The Effect of a Longer Working Horizon on Individual and Family Labour Supply*

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Abstract

When search is costly, the returns from a job depend on its expected duration; in pensions systems in which individuals tend to retire as soon as they reach eligibility, a longer distance to retirement may not only affect the labour supply of individuals around the eligibility threshold, but it may also boost the search effort of younger individuals, whose working horizon has increased. This paper estimates the comprehensive labour supply responses to a longer working horizon at the individual level and at the household level. Identification exploits the latest pension reform implemented in Italy in 2012, which significantly increased the minimum retirement age, heterogeneously across narrowly defined cells. To isolate the effect of a longer working horizon to the one related to postponed eligibility and, thus pension income, we focus on individuals who were not eligible for retirement even under the pre-reform rules. We estimate sizeable positive effects on female participation at all ages (between 45 and 59), but no response of men. Within families, a longer wife's working horizon also raises her husband's participation; the opposite effect does not seem to be in place.

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1 Introduction

Aging is one of the major challenges faced by developed economies in this century, as it puts enormous pressure on fiscal systems and it threatens the sustainability of Pay As You Go pension regimes. Since the '90s, governments responded by implementing different types of pension reforms. Delaying the mandated retirement age and therefore postponing the age at which pension benefits can be claimed has been a widely adopted one, with the ultimate effects of lowering the number of pension recipients and of potentially enlarging the tax base through positive labour supply effects (OECD, 2015).

Whether this policy actually increases the labour force participation of the elderly is not *a priori* obvious, however. The available evidence regarding the elasticity of labour supply to pension eligibility is mixed; it depends on the availability and the generosity of other welfare programs (like disability benefits, see Arpaia et al. (2009) for a discussion), or on the development of private pension schemes which allow individuals to retire even if they do not reach eligibility for a public pension. The available evidence tends to find positive but rather small effects, therefore inducing policy-makers to question the fiscal efficacy of these reforms. The labour supply responses of a higher retirement age may, however, not be limited to the mechanical effect on older individuals, who would have been eligible to retire before the increase in the legal retirement age.

Indeed, the macroeconomic literature identifies a labour supply channel which affects all individuals and operates through the length of their working horizon. In Social Security systems where people retire as soon as they become eligible (like the European ones that impose heavy taxes on continued working activity after retirement, see Gruber and Wise (2004)), the working horizon is delimited by the minimum retirement age, which affects the duration and, thus, the value of a job.[1] In models in which search is costly and there are search frictions, delaying the pension eligibility increases the expected returns on a job and affects the labour market behaviour of all individuals, inducing them to participate more in the labour market. However, the effect on employment might be ambiguous; the longer working horizon allows individuals to be less impatient in accepting a job and it increases their reservation wage. In addition to individual level responses, the labour supply effect may be amplified or reduced through intra-household spillovers, as changes in one partner's distance to retirement may also have effects on the other partner's labour supply. Suppose that an individual's participation increases in response to her longer working horizon; her partner's working behaviour may change, for instance by reducing his own labour supply (effects via the household budget constraint) or by increasing it, in the impossibility of enjoying leisure together (effects given by the presence of leisure complementarities).

This paper provides a quantification of the distance to retirement effect, both at individual and at the family level. We go beyond the estimates of the mechanical effect on labour participation derived from the immediate, but temporary, loss of the pension eligibility criteria (which means that the availability of pension income is delayed at older

[1] This literature uses this effect to explain the low employment rates of the elderly, even when they are still not eligible for claiming pension benefits. Before the massive pension reform implemented in Italy, in 2011 the employment rate for individuals aged 55-64 (37.8%) was about half of that of younger age classes (72.2% for 45-54 y.o.; 74.6% for 35-44; 65.3% for 25-34), with the exception of the youngsters (15-24).

ages), and we focus on participation and job search behaviours of younger individuals, whose working horizon increases, and of their partners, who may respond as well via intra-household interactions.[2] To solve for the endogeneity between the duration of one's working life and her labour supply decisions, the empirical analysis exploits changes in the minimum retirement age (from now on MRA) induced by an Italian pension reform that took place in 2012[3] and that increased MRA, on average, by 4 years. Since the mandated increase in MRA was highly heterogeneous, mainly depending on workers' gender, previous contributory history and year of birth, we source on detailed individual level data from the Bank of Italy's Survey on Household Income and Wealth (SHIW) to estimate a difference-in-differences model that exploits variation in the extension to MRA within narrowly defined cells. Most of the within-cell variation comes from the amount of previously accrued years of contribution. In particular, for women, the reform mostly intervened on the age requirements needed to obtain the old age pension, for which a limited number of accrued years of contribution is needed, while for men the increase was mostly concentrated on the seniority pension requirements, exclusively based on the number of accrued years of contribution. Therefore, the reform affected more strongly women with more discontinuous working lives and men with more continuous working lives. The estimated effect is allowed to vary according to two a priori relevant dimensions, gender and age class.

We find that an increase in the working horizon set by a delayed MRA has positive effects on labour supply, employment and unemployment probabilities along the entire life-cycle for women. Overall, the probability of participating in the labour market increases by 2.6 percentage points for women between 55 and 59 years old, by 1.5 percentage points for women aged between 50 and 54 and by 0.8 percentage points for women in their late 40s. While the increase in participation translated into an increase in the employment probability for women aged between 55 and 59, it mostly fed the unemployment probability for younger women. The effect, moreover, is mostly concentrated on lower educated individuals: their labour supply is typically more elastic as their marginal benefit in terms of search activity (and therefore of a better match) from the longer working horizon is higher. Much smaller effects are found for men, compatibly with women's greater labour supply elasticity. Our comprehensive set of estimates allows us to infer that about one third of the growth in the activity rate of Italian 15-64 year-old women between 2010 and 2014 can be attributed to the reform-induced increase in the working horizon, which also explains about 19% of the increase in the share of unemployed women observed in the same period.[4] Moreover, we find that the effect on women's labour supply has significant spillovers within the household. Our estimates suggest that

[2]The longer working horizon is measured by increases in the number of year the individual is far from reaching the minimum retirement age for pension eligibility. The latter might imply also reductions in future pension wealth. Since individuals do not seem particularly accurate in predicting their future pension wealth(Bottazzi et al., 2006), we are quite confident that we actually estimate the effect of the longer working horizon only.

[3]The minimum retirement age is the minimum age at which an individual can retire under either the old age or seniority pension system. Section 5 provides a detailed description of how this variable is built.

[4]These effects come from the increase in the working horizon of individuals who would not have been eligible to retire in any case, they therefore exclude the possible direct effect coming from the postponement of the pension eligibility criteria for those who would have been eligible otherwise.

husbands are induced to increase their labour supply if their wives' working horizon increases. A one year increase in the wives' working horizon increases their husbands' labour supply by 1.4 percentage points, mostly because men postpone their retirement decisions. The contrary does not seems to hold, maybe because there is no direct effect on men in the first place. Overall, spillovers within the family extensively amplify the direct individual effect, by affecting men's labour force participation as well.

The literature investigating the labour supply effect of a longer working horizon, net of the mechanical response of individuals who would have been eligible to retire but whose pension income is postponed, is rather scarce. Indeed, most of the previous studies focuses on the elasticity of retirement and employment of the elderly to the pension eligibility threshold (Song and Manchester, 2007; Liebman et al., 2009; Mastrobuoni, 2009; Staubli and Zweimüller, 2013; Manoli and Weber, 2016). Isolating the distance to retirement effect is instead rather demanding, as it requires to find and measure exogenous changes in the individuals' expected retirement age. The Italian setting allows us to overcome many of the reasons why these types of tests are rarely implemented in practice. The increase in the mandated retirement age induced by the 2012 pension reform in Italy was sizeable and well-understood by the majority of the population, probably because of the inflamed public debate around this reform, which, even if necessary for the sustainability of public finances, were considered too onerous for the population. Moreover, the increase was largely heterogeneous, depending on one dimension, the continuity of individuals' previous working life, which we can observe in our data. This provides us a suitable control group for our difference-in-difference estimation. To our knowledge, only Hairault et al. (2010) provide causal evidence of the distance to retirement effect on individual labour supply.[5] They take advantage of a pension reform implemented in France in the '90s, which increased the mandated retirement age for old age pensions by about one year per cohort. Since they do not observe the number of accrued years of contribution and they proxy them by using age at first job, their analysis restricts to men who are more likely to have continuous careers. They study the response of individuals older than 57 and find the effect to be positive but non significant, maybe because of the small sample size. We extend the analysis to women, the group with the highest expected elasticity to the policy change, and to individuals in a broader set of age classes (in particular those in their 40s and 50s).[6] Moreover, we do not limit our analysis to the effects at the individual level but we investigate how the effect is magnified or reduced by intra-household responses. Our paper therefore speaks also to the literature on family labour supply and retirement decisions. The existing studies on family's behaviours mainly focus on partners' joint retirement and participation decisions (Coile,

[5]Following their analysis, also Sabatier and Legendre (2017) analyze the distance effect on a different French data source which contains information also on health status. They show that the poor health status amplifies the distance effect, which is small on average. Distance to retirement seems to positively affect also older male workers' participation to training programs (Montizaan et al., 2010; Brunello and Comi, 2015) and healthy behavior of middle-age workers (Bertoni et al., 2017): workers try to take advantage of the increased returns to job.

[6]Engels et al. (2017) also look at the labour market effects of pension rules on non eligible individuals, called anticipation effects. They do not identify a distance effect since the reform they exploit introduced monetary disincentives for early retirement and did not change the mandated retirement age. The anticipation effect for women aged 55-59 is positive regarding employment, negative on unemployment. These effects are not evaluated for younger cohorts, as we do.

