those at the margin of participating, who are activated by the new pension rules, may be more difficult to find permanent, full time positions. Note moreover that for women aged 44-51 there is no aggregate effect on employment, however these women tend to switch from part time to full time contracts as a response to longer working horizon.

In line with the existing literature, male labour supply is much less elastic: men indeed do not seem to react much or at least not in a significant way to changes in their working horizon.

Overall, we estimate that the increase in distance to retirement age caused by the reform (by 4 years on average) explains about 40% of the increase in the activity rate of women 15-64 between 2010 and 2014, 8% of the increase in the share of unemployed.

Table 4 evaluates how the effect differs by educational levels, in particular for individuals who achieved at least the secondary school degree. The results show that the effect, albeit being present for all educational groups, is concentrated on individuals with lower levels of education. If we take education as a proxy of permanent income, this implies that individuals with lower income are more affected by an increase in the length of the working horizon. This is consistent with the fact that labour supply elasticity is higher lower educated- lower income individuals.

6.1 Within family interactions

To fully evaluate the aggregate effect of pension reforms, we also consider interactions within the family. The positive effect on women labour supply driven by increased

distance to retirement, may spillover the husband's participation or employment probability, in the presence of leisure complementarities or of income effects. Moreover, even if the longer working horizon does not affect men's labour supply thoughout the entire life cycle, it does affect their labour supply after age 64 (Staubli et al. (2013) and Geyer and Welteke (2017)), and it may therefore have spillover effects on their wives' labour market participation.

To study these interactions, we apply the same strategy as in equation 1 for married or cohabiting couples only and we contemporaneously evaluate the effect on the husband's and on the wife's distance to retirement. We run the following equation:

$$Y^s_{jq_wq_ht} = \beta^s_1 T_{qw} * post2011_t + \beta^s_2 T_{qh} * post2011_t + \beta^s_3 W_{jq_wq_htt} + \alpha^s_t + \epsilon^s_{jq_wq_ht} \quad (3)$$

where $Y^s_{jq_wq_ht}$ is a dummy that indicates whether spouse s in household j, where the wife belongs to age-contribution cell q_w and the husband to cell q_h, is active; T_{q_w} and T_{q_h} are time invariant indicators of the number of years the MRA increased because of the new pension rules for wives and husband respectively; $post2011_t$ indicates the post reform period; $W_{jq_wq_ht}$ is a vector of controls at the individual level (accrued years of contribution and age fixed effects both for men and for women, region of residence, usual sector of employment for men and women, some controls at the household level like difference in distance to retirement and age among partners); α^s_t are year dummies. Finally, $\eta^s_{jq_wq_ht}$ is an error term.

Table 5 analyses the presence of cross elasticities within the couple. As found in Table 3, there is a positive effect of the increased distance to retirement on women's labour supply. Moreover this table shows that the pension reforms, by increasing the minimum retirement age and labour supply of women, induced their husbands to increase their participation rates, even if to a small extent. This may be rationalized by the presence of leisure complementarities between partners.

7 Conclusion

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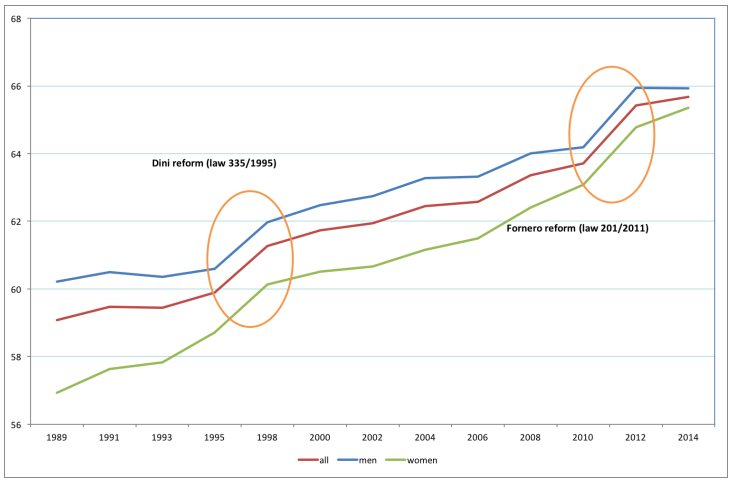
Figures and Tables

