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

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# Motivation: delaying MRA

- Aging is one of the major challenges faced by developed economies in this century
- Many countries reacted by implementing reforms to delay the minimum retirement age (MRA)
- It allows both reducing the number of pension recipients and enlarging the tax base
- Through (in principle) positive labour supply effects, since people should work more years

# The effect on individuals who lose eligibility

**'Mechanical' effects around the pension eligibility threshold** on individuals who lose their eligibility

- Rather extensively analyzed (Arpaia et al. 2009, Staubli and Zweimuller 2013, Geyer and Welteke 2017)
- Mixed findings
  - Program substitution: unemployment or disability benefits
  - Private pension schemes
  - Weak labour demand
- Positive employment effect but small
- Fiscal efficacy of delaying MRA?

# The distance to retirement labour supply effect

Possible **effects also on younger individuals, not eligible to retire even with the pre-increase rules**

- When search is costly and in the presence of search frictions, **the expected duration of a job increases its value** and $\uparrow$ participation because $\uparrow$ search effort
- The effect on employment/unemployment are ambiguous:
  - **search effort** $\uparrow \rightarrow \uparrow$ employment
  - **reservation wage** $\uparrow$ (greater benefits of an additional period of search) $\rightarrow$ may $\uparrow$ unemployment
- Used to explain low participation at the end of working life (Hairault et al. 2010, Seater 1977, Ljungqvist and Sargent 2008, Cheron 2011)

# Research question

- **The direct effect of a longer working horizon** on individual labour supply
  - search behaviour of individuals not eligible to retire even before the increase in MRA, whose working horizon increases
- **The indirect effects on the spouses generated by within-family interactions**
  - through leisure complementarities or income effects
- We use a **two pension reforms implemented in Italy in 2011 and 2012**
  - sizeable increase in MRA (4 years on average)
  - well-understood (inflamed public debate)
  - increased MRA heterogeneously depending on observable dimensions (gender, age and continuity of previous working life)

# This Paper

- We estimate a **diff-in-diff model**, comparing over time the labour supply of individuals (and their partners) most or least exposed to the pension reforms induced increase in MRA
- We find:
  - **positive effects on labour supply in all age classes (45+) for women**, not for men
  - effects on the husbands' labour supply but not on the wives'
- When evaluating the labour supply effect of policies increasing MRA, we should take into account the effect of a longer working horizon on individuals and their partners

# Related literature and contribution

- On the direct effect of a longer working horizon:
  - only Hairault et al. (2010): look at French reform, postponed RA by about 1 year, only men 57+. Positive but not significant effects (small sample)
  - we look at younger individuals, also women, also their partners
  - because very large and well-understood increase in MRA in Italy
- On within partner effects:
  - comprehensive estimate of labour supply effects
  - increasing quasi-experimental literature on joint labour supply and retirement decisions within the family [Coile 2004, Hospido Zamarro 2014, Bloemen et al. 2015, Lalive Perrotta 2017]

# Graphical evidence: the Italian case

Raise in labour force participation in 2012 (first year of implementation of the pension reform)

Figure: Men

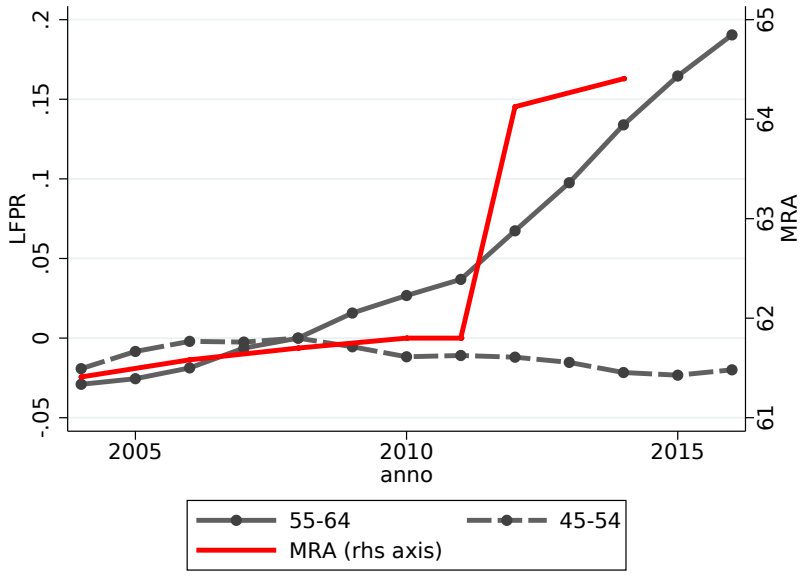
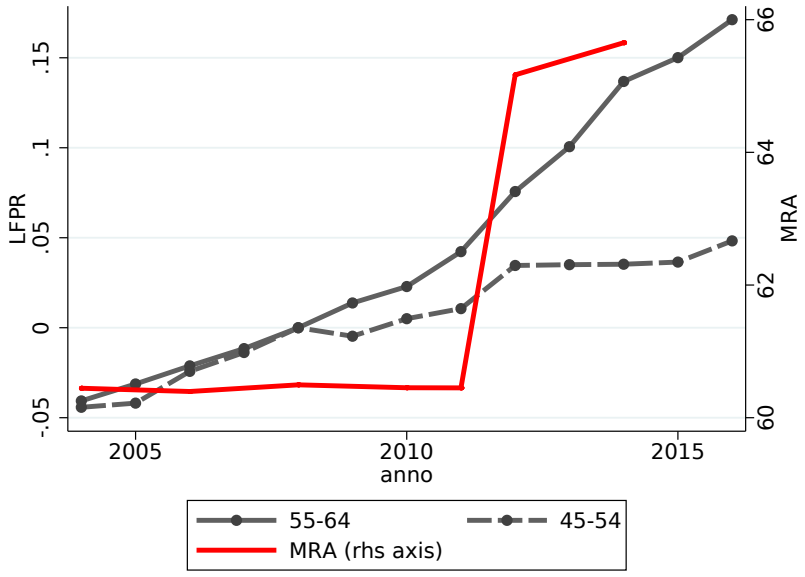