2004; Hospido and Zamarro, 2014; Bloemen et al., 2015; Lalive and Parrotta, 2017) and their time allocation after retirement (Stancanelli and Soest, 2012; Ciani, 2016). They tend to find large within-household interactions, which importantly amplify the individual direct effects. We contribute to this literature by providing estimates of how partners' distance to retirement affects the overall family labour supply. We show that participation and retirement decisions depend not only on partners' pension eligibility, both at the individual and at the family level, but also on how far they are to retirement eligibility.

From a policy perspective, our results support the effectiveness of policies aimed at postponing the mandated retirement age in boosting labour market participation, especially of those population groups less attached to the labour market - low educated women. We find evidence that, in settings in which individuals retire once they reach pension eligibility, a higher MRA generates a positive labour supply effect, which involves individuals (and their partners) at younger ages through their longer working horizon.

The remainder of the paper is organized as follows: Section 2 introduces a conceptual framework that informs our empirical analysis; Section 3 provides a short description of the dataset; Section 4 introduces the Italian pension system and describes the reform exploited in the empirical analysis for the identification of the estimated effects; our empirical strategy is then explained and discussed in Section 5; in Section 6 we report the results of the empirical analysis both at the individual and at the family level; we also provide some robustness checks to validate our identification. Section 7 concludes.

2 Conceptual framework

It is a quite well-known fact that participation and employment rates are lower as people approach their mandated retirement age (OECD, 2015); among the advocated causes there is the availability of early retirement schemes or of other welfare programs like unemployment or disability benefits. The macroeconomic literature claims, in addition, that the low employment of the elderly may be explained by the different incentives to look for a job individuals have over their working life. In systems characterized by an implicit tax on continued working activity after having reached pension eligibility, workers retire as soon as they reach the mandated retirement age, which defines the length of the working horizon. In this literature (Seater (1977); Ljungqvist and Sargent (2008); Chéron et al. (2011); for a review see French and Jones (2012)), if search is costly and there are search frictions, older workers are less prone to participate in the labour market since the returns to work are lower: the shorter the payoff period, the smaller is the return. The implications for employment are ambiguous: on the one hand, the smaller returns from work reduce search effort, and thus have negative effects on participation and employment (*search effort effect*); on the other hand, they reduce the benefits of an additional period of search, implying lower reservation wages and lower unemployment (*reservation wage effect*). Hairault et al. (2010) theoretically prove that the first effect is likely to dominate the second one, when unemployment benefits and separation rates are both high; in this way they show how distance to retirement explains part of the low employment rates observed for the elderly in France.[7]

[7] Sabatier and Legendre (2017) theoretically derive the distance effect in a job search model with infinite horizon, where individuals are heterogeneous in distance to retirement and health status, which

In these models, individuals are heterogeneous with respect to age, which drives the heterogeneity in the length of the residual working horizon given that the mandated retirement age is equal for all. We use this setting to rationalize why we expect that an increase in one's own working horizon should augment the returns from work especially of older cohorts, given their lower number of periods of residual working activity relative to the youngsters. It will increase their participation, while the magnitude of the unemployment and employment effect depends on the factors like the availability of generous unemployment benefits and frictions on the labour market. In the empirical analysis, within each age bracket, we explicitly exploit the heterogeneity in the length of the working horizon among individuals otherwise similar.

Given the relevance of within household interactions in shaping individual behaviour and response to policies (see, for example, Ashenfelter and Heckman (1974); Blundell et al. (2007); Stancanelli and Soest (2012)), it is likely that the distance effect may indirectly affects also partner's labour supply. In the framework developed by Guler et al. (2012), under the assumption of income pooling between partners, having a partner active on the labour market, in particular if employed, represents an income buffer that allows the other spouse to look for a better job offer or to become inactive. This effect works via the household budget constraint; it may however be countervailed by the one determined by the existence of leisure complementarities: in the impossibility of enjoying leisure together, the higher participation of one partner induces also the other spouse to increase participation (see, among others, Blau (1998), Goux et al. (2014) and Gelber (2014)). The overall effect on participation for the entire household is thus ambiguous.

3 Data

In our analysis, the 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 households and 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 2004 to 2014, which include the years around the pension reform we analyze. 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, importantly, on accrued years of contribution; this allows us to build for each individual the MRA on the basis of the eligibility rules at place each year. Moreover, being a survey, it has the advantage of providing information on expected working life and expected replacement rate, which allows us to support our identifying assumption and the soundness of our approach. Finally, it provides information on labour supply of both spouses within a household, necessary to test for within family interactions.

Despite there is a panel component, for our analysis we only use repeated cross

both affect the cost and the efficiency of job search. The reservation wage effect does not work in a model with infinite horizon. In equilibrium, the smaller distance to retirement implies lower search effort and poorer job opportunities, thus lower employment; the effect is amplified for poor health individuals. The non-participant status is not explicitly modeled.

sections, because the panel is short and covers only half of the original sample.

4 The Italian pension system and the recent pension reforms

The Italian pension system is based on two types of benefits linked to the working activity: the old age and seniority pensions. The first entails that individuals retire after having achieved a certain age, the second entails that they retire once they accrue enough years of contribution. At the end of 2011, during the sovereign debt crisis, when the stability of the Italian fiscal system was at risk, a substantial pension reform,, which affected both systems by introducing stricter eligibility rules, was announced and implemented few days later (Law 22 December 2011 n. 201, known as "Fornero Reform") .[8]

As for the old age pension, before the reform the retirement age was 60 for women and 65 for men. Eligibility also required a minimum number of accrued years of contribution (at least 20 years for individuals who had started to work before January 1 1996; at least 5 years for those who had started to work after January 1 1996). The Fornero pension reform exacerbated both criteria. [9] It smoothly increased the retirement age for all workers up to 67 by 2020 and required at least 20 accrued years of contribution for everybody. Simultaneously, the reform allowed all individuals to retire at 70, as long as they have accrued at least 5 years of contribution.

Before the Fornero reform, in order to qualify for seniority pensions, 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 years of contribution; 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.[10] However, women were allowed to still retire at age 57, as long as they had accrued at least 35 years of contribution, but at the cost of a slightly lower pension benefit (the so-called "women's option"); while before the reform this option was not exploited, after the reform it started to be a valuable option (see Italian Institute of Social Security (2016) for more details). Finally, workers who were already eligible for a public pension when the bill passed could still retire with the pre-reform rules.

The different retirement age by gender, cohort, sector and previously accrued years of contribution implies that individuals have been differently affected by the reform in terms of length of the residual working period before retirement. In particular, women were particularly exposed to the change in the old age pension rules; men, instead, were more affected by the changes in the eligibility criteria for the seniority pension.[11] Panel

[8] At the end of 2010 another pension reform was implemented only in the public sector (Law 30 July 2010 n. 122, known as "Sacconi Reform"). We do not take advantage of it since we do not have data for 2011.

[9] 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.

[10] In 2013 minimum required years of contributions rise to 43 for men and 42 for women; from 2014 onward to 44 for men and 43 for women.

[11] In any case they always retire as soon as they reach eligibility under any of the two regimes, but for women with very few years of contribution this may still imply for instance that they wait seven years,

a of Figure 1 clearly shows this difference. The dashed line refers to the retirement age under the old age pension system: it went from 60 to 67 for women, and from 65 to 67 for men. The dotted line, instead, reports the average retirement age under the seniority system, given the existing distribution of years of contribution in the population of men and women. For men the increase in the average retirement age for seniority pension was greater, both because of the absence of the "women's option" and because their more continuous working lives allowed them to reach 40 years of contribution more easily (or the eligibility criteria under the "quota system") and to retire well before the age of 65 before 2011. On average, women's minimum retirement age increased from 60, under the old age system, to 64, under the seniority system; from men it increased from about 63, under the quota system, 50 67, under the old age system.

5 Identification strategy

Several identification issues hinder the estimation of the causal effect of a longer working horizon on labour supply. For instance, in a job search model, individuals with better employment opportunities are more likely both to have a longer working horizon and to supply more labour, independently of the direct effect of a longer expected job duration on the probability of looking for a job. A simple comparison of the labour supply of individuals with longer or shorter working lives would therefore be misleading.

We solve the endogeneity problem by exploiting exogenous changes to the MRA induced by the pension reform described above. Our identification strategy compares overtime the labour supply of individuals more and less exposed to the increase in MRA.

We compute the degree of exposure to the policy of each individual, by constructing cells (denoted as q) based on the full interaction of all the characteristics needed to determine MRA in Italy (age, gender, years of contribution and sector of employment)[12]. We create a time invariant measure of exposure to the shock, by taking the difference between the expected MRA under the post-reform and the pre-reform rules ($T_q = MRA_{q,2012} - MRA_{q,2008}$, which determines the cross sectional variation of our shock).

In order to obtain the expected MRA before and after the reform for younger individuals ($MRA_{q,2008}$ and $MRA_{q,2012}$), we need to make assumptions about the expected amount of accrued years of contribution at the end of individuals' working careers. Throughout the paper we assume that individuals in our sample will accumulate years of contribution continuously from the year of the interview onward; this means we mainly only exploit heterogeneity in the continuity of their working life in place before the reform. Even if this assumption may appear problematic for women, whose working life is usually more fragmented, this is the most restrictive choice, as, if anything, we are overestimating the probability that they retire under the seniority regime and we are therefore underestimating their expected shock to MRA. Moreover, using the administrative records of the Italian Social Security Institute, we find that the discontinuous spells in individuals' careers are concentrated before the age of 35 (because of maternity leave periods or longer study paths) and after 60. Comparing the actual contributory histories obtained from the administrative records, we find that the error generated by assuming continuous working

because they may still not manage to reach 35 years of contribution before the age of 67.