Figure 1: Expected retirement age and pension reforms

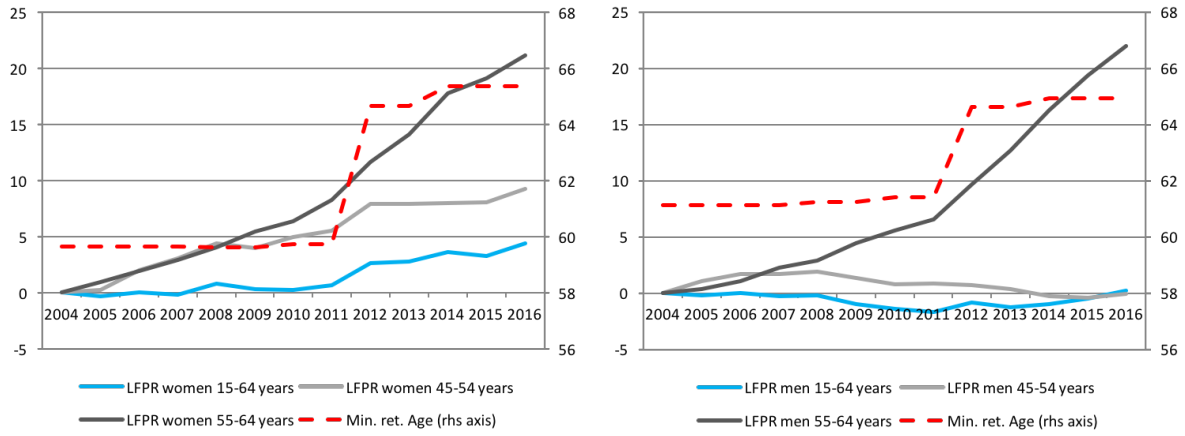


Source: SHIW historical data

Figure 2: Labour force participation and minimum retirement age by gender

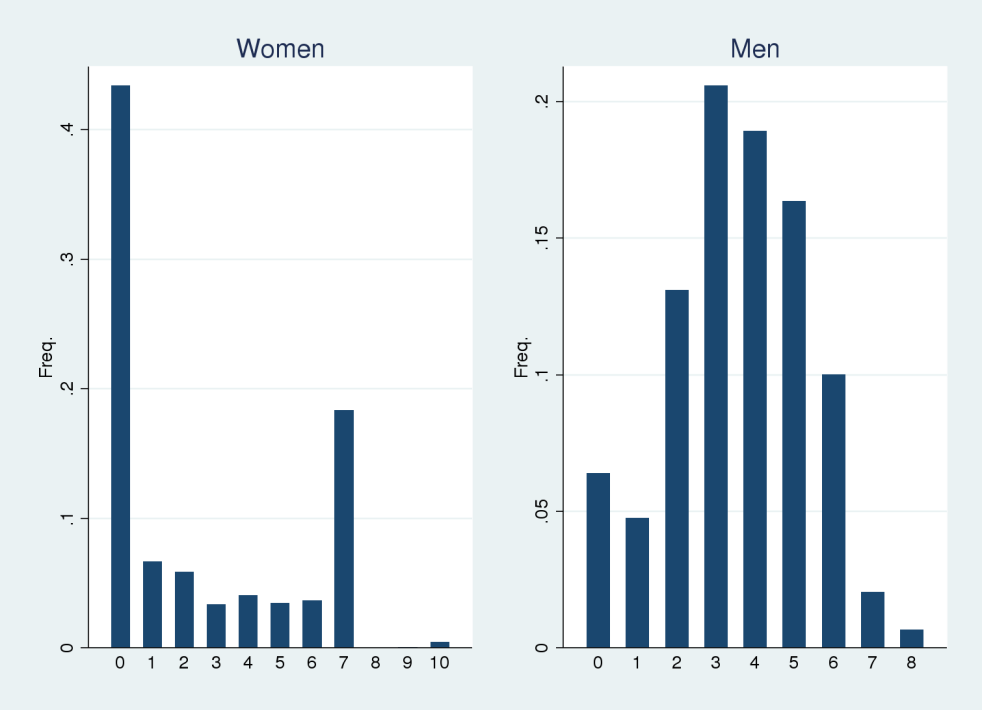
(a) Women

(b) Men



Source: Italian Labour Force Survey and SHIW (from minimum retirement age)