Figure: Women




**Source:** SHIW (Bank of Italy) for distance to retirement; Italian Labour Force Survey (Istat) for labour market indicators

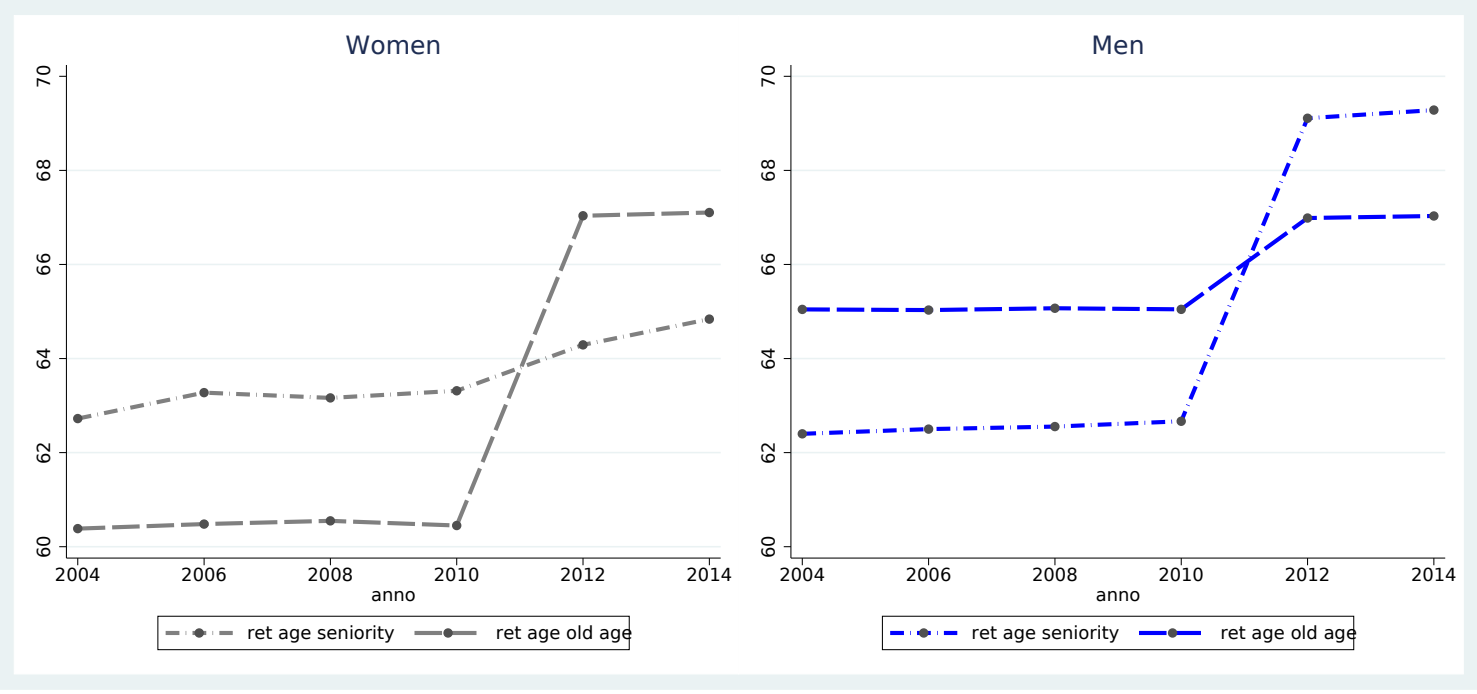
# The Treatment and The Data

# Exogenous variation in MRA

- Before the reforms:
  1. **old age pension**: RA 60 for women and 65 for men
  2. **seniority pension**: the quota system (at least 35 years and minimum age requirements 58 or at least 40 years of contribution)
- After the reforms:
  1. **old age pension**: RA 67 for women and for men
  2. **seniority pension**: quota system abolished, at least 42 contribution years. Exceptions for women ▸ rules ▸ Example
- **Most exposed women: those with more fragmented working lives; most exposed men: those with less fragmented working lives**