[12]This refers to the usual sector of employment for not employed individuals.

lives under a four year horizon would be on average of 1 year and 3 months for individuals in their mid 30s, of about 1 year for individuals in their mid 40s and of about 9 months for individuals at their mid 50s; the error is more than halved if we consider individuals with more continuous working lives (with at least 10 years of experience). For these reasons, to minimize the possible error generated by this assumption on future contribution years, we exclude from our sample individuals aged less than 45 and those very little attached to the labour market, with less than 10 years of contribution.

Panel a of Figure 2 describes the distribution of the size of the shock to distance to MRA induced by the reform across the population of women, which allows us to identify our control and treatment group for the difference-in-differences analysis. A simple example illustrates one source of the variation in the shock (Table 2). Consider two women, Maria and Antonia, aged 58; they differ in the number of total accrued years of contribution, respectively 35 and 26, because of differences in the continuity of their working lives. Before the reform, the MRA at which Maria could retire was 58 (under the seniority pension regime); after the reform, she could still retire at 58, exploiting the so-called "women's option", because at age 58 she would have accrued enough years of contribution. As for Antonia, her MRA corresponded to the mandated retirement age for the old age pension, 60, before the reform. Since after the reform it became 67 and since she is not eligible for the seniority pension because of the smaller number of accrued years of contribution, she will have to wait to be 67 to retire. The reform increased the length of the working horizon differently for Maria and Antonia: the former experiences a null increase, the latter a 7 years increase. Figure 2 shows that roughly 20% of women experiences a 7 year shock (like Antonia), because they accrued few contribution years and have to wait till they reach the new MRA for the old age regime after the reform. About 40% of women does not experience a shock, because they can still retire under the seniority regime, using the "women's option". Panel b of Figure 2 reports the distribution of the shock for men. The source of variation in the shock for men is different: those who experienced a larger shock are men who would retire under the quota system before the reform (Mario or Luigi in the example of Table 2), because there is no "women's option" for men; those who experienced a smaller shock are instead men who would have retired under the old age system (like Valerio in the example, whose MRA increased from 65 to 67) and men who started to work very early and could retire with 40 years of social contribution before the reform, 43 after the reform (like Giovanni in Table 2). Figure 2 confirms that, a part from rounding, the minimum T_q for men is 2 years (for men who retire under the old age system at 67 instead of 65); the maximum is 7 years (for men who could have retired under the 97 quota before 2012 -if they were aged at least 62 with at least 35 accrued years of contribution- and have to wait till they achieve 43 years of contribution after the reform).

To capture the variation in distance to retirement exclusively induced by the pension reform, 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. The reduced form specification for individual i's labour force status is:

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

where T_q is the change in the distance to retirement imposed on the cell q by the reform ($MRA_{q,2012} - MRA_{q,2008}$, described in Figure 2), a time invariant measure of exposure to the policy;[13] $post2011_t$ is a dummy that indicates the post reform period; W_{iqt} is a vector of controls at the individual level;[14] α_t are year fixed effects, absorbing long term or cyclical developments that affect all individuals in the same way, and α_q are the fixed effects for each cell q, absorbing variations in labour supply that depend on years of experience, age or sector of employment. Moreover, α_q absorb all pre-reform differences in distance to MRA. The coefficient β_1 therefore estimates the average labour supply differences between cells with longer or shorter working horizons, exclusively depending on their degree of exposure to the policy, around its implementation. Finally, ϵ_{iqt} is an error term. Standard errors are clustered at the cell q level, which defines the cross sectional level of variability of the treatment.

In order to capture changes in labour force status of individuals who were actually exposed to the policy, we exclude from the sample retired individuals and those who could have retired but chose not to, because they represent a very selected sample of the population. In other words, we exclude individuals whose $age_{qt} > MRA_{qt}$. Moreover, since our identification is based on the comparison of participation rates of individuals who were not eligible to retire under any scenario (neither before nor after the reform), we exclude from the sample those whose $age_{qt} > MRA_{q2008}$.[15] In this way we isolate the effect of a longer working horizon from the mechanical effect coming from the loss of the pension eligibility after the reform. 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 accrued years of contribution, as well as individuals younger than 45. Our results are robust to changes in the considered sample.

To fully evaluate the aggregate labour supply effect of increasing the time horizon, we also consider interactions within the family. For instance, a positive effect of a longer working horizon on women labour supply may affect also their husband's participation or employment probability, positively in the presence of leisure complementarities or negatively in the presence of income effects. To study these interactions, we apply the same strategy as in equation (1) to married or cohabiting couples only. We estimate the labour supply effect on each partner $s = \{w, h\}$ belonging to couple j of an increase in the distance to retirement of partner $s' = \{w, h\}$, where s can be equal or different from s'. In particular, we run the following linear probability model, for both partners:

$$Y^s_{jq_sq_{s'}t} = \beta^s_1 T_{q_{s'}} * post2011_t + \beta^s_2 W_{jt} + \alpha^s_{q_{s'}} + \alpha^s_t + \alpha^s_{q_s} + \epsilon^s_{jq_sq_{s'}t} \tag{2}$$

where $Y^s_{jq_sq_{s'}t}$ is a dummy that indicates the labour force status of spouse s in household j belonging to cell q_s and whose partner s' belongs to the age-contribution cell $q_{s'}$; $T_{q_{s'}}$ is the time invariant indicator of the cells more exposed to the policy based on the observable characteristics of partner s'; $post2011_t$ indicates the post reform period; W_{jt} is a vector of controls at the individual and household level (region of residence, the difference in

[13] We attribute to each cell q for all years the change in distance to retirement T_q experimented by the same cell q in the post reform years.

[14] Marital status, region of residence, usual sector of employment.

[15] Women older than 59, men older than 64, individuals with more than 40 years of contribution and individuals eligible to retire under the quota system.

distance to retirement and age among partners); α_t^s are year dummies and $\alpha_{q_s}^s$ and $\alpha_{q_{s'}}^s$ are fixed effects for the cell q_s and $q_{s'}$ based on the characteristics of partner s and s', respectively. In order to absorb changes in s's labour supply induced by variation in her own MRA, in our controls W_{jt} we include partner s shock to distance to retirement. Finally, $\eta_{jq_{s'}t}^s$ is an error term. The coefficient β_1^s estimates the labour supply response of partner s to a longer distance to retirement of partner s'.

We apply the same restrictions as in equation 1, for partner s'. We do not distinguish, however, by age classes, in order to enlarge the sample size, given the high number of controls. In particular, for the regressions where wives are treated, we consider women aged between 45 and 59 with at least 10 accrued years of contribution; for the regressions where husbands are treated, we consider men aged between 45 and 64 with at least 20 accrued years of contribution. In order to capture the full response of the other partner s, even if already eligible to retire, we do not impose restrictions for partner s.

6 Results

This section presents our main results. First, we present some descriptive statistics of our selected sample (subsection 6.1); second, we test the credibility of our main identifying assumptions (subsection 6.2). Finally, we discuss the results we obtain at the individual level, also studying the heterogeneity of the effect (subsection 6.3), and we analyze the presence of spillovers across partners to quantify the overall effect of a longer working life on the labour force participation rate (subsection 6.4).

6.1 Descriptive statistics

The top panel of Table 3 shows some descriptive statistics about the groups of women and men, more and less exposed to the changes in the pension rules in our sample.[16] Columns 1 and 5 report statistics for the entire sample of women aged 45-59 and men aged 45-64, respectively; Columns 2 and 6 display descriptives for our sample (of individuals not eligible to retire either before and after the reform, and attached enough to the labour market, so to be affected by the change in the working horizon).[17] Individuals in our sample are slightly younger, as we are excluding those eligible to retire (and those retired), and display higher participation rates. Finally, Columns 3 and 4 (and 7 and 8) split the sample between those more or less exposed to the pension reform. Consistent with our discussion above, the table confirms that the most affected among men are the ones with more continuous working lives (with more years of contribution on average with respect to their age, with the exception of those who started to work very early and could retire with 40 years of contribution before the reform, who only experience a three year shock after the reform); while among women, the most affected by the shock are those with more fragmented working lives (who accrued less years of contribution relatively to their age).

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

[17] As stated in Section 5, we exclude women with less than 10 and men with less than 20 years of contribution, as they are in any case very far away from pension eligibility.

The bottom panel of Table 3 displays some descriptive statistics of the couples we consider for our analysis, distinguishing those treated because of a larger shock to the wife's distance to retirement (and the corresponding control group, Columns 1 to 4) and those treated because of a larger shock to the husband's distance to retirement (and the control group, Columns 5 to 8). The table confirms that the wives most exposed to the policy are those with more fragmented working lives, while the most exposed husbands are those who accrued more years of contribution during their working life. Importantly, partners belonging to couples in which either the wife or the husband is treated, are less likely to participate in the labour market than individuals directly treated (Column 6 and 2 of the top panel). The reason is probably that we are not imposing any restriction on the sample of partners, therefore we are including also older individuals already eligible to retire and less attached to the labour market as well as housewives.

Panel b and c of Figure 1 provide some preliminary evidence in support of the presence of a distance to retirement effect, especially among women. They show that for women aged 60 to 65 the participation increased from less than 15% to about 30% after 2012; for men from about 30% to 50%. However, also the labour supply of younger individuals, women in particular, not yet eligible for retirement (aged between 40 and 55), increased after 2012.