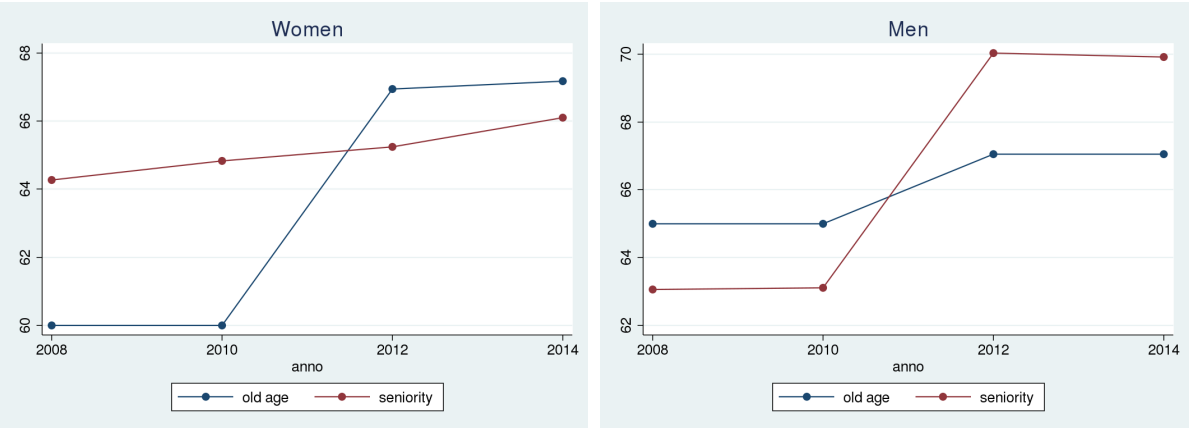
Figure 3: Distribution of the shock in distance to minimum retirement age (variation between $t \geq 2012$ and 2008), by gender and age



Source: SHIW.
Note: Distance to retirement measures distance to minimum retirement age, depending on the time varying pension rules. Data are at the individual level.