6.2 Supporting evidence on the identifying assumptions

Our estimation strategy relies on three main identifying assumptions. The first is that individuals tend to retire as soon as they reach the MRA, so that changes in MRA truly affect the actual retirement age and the actual working horizon. Figure 3 provides evidence in support for the first hypothesis; it shows that a large fraction of individuals retires as soon as they become eligible (i.e. when $MRA = age$), meaning that changes in MRA translate into changes in actual retirement age. The figure plots the probability of being a pensioner, depending on each individual's distance to retirement eligibility ($MRA - age$) 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), Ciani (2016) and Manacorda and Moretti (2006)).[18] This evidence supports the view that the tax on continued activity is relevant in Italy, as the pension system is still not completely actuarially fair. Moreover, the fast sequence of changes in retirement eligibility rules might have introduced uncertainty about the rules in the next future, inducing workers to retire as soon as they become eligible.

Second, our empirical strategy relies on the assumption that individuals actually modify their expected retirement age according to the new rules introduced by the pension reform. This would imply, for instance, that the expected retirement age of women with more discontinuous working lives, who think they would retire under the old age regime (our treatment group), increased more after 2011 than the expected retirement age of women with more continuous working lives, who would probably retire under the seniority regime (our control group). The top panel of Figure 4 provides support to this second

[18] 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.

assumption; it shows that, in our sample, women with more fragmented working lives expect their retirement age to increase more after 2011 than women with more continuous working lives. Vice versa, the increase in expected retirement age after 2011 among men who accrued less years of contribution (our control group) is smaller than that of men who accrued more years of contribution and therefore expect to retire under the quota system (our treatment group). Finally, the bottom panel of Figure 4 shows how the developments of the participation rates of groups with more or less continuous working lives seem to mirror the evolution in the expected retirement age, especially for women.

Third, as standard for the estimation of difference-in-difference models, we need to show that the trends in participation rates would have been parallel for individuals with different exposure to the shock, absent the change in the pension rules. In order to test for this assumption, we show that the difference in the labour supply behaviour of individuals with different exposure to the shock was constant before 2012 and starts changing exactly after the introduction of the new pension rules, in 2012. We estimate the following equation for men and women separately:

$$Y_{iqt} = \sum_{r=2006}^{2014} \gamma_r \left(T_q * \delta_r\right) + \gamma W_{iqt} + \delta_q + \delta_t + \eta_{iqt} \tag{3}$$

where all variables are defined as in equation (1) and δ_r are year dummies.

We repeat the same exercise for the within family estimation, by estimating the following equation:

$$Y^s_{jq_sq_{s'}t} = \sum_{r=2006}^{2014} \zeta^s_r \left(T_{q_{s'}} * \alpha^s_r\right) + \beta^s W_{jt} + \alpha^s_{q_{s'}} + \alpha^s_t + \alpha^s_{q_s} + u^s_{jq_sq_{s'}t} \tag{4}$$

where again all variables are defined as in equations (2) and α^s_r are year dummies.

The coefficients γ_r and ζ^s_r of equation (3) and (4) show how the difference in the outcomes Y_{iqt} (or in their spouse's outcomes $Y^s_{jq_sq_{s'}t}$) between individuals (i or s') belonging to the most and the least exposed cells q evolves over time, with respect to the omitted, pre-reform, year. 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 the omitted year, and positive after the reform, if the longer working horizon actually boosts individuals' labour supply. Figure 6 displays the coefficients γ_r and the corresponding confidence intervals obtained from estimating equation (3) for women and men (panels a and b, respectively). It shows that for both women and men, the trend was parallel before the 2011 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. In the same way, the figure displays the coefficients ζ^s_r and the corresponding confidence intervals obtained from estimating equation (4) for wives and husbands (panels c and d, respectively). In particular, it displays the cross-partner effects and it shows that the trend in the participation probability of both wives and husbands, whose partners were differently exposed to the policy, was parallel before the 2011 reform.

Finally, the Fornero reform, in addition to increasing the mandated retirement age, changed the pension benefit formula moving individuals with at least 18 years of accrued

contribution by January 1996 from a defined benefit to a defined contribution pension scheme for the years after 2011 (therefore linking the pension benefit to the total amount of years of contribution accrued over post 2011 years rather than the last earned wages). We check whether this change differently affected individuals depending on the continuity of their working life (i.e. on whether they belong to our treatment or control group); if this is the case, the interpretation of our treatment will change, as the effect would not only come from the longer distance to retirement but also from the difference in the expected benefits. In Figure 5 we use the question in our dataset asking about the expected replacement rate; the figure shows that, while the expected replacement rate lowered around 2012 for everybody, we do not detect different changes across individuals with different degree of continuity of their previous working life. This may be due to the fact that the change in the pension benefit formula was small[19] and involved a limited fraction of the population relative to the change in MRA; according to our estimates less than 30% of individuals in our sample was affected by the change in the pension benefit formula.[20] Moreover, individuals do not seem particularly accurate in predicting their future pension wealth (Bottazzi et al., 2006).

6.3 Direct labour market effects at the individual level

Table 4 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. We choose to split our analysis by gender, both because men and women tend to have heterogeneous labour supply responses and because they have different MRA. We consider different age classes: Columns 1, 2 and 3 report results for women aged 55-59, 50-54 and 45-49, respectively; Columns 4, 5 and 6 report results for men belonging to the same age-classes as shown for women. We chose 5 year long intervals so to have three age brackets and not to look at individuals too young, for whom the assumptions on total expected accrued years of contribution at the end of their working life are more problematic (and also the distance to retirement effect is less likely to be at work).

We find that increasing the length of the working life has a positive effect on female labour force participation for all the considered age classes. The effect is larger for individuals at the end of their working life. These are individuals who would not have been eligible to retire even before the reform, but who may probably respond more because they need to respond more quickly, since they will retire sooner in any case. In particular, we find that if the length of the working life increases by one year, the labour supply increases by 2.6 percentage points for women aged 55-59, by 1.5 ppt. for women between 50 and 54 and by 0.8 ppt. for younger women (45-50). The increased labour supply translates into

[19]The pension benefit will be computed under the defined benefit scheme for the years of contribution accrued before 2012, under the defined contribution scheme for later years of contribution. Since the change involved individuals with at least 18 years of social contribution accrued by January 1996, the amount of the pension benefit computed according to the defined contribution scheme is likely negligible.

[20]We computed the share of individuals in our sample more likely to have accrued at least 18 years of contribution in 1995, by looking at whether individuals' estimated contribution year in 1995 (computed as the difference between individuals' age in 1995 and the age when they started to work times their average working life continuity) were greater than 18.

higher unemployment (for younger individuals) and into higher employment (especially for older individuals). The type of employment also changes: women are more likely to switch from working part-time to working full time, in all age classes. This evidence seems to suggest that workers respond also along the intensive margin of labour supply, and not simply by having a job in order to meet the stricter requirements in terms of accrued years of contribution.

In line with the existing literature which underlines that male labour supply is much less elastic than the female one, men do not seem to react much to changes in their working horizon. Our results for men are broadly in line with Hairault et al. (2010), who find positive but borderline significant effects of a longer working horizon for men.

As stated in the Section 2, the effect on employment might be ambiguous, given by the *search effort* and the *reservation wage* effect. In particular, if on one side the longer distance to retirement eligibility increases the returns from a job and incentivizes search effort (the first aforementioned effect), thus increasing job opportunities, on the other side it reduces the cost of waiting for a better offer, implying a prolonged unemployment status (the reservation wage effect). Our estimates across age classes seem to suggest that for older individuals the *search effort effect* dominates, translated into higher employment, while for younger individuals dominates the *reservation wage effect*, and unemployment consequently increases. In the attempt to validate this interpretation and to exclude that the unemployment effects are driven by the scarcity of jobs for relatively younger individuals, we estimate our model focussing on those Italian regions characterized by high labour demand; the underlying assumption is that, in more fluid labour markets, unemployment is not driven by the lack of jobs but by changes in the job acceptance rule. If the reservation wages were not altered by the changes in distance to retirement, the increase in participation would translate mechanically into higher employment. Table 5 shows that the effect on unemployment for women aged 50-54 persists even in the presence of high labour demand,[21] suggesting that at least part of the effect is driven by changes in the reservation wage.

Moreover Table 6 shows that our results are robust to the inclusion of age specific time trends, which absorb, for instance, cohort specific trends in labour market participation and employment prospects due to increasing level of women's education and cultural changes.

Table 7 evaluates how the effect differs by educational levels, in particular depending on whether individuals achieved at least a secondary school degree. The results show that the effect is concentrated on individuals with lower levels of education. If we take education as a proxy for permanent income, this implies that individuals with lower income are more affected by an increase in the length of their working horizon. This is consistent with the fact that labour supply elasticity is higher for lower educated- lower income individuals: by standard assumptions about concavity of the utility function, the marginal return of working one year more is higher for lower income individuals.

Overall, we estimate that the increase (by 4 years on average) in the working horizon for women aged 45-59 caused by the reform explains slightly less one third of the increase in the activity rate of women 15-64 between 2010 and 2014 and 19% of the increase in

[21] We use the ratio between vacancies and unemployed by region and year (taken from the Italian National Statistical Office) as a proxy for labour demand. We define as regions with high labour demand those with a vacancy rate higher than the highest third of the distribution of vacancy rates.

the share of unemployed women.

6.4 Within family interactions

Table 8 analyses the presence of cross elasticities within the couple. Columns 1 and 2 look at the effect of a shock to the wife's working horizon, on the wife herself and on her husband, respectively. Columns 3 and 4 report the effect of an increase in the husband's working horizon on the husband himself and on his wife. Similarly to what found in Table 4, Columns 1 and 3 confirm that there is a positive effect of an increase in one's own working horizon on women labour supply, while no effect for men. Column 2 shows that the longer wife's working horizon, and consequently higher participation, also increases the husband's participation. A one year increase in a wife's distance to retirement increases her husband's labour supply by 1 ppt., supporting the hypothesis of leisure complementarities (similarly to some of the available literature on joint labour supply decisions like, for instance, Blau (1998)). The opposite effect, that of an increase in the husband's distance to retirement on his wife's labour supply, does not seem to be in place. Probably because men do not respond to their own shock in the first place.

What appears more puzzling, however, is that husbands respond more to their wives' rather than to their own shocks (Column 2 against Column 3 of Table 8). One reason may be that, as discussed before, the sample of men in Column 2 is different from that considered in Column 3. The first group of men is much less likely to participate in the labour market (the share of participants over the reference population is, respectively, 82% and 98%), they tend to be older and some of them are probably already eligible to retire. There is, therefore, more room to increase their labour supply. The effect mostly comes, indeed, from men who decide to postpone retirement (the probability of being a pensioner decreases when the working horizon of the wife increases by one year). Some papers in the literature point out that men are particularly responsive, more than women, to their partner's behaviour (Coile (2004), Zweimüller et al. (1996) and Bingley and Lanot (2007); Goux et al. (2014) find exactly that men respond more to thier wives's shocks than to their own shocks in working hours). Zweimüller et al. (1996) suggest this may be due to asymmetric preferences concerning joint leisure, as husbands in traditional families are not used to be alone and may have stronger preferences about spending their leisure time with their wives. Moreover, even if preferences towards joint leisure are identical across partners, a difference may arise because wives can still carry on with household production while not working on the market (i.e. by providing care to their grandchildren (Battistin et al., 2014; Bratti et al., 2016) or to their elderly parents in case of younger women), while men are much less likely to be involved in housework and their non-working time is more likely to be related to leisure.

Finally, Table 9 evaluates how the within couple effect differs by level of education of the spouses, where again we use education as a proxy for permanent income and wages. The results confirm what found in Table 7: low educated individuals are the ones who respond the most to changes in their own working horizon, because their marginal utility from working more is higher. There does not seem to be instead significant heterogeneity on the spouses's responses, based on their own education level.

Overall, we show that, once we consider not only the direct effect of the longer women's working horizon on their own labour supply, but also the indirect effect on their husbands,

the overall impact on labour supply is almost twice as large.

7 Conclusions

This paper provides experimental evidence for the existence of a distance to retirement effect on labour supply. In Social Security systems characterized by implicit tax on continuing working after having reached MRA, a longer distance to the pension benefits eligibility not only mechanically affects the retirement decision of those who would have been eligible to retire otherwise, but it may also increase the labour supply of younger individuals, not eligible in any case. Such mechanism has been mainly analyzed by search models, which show that the smaller is the distance to retirement, the lower are the returns from working and looking for a job, weakening the incentives to participate in the labour market and to exert job effort. Given the relevance of intra-family interactions, we provide a comprehensive assessment of the magnitude of the distance to retirement effect by investigating whether the distance effect has spillovers on the partner's labour supply. By exploiting the difference in eligibility criteria for pension benefits across individuals' observable characteristics, we analyze the distance to retirement effect both in terms of participation, employment and unemployment, and in terms of type of employment, at the individual and at the family level.

We find that lengthening the working horizon has positive effects on participation and job search effort for individuals in younger age classes, far from pension eligibility. The effect is concentrated on women, whose labour supply is more elastic. Moreover, we estimate that there exist spillover effects within the family: in particular, men tend to increase their labour supply in response to their wives' longer working horizon, while the contrary does not seem to hold.

Overall, our estimates suggest that there exist positive labour supply responses which go well beyond the direct impact on the age groups forced to remain longer in the labour market due to the delaying of their pension benefits and the temporary loss of pension income. Our findings open important avenue for future research, i.e. it is important to understand what are the welfare costs related to this policy (for instance in terms of lost household production or leisure) and whether alternative policies, like modifying the tax schedule for older workers, may generate higher welfare gains.

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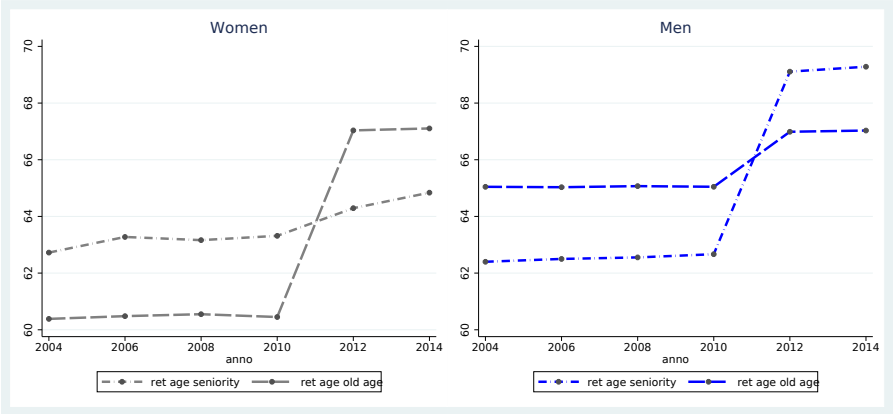
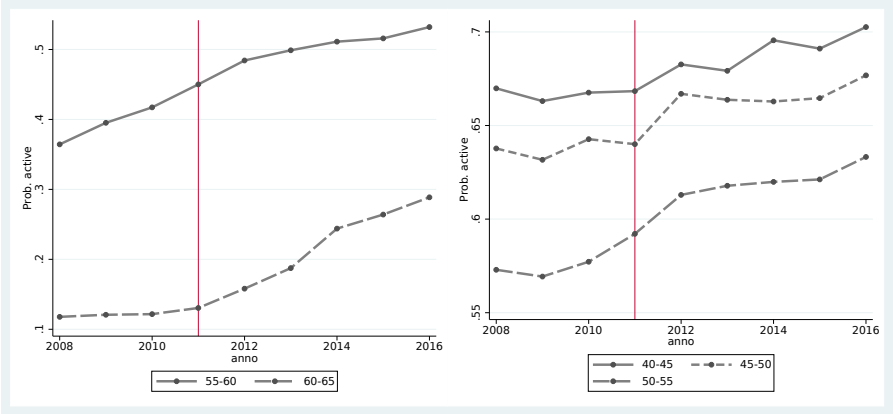
Figure 1: Minimum retirement age and labour force participation rate (LFPR) by gender