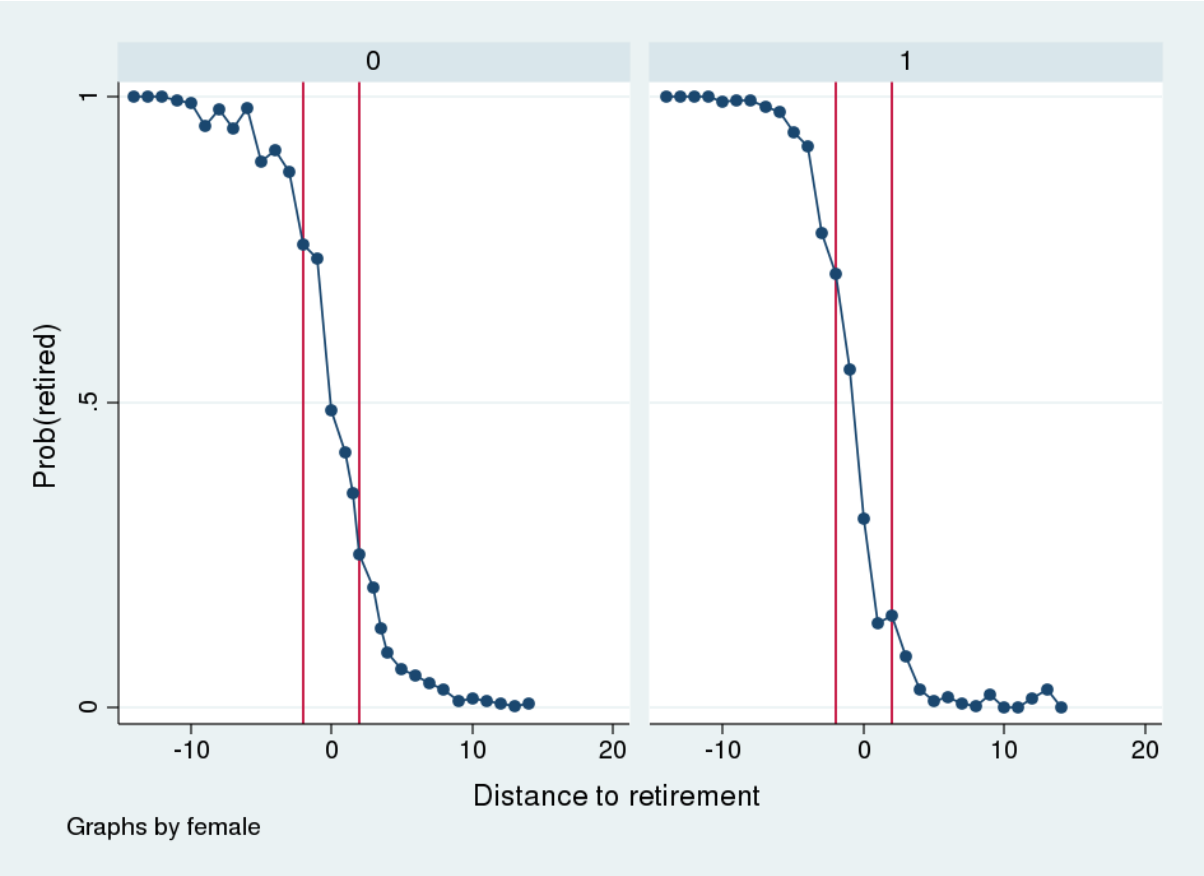
Figure 4: Overtime variation in minimum retirement age, old age pension and seniority pension

(a) Women (b) Men



Source: SHIW.
Note:

Figure 5: Probability of retiring and distance to minimum retirement legal age

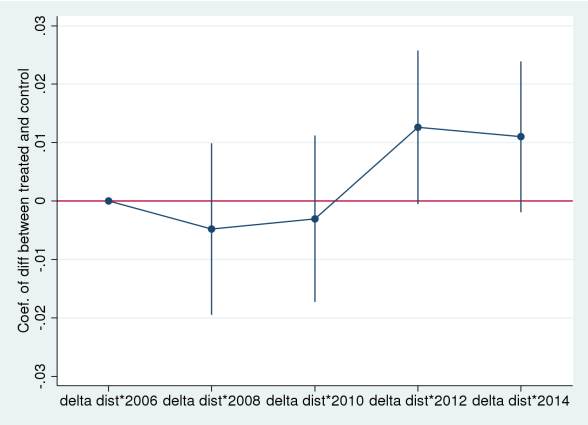


Source: SHIW, 2008-2010-2012-2014.
Note: Distance to retirement measures distance to minimum retirement age, depending on the time varying pension rules.

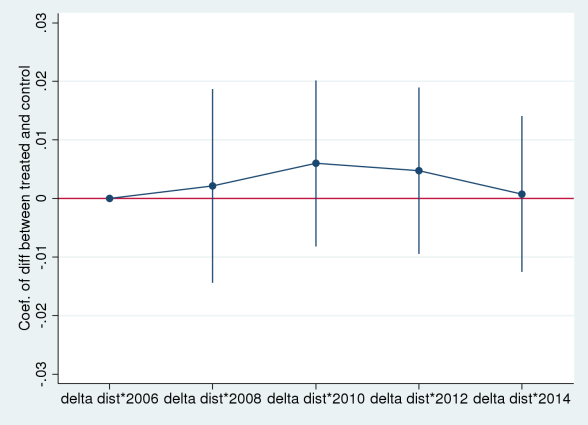
Figure 6: Effect of reform-induced changes in distance to retirement: evolution of the difference in the probability of being active/employed between more and less affected individuals