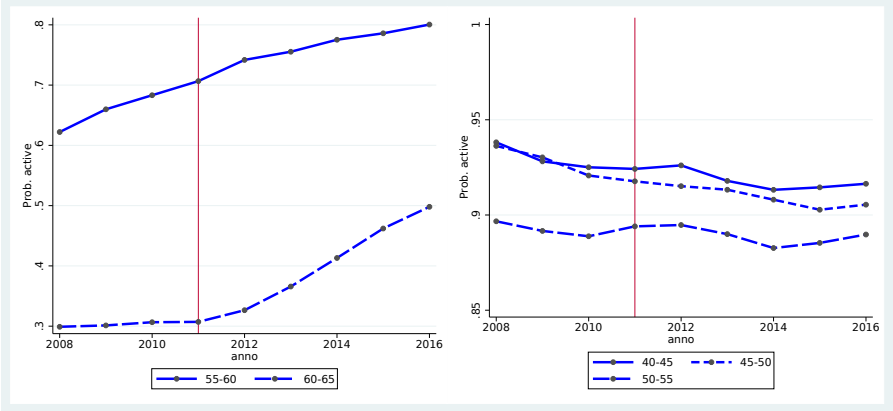
(a) Retirement age, women vs men



(b) Female participation, older cohorts vs younger cohorts

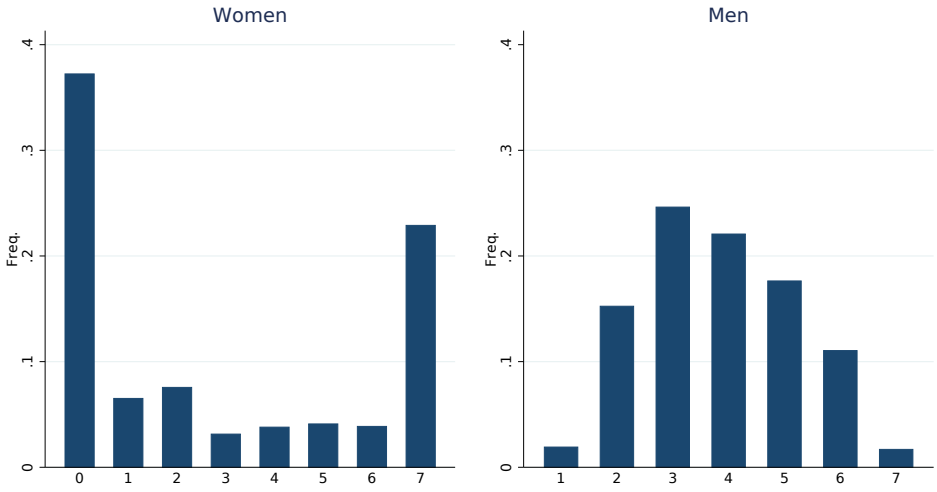


(c) Male participation, older cohorts vs younger cohorts



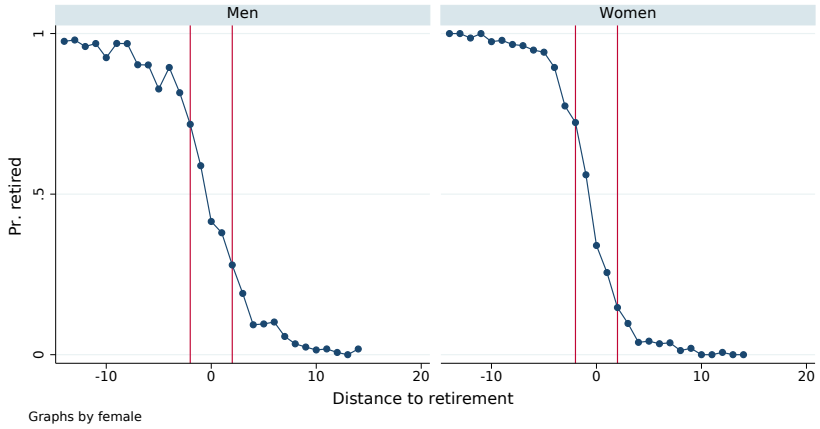
Source: SHIW in panel a; Italian Labour Force Survey in panels b and c.
Note The Figure shows that around the last pension reform, which increased MRA by 4 years on average, LFPR increased for the elderly, both men and women. As for women, the increase in LFPR involved also younger age classes.

Figure 2: Distribution of the shock in distance to minimum retirement age (variation between $t \geq 2012$ and 2008), by gender



Source: SHIW.
Note: The Figure displays the distribution of the reform-induced shock to the working horizon, by gender. It show the distribution of the difference between the post and the pre reform MRA for individuals in our sample (women aged between 45 and 59, with at least 10 accrued years of contribution, eligible to retire neither before nor after the reform; men aged between 45 and 64, with at least 20 accrued years of contribution, eligible to retire neither before nor after the reform). Data are at the individual level, the y axis reports the probability of observing a certain shock. This is the variation used to compute the analysis.

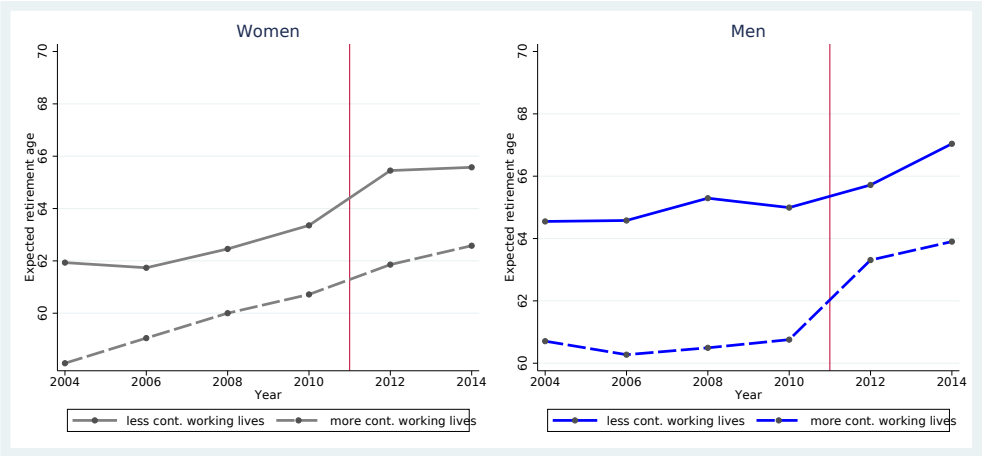
Figure 3: Probability of retiring and distance to minimum retirement age, by gender



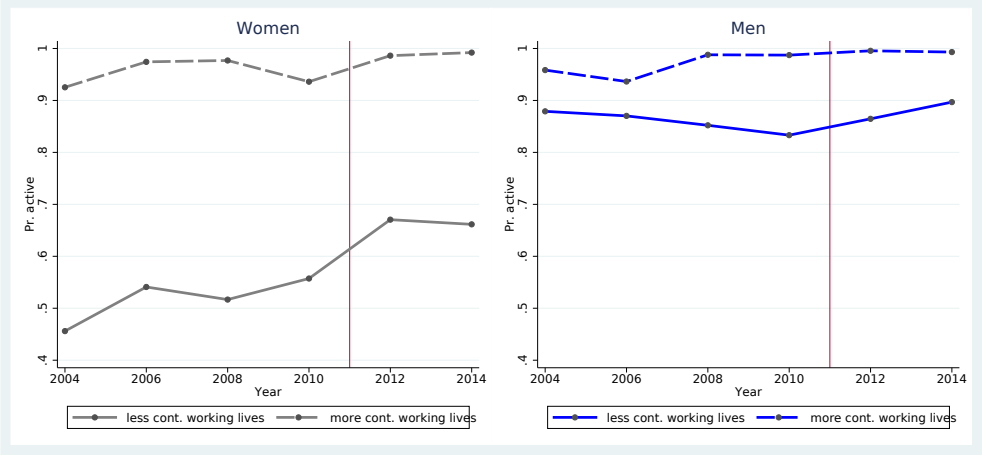
Source: SHIW, 2008-2010-2012-2014.
Note: The Figure shows that individuals actually retire when they reach their MRA, i.e. when their distance to retirement ($=MRA - age$) approaches 0.

Figure 4: Expected retirement age and activity rate over time, by gender and working life's continuity

(a) Expected retirement age

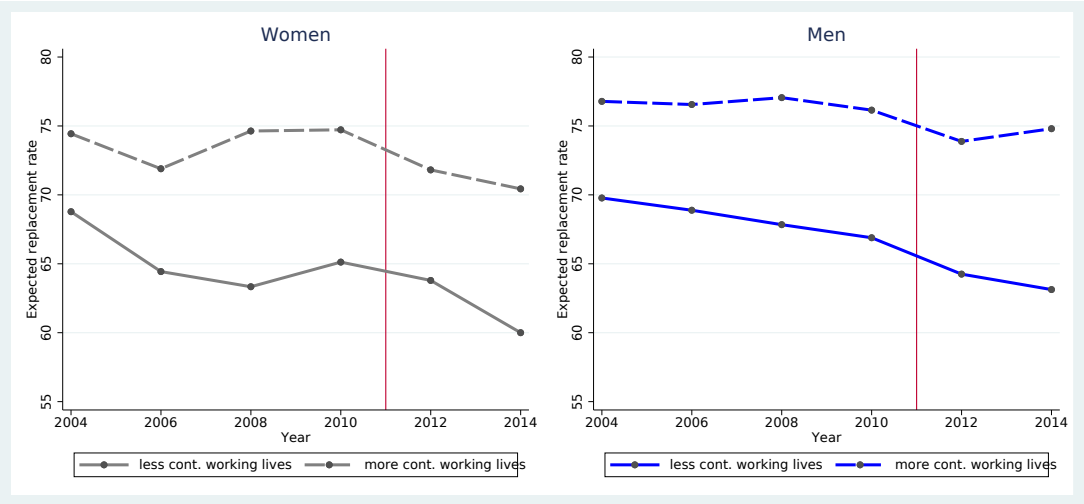


(b) Probability of being active



Source: SHIW, question on expected retirement age.
Note: The Figure shows that the expected retirement age (and the activity rate) increases more around the reform (2012) for women with less continuous working lives (most treated) and men with more continuous working lives (most treated). Only individuals with at least 10 (for women) or 20 (for men) and no more than 40 accrued years of contribution; women aged 50-59; men aged 55-64, not eligible to retire either before and after the reform. The question on expected retirement age is asked only to employed individuals. Working life's continuity is defined as whether individuals are in the first of in the third tertile of the ratio between actual years of contribution accrued in year t and the theoretical length of a continuous working life (age at year t-18, assuming individuals started to work at 18 years old).

Figure 5: Expected replacement rate over time, by gender and working life's continuity

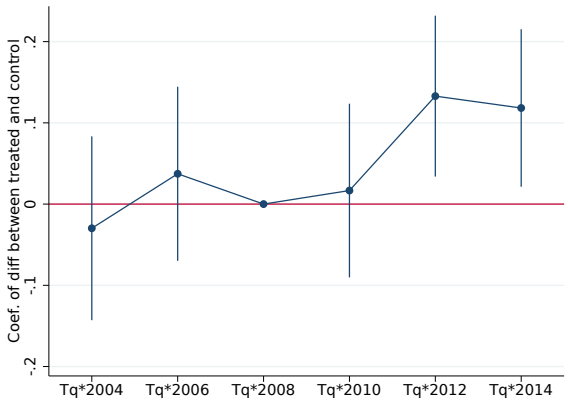


Source: SHIW, question on expected replacement rate.
Note: The Figure shows that the replacement rate (the ratio between the monthly pension benefit and the last earned monthly wage) lowered around the reform (2012), but not in a different way across individuals with different length of the working life. The reform changed the pension benefit formula only for those who had at least 18 years of accrued contribution by January 1996. In the figure, we consider individuals in our selected sample (those with at least 10 (for women) or 20 (for men) accrued years of contribution, but no more than 40; women aged 45-59; men aged 45-64, not eligible to retire either before and after the reform) with at least 18 years of social contribution on January 1996. The question on the expected replacement rate is asked only to employed individuals. Working life's continuity is defined as whether individuals are in the first of in the third tertile of the ratio between actual years of contribution accrued in year t and the theoretical length of a continuous working life (age at year t-18, assuming individuals started to work at 18 years old).

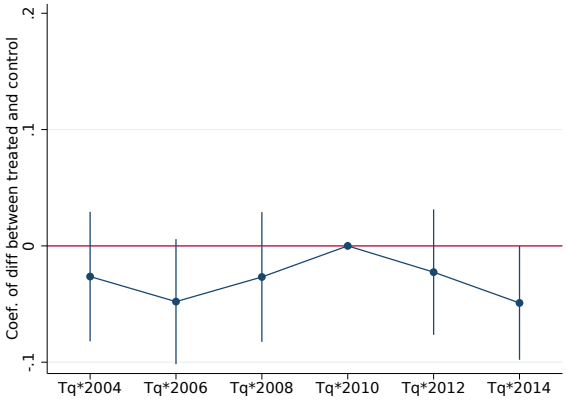
Figure 6: Effect of reform-induced changes in distance to retirement: evolution of the difference in the probability of being active/employed between more and less exposed individuals

Individual effects

(a) Prob of being active women
women's shock

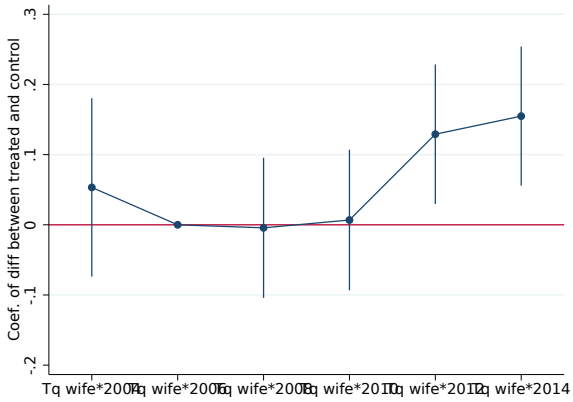


(b) Prob of being active men
men's shock

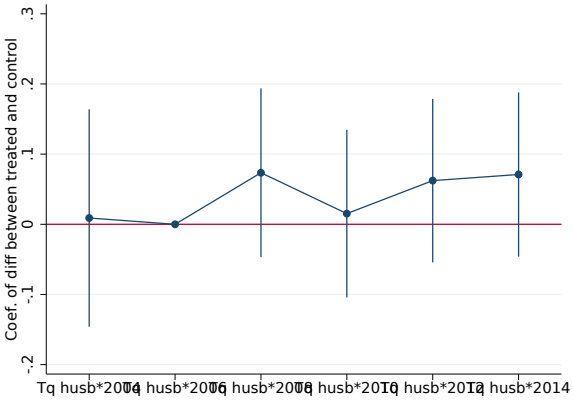


Intra-family cross-effects

(c) Prob of being active husbands
wives' shock



(d) Prob of being active wives
husbands' shock



Source: SHIW, from 2006 to 2014.
Note The graphs test the parallel trend assumption by plotting the coefficients γ_r and ζ_r^s (and the corresponding 5% confidence intervals) obtained from estimating equations 3 and 4. Pre-reform years: 2004-2006-2008-2010, post-reform years: 2012-2014.

Table 1: Seniority pension eligibility rules

Year	Private & Public		Self-employed	
	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- (men)		43		43
2012- (women)		42		42
Women's option (only for women)				
2008-	57, 35		58, 35	

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, 42 or 43 after the reform).

Table 2: Difference in differences, examples of treated and control in the private sector group

	Pre-2012		Post-2012		Delta distance
	Seniority	Old	Seniority	Old	(Post - Pre)
Women, 58 years old					
Maria, $C = 35$	**58**	60	**58**	67	0
Antonia, $C = 26$	67	**60**	**67**	**67**	7
Men, 58 years old					
Mario, $C = 35$	**58**	65	**66**	67	8
Antonio, $C = 32$	**61**	65	69	**67**	6
Valerio, $C = 26$	67	**65**	75	**67**	2
Men, 56 years old					
Giovanni, $C = 40$	**56**	65	**59**	67	3
Luigi, $C = 32$	**59**	65	**67**	**67**	8

Notes: This table reports an example of individuals differentially treated by the mandated extension of the MRA, because of heterogeneity on their previous working histories. Minimum retirement age by type of pension benefit for individuals working as employees in the private sector. C is the number of accrued years of contribution. Delta distance is the difference between the minimum retirement age (the minimum between the mandated retirement age for old age and seniority regime) after and before the reform that took place in 2012.

Table 3: Descriptive statistics

	Individual level analysis							
	Women				Men			
	All 45-59 [1]	Sample not elig [2]	Control $T_q < 7$ [3]	Treated $T_q \geq 7$ [4]	All 45-64 [5]	Sample not elig [6]	Control $T_q < 4$ [7]	Treated $T_q \geq 4$ [8]
Age	51.692	51.132	51.110	51.193	53.911	51.864	54.859	50.301
	(4.296)	(4.035)	(3.903)	(4.386)	(5.739)	(4.534)	(4.056)	(3.947)
Y. contrib	15.777	23.536	26.349	15.598	28.410	28.508	29.508	27.986
	(13.409)	(7.506)	(6.314)	(4.178)	(11.452)	(5.087)	(6.573)	(4.005)
1=married	0.770	0.729	0.727	0.736	0.841	0.849	0.847	0.851
1=sec. edu	0.483	0.604	0.640	0.502	0.477	0.529	0.423	0.585
1=children	0.348	0.291	0.269	0.347	0.333	0.251	0.353	0.194
1=active	0.569	0.870	0.916	0.741	0.778	0.979	0.955	0.992
1=unemployed	0.042	0.045	0.031	0.086	0.064	0.047	0.070	0.035
1=part time	0.094	0.140	0.127	0.174	0.020	0.016	0.021	0.013
1=perm. contr	0.391	0.630	0.700	0.433	0.491	0.680	0.623	0.709
log(wage net)	9.519	9.552	9.626	9.266	9.791	9.839	9.785	9.864
	(0.570)	(0.554)	(0.487)	(0.687)	(0.486)	(0.430)	(0.459)	(0.414)
Observations	14155	7615	5711	1904	16992	9112	3306	5806
	Family level analysis							
	Treated Wives				Treated Husbands			
	All wife 45-59 [1]	Sample not elig [2]	Control $T_q^w < 7$ [3]	Treated $T_q^w \geq 7$ [4]	All husb 45-64 [5]	Sample not elig [6]	Control $T_q^h < 4$ [7]	Treated $T_q^h \geq 4$ [8]
Age w	51.746	51.191	51.154	51.292	50.813	48.665	51.512	47.143
	(4.341)	(4.107)	(3.972)	(4.452)	(6.649)	(5.417)	(4.943)	(5.032)
Age h	54.757	53.985	54.046	53.822	54.041	51.800	54.784	50.204
	(5.734)	(5.597)	(5.383)	(6.136)	(5.854)	(4.536)	(4.047)	(3.939)
Y. contrib w	15.500	23.479	26.412	15.568	15.327	14.837	15.468	14.499
	(13.408)	(7.650)	(6.468)	(4.208)	(13.723)	(12.193)	(13.362)	(11.507)
Y. contrib h	30.166	30.776	31.321	29.306	29.277	28.539	29.701	27.918
	(10.552)	(8.934)	(8.238)	(10.447)	(10.949)	(5.096)	(6.512)	(4.011)
1=sec edu w	0.498	0.611	0.649	0.509	0.510	0.582	0.480	0.637
1=sec edu h	0.491	0.569	0.593	0.503	0.496	0.543	0.429	0.604
1=children	0.355	0.296	0.280	0.336	0.331	0.227	0.343	0.163
1=active w	0.537	0.849	0.907	0.691	0.515	0.601	0.544	0.632
1=active h	0.780	0.822	0.831	0.799	0.785	0.982	0.961	0.993
1=unempl w	0.043	0.054	0.033	0.109	0.043	0.044	0.040	0.046
1=unempl h	0.060	0.042	0.036	0.058	0.059	0.045	0.075	0.028
log(wage net) w	9.525	9.554	9.622	9.268	9.515	9.524	9.528	9.523
	(0.598)	(0.580)	(0.516)	(0.730)	(0.598)	(0.574)	(0.590)	(0.567)
log(wage net) h	9.845	9.900	9.935	9.801	9.838	9.870	9.813	9.898
	(0.478)	(0.476)	(0.446)	(0.543)	(0.472)	(0.440)	(0.483)	(0.415)
Observations	7920	4169	3103	1066	10320	5559	2074	3485

Notes: for the top panel: column 1 (5) reports the entire sample of women (men) aged between 45-59 (45-64); column 2 (6) only individuals in our sample (not eligible to retire either before and after the reform and with at least 10 (for women) and 20 (for men) accrued years of contribution); columns 3 and 4 (7 and 8) split the sample between treated and control individuals (women (men) are defined as treated if experienced a shock to distance to minimum retirement of >= 7 (>= 4) years after 2011 reform). w stands for wives, h stands for husbands. For the bottom panel: restrictions are imposed only on the treated spouse.