Prob of being active

(a) Women

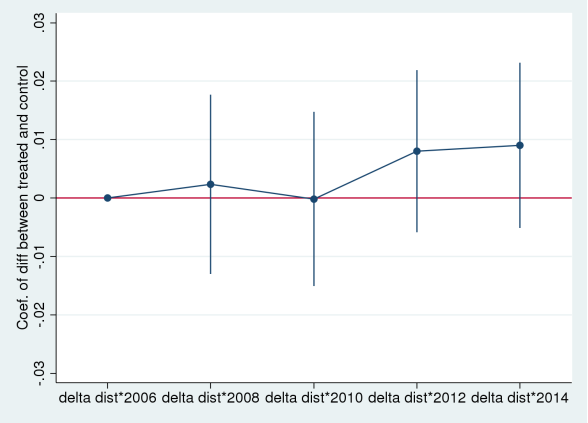


(b) Men

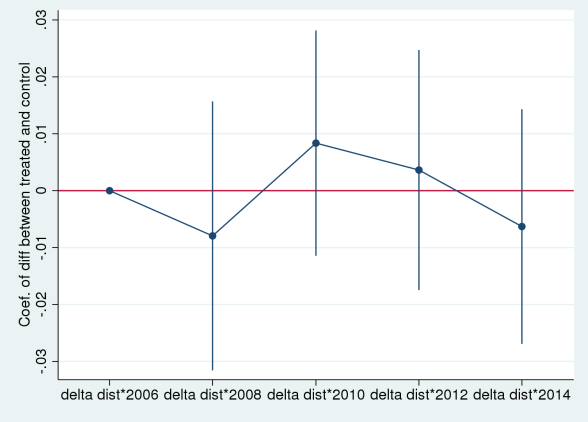


Prob of being employed

(c) Women



(d) Men



Source: Italian Labour Force Survey. The graph plots the coefficients γ_r and the corresponding 5% confidence interval obtained from estimating equation 2.

Table 1: Difference in differences, identifying treated and control in the private sector group

	Private & Public		Self-employed	
Year	A, C, Q	only C	A, C, Q	only C
Before Fornero reform				
2007	57, 35	39	58, 35	40
2008	58, 35	40	59, 35	40
2009-2010	59, 35, 95	40	60, 35, 96	40
2011	60, 35, 96	40	61, 35 97	40
2011-2012	60, 35, 96	40	61, 35, 97	40
2013 onwards	61, 35, 97	40	62, 35, 98	40
After Fornero reform				
2012 onwards		42		42

Notes: A stands for age, C for number of years of contribution, $Q = A + C$ is the so-called "quota", the sum of age and years of contribution must be larger or equal than Q to have retirement eligibility. Independently from actual age, retirement eligibility is also granted when the number of years of contribution is sufficiently high (39 in 2007, 40 in the following years).

Table 2: Descriptives

	Men		Women	
	control	treated	control	treated
Active	0.95	0.99	0.89	0.82
Employed	0.90	0.97	0.86	0.76
Unemployed	0.06	0.03	0.03	0.06
Married	0.81	0.81	0.72	0.71
Whether cohab children	0.33	0.17	0.27	0.24
High school	0.50	0.58	0.64	0.62
Y. of contrib	22.87	23.98	23.57	13.35
Age	51.01	45.98	49.10	44.44

Notes: Men and women with at least 35 year old and 8 years of accrued contributions. Women (men) are treated if experienced a shock to distance to minimum retirement of >= 7 (>= 4) years after 2011 reform. Years 2008 and 2010.