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

	women 55-59 [1]	women 50-54 [2]	women 45-49 [3]	men 55-64 [4]	men 50-54 [5]	men 45-49 [6]
			Dep. Var: *1=active*			
T*post2011	0.026***	0.015***	0.008*	0.003	-0.005	0.006
	(0.006)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
			Dep. Var: *1=unemployed*			
T*post2011	0.009*	0.008**	0.010***	0.000	-0.008	0.013
	(0.005)	(0.004)	(0.003)	(0.008)	(0.007)	(0.012)
			Dep. Var: *1=employed*			
T*post2011	0.016**	0.007	-0.002	0.002	0.002	-0.007
	(0.007)	(0.004)	(0.005)	(0.008)	(0.008)	(0.015)
			Dep. Var: *1=employed full time*			
T*post2011	0.013*	0.019***	0.007	-0.002	0.011	-0.018
	(0.007)	(0.005)	(0.006)	(0.008)	(0.010)	(0.019)
			Dep. Var: *1=employed part-time*			
T*post2011	0.005	-0.011**	-0.010*	0.000	-0.002	0.011
	(0.006)	(0.005)	(0.006)	(0.004)	(0.006)	(0.009)
N	1728	2751	2620	2668	3302	2789

Notes: Additional controls: year and cell q fixed effects, region and sector fixed effects, time fixed effects, marital status. The sample consists of individuals that are not eligible for a public pension either before and after the reform and have accrued a number of years of contribution greater than 9 for women or 19 for men, and smaller than 40. Robust standard errors clustered at the cell q level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Effects of the longer working horizon on working status in regions with vacancy rate higher than the highest third

	women 55-59 [1]	women 50-54 [2]	women 45-49 [3]	men 55-64 [4]	men 50-54 [5]	men 45-49 [6]
			Dep. Var: *1=active*			
T*post2011	0.031***	0.018***	0.004	-0.004	-0.014*	0.009
	(0.010)	(0.006)	(0.008)	(0.010)	(0.008)	(0.007)
			Dep. Var: *1=unemployed*			
T*post2011	0.009	0.015***	0.007	-0.004	-0.007	0.029*
	(0.007)	(0.005)	(0.006)	(0.013)	(0.010)	(0.015)
			Dep. Var: *1=employed*			
T*post2011	0.022**	0.003	-0.002	-0.006	-0.007	-0.020
	(0.011)	(0.008)	(0.010)	(0.015)	(0.011)	(0.016)
N	717	1303	1210	797	1361	1217

Notes: Additional controls: year and cell q fixed effects, region and sector fixed effects, time fixed effects, marital status. The sample consists of individuals that are not eligible for a public pension either before and after the reform and have accrued a number of years of contribution greater than 9 for women or 19 for men, and smaller than 40. Robust standard errors clustered at the cell q level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Effects of the longer working horizon on working status, controlling for cohort trends

	women 55-59 [1]	women 50-54 [2]	women 45-49 [3]	men 55-64 [4]	men 50-54 [5]	men 45-49 [6]
			Dep. Var: *1=active*			
T*post2011	0.022***	0.015***	0.009**	-0.001	-0.004	0.006
	(0.006)	(0.004)	(0.004)	(0.005)	(0.003)	(0.003)
			Dep. Var: *1=unemployed*			
T*post2011	0.007	0.009**	0.011***	0.001	-0.009	0.011
	(0.005)	(0.004)	(0.003)	(0.009)	(0.007)	(0.010)
			Dep. Var: *1=employed*			
T*post2011	0.015**	0.006	-0.002	-0.004	0.004	-0.006
	(0.007)	(0.004)	(0.005)	(0.009)	(0.007)	(0.013)
			Dep. Var: *1=employed full time*			
T*post2011	0.012	0.018***	0.007	-0.009	0.011	-0.016
	(0.007)	(0.005)	(0.006)	(0.009)	(0.010)	(0.017)
			Dep. Var: *1=employed part-time*			
T*post2011	0.004	-0.011**	-0.010*	0.001	-0.001	0.009
	(0.006)	(0.005)	(0.006)	(0.004)	(0.006)	(0.008)
N	1728	2751	2620	2668	3302	2789

Notes: Additional controls: year and cell q fixed effects, region and sector fixed effects, time fixed effects, marital status, age specific trends. The sample consists of individuals that are not eligible for a public pension either before and after the reform and have accrued a number of years of contribution greater than 9 for women or 19 for men, and smaller than 40. Robust standard errors clustered at the cell q level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Effects of the longer working horizon on working status by education level

	women 55-59 [1]	women 50-54 [2]	women 45-49 [3]	men 55-64 [4]	men 50-54 [5]	men 45-49 [6]
			Dep. Var: *1=active*			
T*post2011	0.028***	0.022***	0.008	-0.003	-0.004	0.003
	(0.009)	(0.007)	(0.009)	(0.008)	(0.004)	(0.007)
T*post2011*high edu	-0.012	-0.016*	0.001	0.014	0.002	0.006
	(0.010)	(0.009)	(0.011)	(0.010)	(0.006)	(0.009)
			Dep. Var: *1=unemployed*			
T*post2011	0.015*	0.020***	0.020***	-0.010	-0.006	0.002
	(0.008)	(0.007)	(0.006)	(0.016)	(0.014)	(0.020)
T*post2011*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)
			Dep. Var: *1=employed*			
T*post2011	0.013	0.002	-0.013	0.009	-0.001	0.001
	(0.011)	(0.009)	(0.011)	(0.016)	(0.014)	(0.024)
T*post2011*high edu	-0.009	-0.017**	-0.014**	0.018	-0.001	0.018
	(0.009)	(0.007)	(0.007)	(0.018)	(0.016)	(0.020)
			Dep. Var: *1=employed full time*			
T*post2011	0.009	0.027***	-0.002	0.000	-0.004	-0.025
	(0.010)	(0.009)	(0.012)	(0.015)	(0.015)	(0.028)
T*post2011*high edu	-0.002	-0.019*	0.013	-0.005	0.028*	0.012
	(0.013)	(0.011)	(0.013)	(0.019)	(0.017)	(0.029)
			Dep. Var: *1=employed part-time*			
T*post2011	0.009	-0.024***	-0.010	0.005	0.003	0.027*
	(0.009)	(0.009)	(0.011)	(0.008)	(0.009)	(0.016)
T*post2011*high edu	-0.006	0.021*	-0.001	-0.003	-0.009	-0.028*
	(0.010)	(0.012)	(0.012)	(0.009)	(0.011)	(0.016)
N	1728	2751	2620	2668	3302	2789

Notes: Additional controls: year and cell q fixed effects, region and sector fixed effects, time fixed effects, marital status. The sample consists of individuals that are not eligible for a public pension either before and after the reform and have accrued a number of years of contribution greater than 9 for women or 19 for men, and smaller than 40. High edu is a dummy equal to 1 if individuals obtained at least the secondary school degree. Robust standard errors clustered at the cell q level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Cross effects among partners of the longer working horizon on labour force status

	shock to wife MRA		shock to husb MRA	
	on wife	on husband	on husband	on wife
	[1]	[2]	[3]	[4]
Dep var.		*1=active*		
T wife*post2011	0.017***	0.010**		
	(0.004)	(0.005)		
T husb*post2011			0.003	-0.005
			(0.003)	(0.006)
Dep var.		*1=unemployed*		
T wife*post2011	0.007**	0.004		
	(0.003)	(0.004)		
T husb*post2011			-0.001	0.004
			(0.005)	(0.004)
Dep var.		*1=employed*		
T wife*post2011	0.010**	0.005		
	(0.005)	(0.006)		
T husb*post2011			0.003	-0.009
			(0.006)	(0.006)
N	3763	2705	5724	5296

Notes: Additional controls: year and cell $q_{s'}$ and q_s fixed effects (separately for each dimension), region and sector fixed effects, age difference across partners (also squared) and difference in distance to retirement across partners (also squared), partner s change in distance to retirement. The sample in columns 1 and 2 (3 and 4) consists of individuals belonging to couples where the wives (husbands) are not eligible for a public pension either before and after the reform and have accrued a number of years of contribution greater than 9 (19), and smaller than 40. Robust standard errors clustered at the cell $q_{s'}$ level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Cross effects among partners of the longer working horizon on labour force status by education

	shock to wife MRA		shock to husb MRA	
	on wife	on husband	on husband	on wife
	[1]	[2]	[3]	[4]
Dep var.		*1=active*		
T wife*post2011	0.021***	0.011		
	(0.008)	(0.008)		
T wife*post 2011*edu own	-0.016*	-0.001		
	(0.009)	(0.009)		
T husb*post2011			0.006	-0.006
			(0.006)	(0.009)
T husb*post 2011*edu own			0.007	-0.002
			(0.009)	(0.007)
Dep var.		*1=unemployed*		
T wife*post2011	0.013**	0.010		
	(0.005)	(0.007)		
T wife*post 2011*edu own	-0.008	-0.008		
	(0.006)	(0.007)		
T husb*post2011			0.005	0.004
			(0.009)	(0.006)
T husb*post 2011*edu own			-0.001	0.014
			(0.008)	(0.011)
Dep var.		*1=employed*		
T wife*post2011	0.008	-0.001		
	(0.009)	(0.009)		
T wife*post 2011*edu own	-0.008	0.009		
	(0.010)	(0.012)		
T husb*post2011			0.001	-0.011
			(0.010)	(0.009)
T husb*post 2011*edu own			0.008	0.009
			(0.011)	(0.012)
N	3763	2705	5724	5296

Notes: Additional controls: year and cell $q_{s'}$ and q_s fixed effects (separately for each dimension), region and sector fixed effects, age difference across partners (also squared) and difference in distance to retirement across partners (also squared), partner s change in distance to retirement. The sample in columns 1 and 2 (3 and 4) consists of individuals belonging to couples where the wives (husbands) are not eligible for a public pension either before and after the reform and have accrued a number of years of contribution greater than 9 (19), and smaller than 40. High edu is a dummy equal to 1 if individuals obtained at least the secondary school degree. Robust standard errors clustered at the cell $q_{s'}$ level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.