Table 3: Effects of the longer working horizon on working status

	women 52-59 [1]	women 44-51 [2]	women 36-43 [3]	men 57-64 [4]	men 49-56 [5]	men 41-48 [6]
			Dep. Var: *1=active*			
$T_q * post2011_t$	0.023***	0.008**	0.008***	0.002	-0.000	-0.004
	(0.004)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)
			Dep. Var: *1=unemployed*			
$T_q * post2011_t$	0.011***	0.009***	0.004	0.001	-0.012*	-0.004
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.008)
			Dep. Var: *1=employed*			
$T_q * post2011_t$	0.012**	-0.001	0.004	-0.001	0.011	0.001
	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.008)
			Dep. Var: *1=employed full time*			
$T_q * post2011_t$	0.013***	0.012***	0.005	0.006	0.014*	0.008
	(0.005)	(0.004)	(0.006)	(0.007)	(0.007)	(0.010)
			Dep. Var: *1=employed part-time*			
$T_q * post2011_t$	0.001	-0.014***	0.001	-0.007**	-0.002	-0.011**
	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.006)
			Dep. Var: *1=employed permanent contract*			
$T_q * post2011_t$	0.009*	-0.003	0.001	0.004	0.006	-0.009
	(0.005)	(0.004)	(0.005)	(0.007)	(0.007)	(0.008)
			Dep. Var: *1=employed temporary contract*			
$T_q * post2011_t$	0.005	0.001	0.005*	-0.005	0.005	0.006
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.007)
N	3500	4458	3277	2256	5841	4992

Notes: Interacted fixed effects for age, sector and type of employment, and years of contribution. Additional controls: region and sector fixed effects, time fixed effects, marital status. women with more than 5 accrued years of contribution; men with more than 20 years of contribution. Robust standard errors clustered at age-sector-type-years of contribution level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Effects of the longer working horizon on working status- educated

	women 52-59 [1]	women 44-51 [2]	women 36-43 [3]	men 57-64 [4]	men 49-56 [5]	men 41-48 [6]
			Dep. Var: *1=active*			
T*p2011	0.027***	0.009	0.009	0.001	-0.000	-0.005
	(0.007)	(0.007)	(0.006)	(0.007)	(0.005)	(0.004)
T*p2011*high edu	-0.014*	-0.003	-0.003	0.005	0.002	0.003
	(0.008)	(0.007)	(0.006)	(0.010)	(0.006)	(0.004)
			Dep. Var: *1=employed*			
T*p2011	0.008	-0.009	-0.002	-0.010	0.016	0.004
	(0.008)	(0.008)	(0.009)	(0.012)	(0.012)	(0.014)
T*p2011*high edu	-0.001	0.009	0.007	0.022	-0.010	-0.006
	(0.009)	(0.008)	(0.009)	(0.016)	(0.014)	(0.015)
			Dep. Var: *1=unemployed*			
T*p2011	0.018***	0.018***	0.012	0.009	-0.018	-0.007
	(0.006)	(0.005)	(0.007)	(0.010)	(0.011)	(0.014)
T*p2011*high edu	-0.013**	-0.012**	-0.010	-0.018	0.014	0.007
	(0.006)	(0.005)	(0.008)	(0.013)	(0.013)	(0.015)
N	3500	4458	3277	2256	5841	4992

Notes: Interacted fixed effects for age, sector and type of employment, and years of contribution. high edu is a dummy equal to 1 if individuals obtained at least the secondary school degree. Additional controls: region and sector fixed effects, time fixed effects, marital status. women with more than 5 accrued years of contribution; men with more than 20 years of contribution. Robust standard errors clustered at age-sector-type-years of contribution level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Cross effects among partners of the longer working horizon on labour force status

Dep. var:	1=active		1=employed		1=unemployed	
	wife [1]	husband [2]	wife [3]	husband [4]	wife [5]	husband [6]
$T_q * post2011_t$ wife	0.019***	0.005**	0.013**	0.002	0.006	0.002
	(0.005)	(0.002)	(0.006)	(0.004)	(0.004)	(0.004)
$T_q * post2011_t$ husb	-0.001	-0.000	-0.001	-0.002	0.000	0.000
	(0.007)	(0.004)	(0.008)	(0.008)	(0.005)	(0.007)
N	2301	2301	2301	2301	2301	2301

Notes: Separate fixed effects for age, sector and type of employment, and years of contribution. Additional controls: region and sector fixed effects, time fixed effects. Women aged 44-59, men aged 49-64. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.