# RA under the old and and seniority system

RA for women (men) increases more under the old age (seniority) pension regime



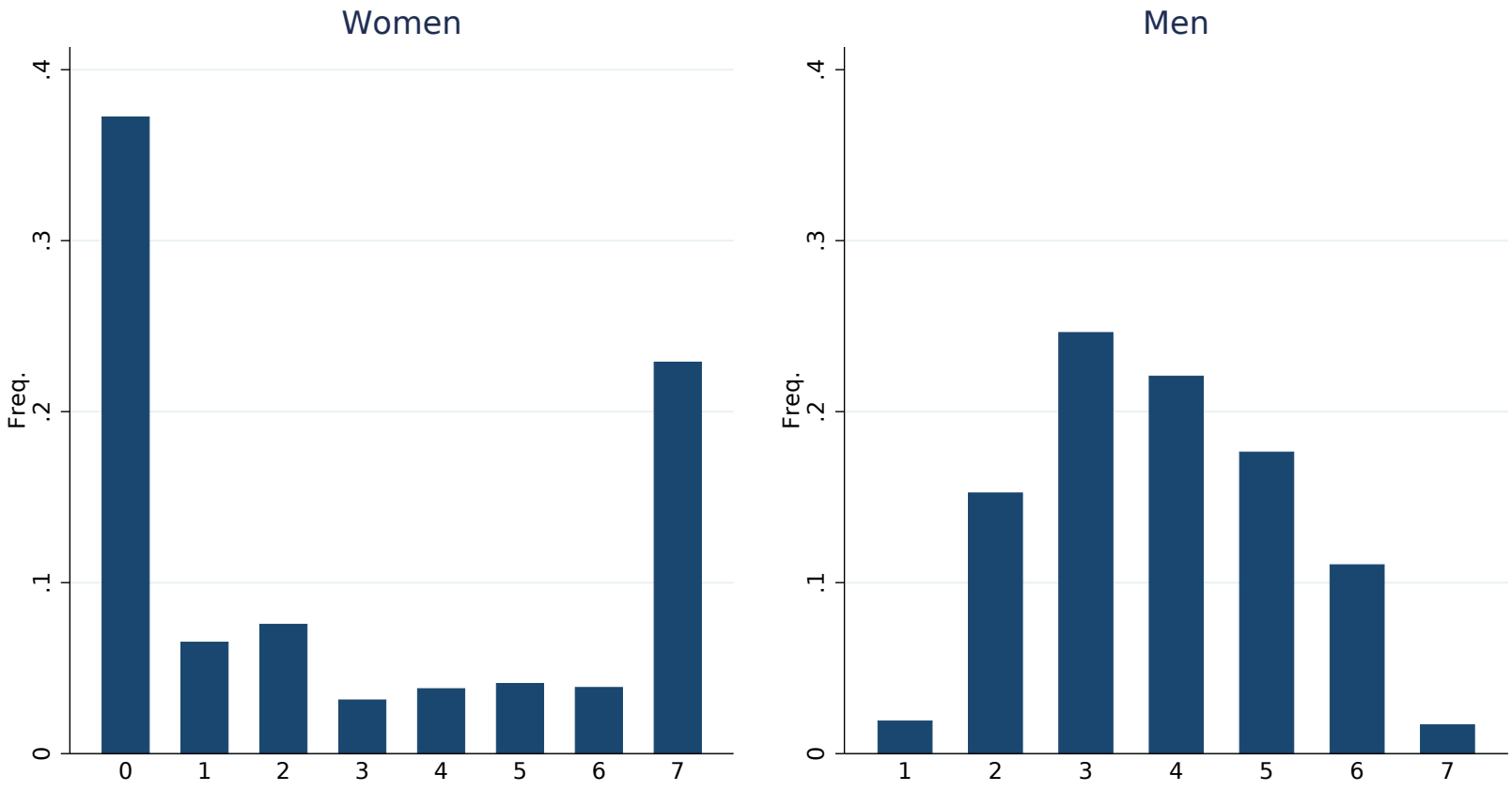

**Source**: SHIW, 2008-2010-2012-2014.

# Most and least exposed individuals

- We define **cells ($q$) based on the full interaction of the characteristics** used to determine MRA: **age, accrued years of contribution, gender**, private/public, employee/self-employed

- **Time invariant** measure of exposure to the reform at the cell $q$ level:
  - Those which experience a larger increase in MRA due to the 2011-2012 pension reforms
  - $T_q = MRA_q^{2012} - MRA_q^{2008}$

# Distribution of the shock $T_q$, by gender




**Source**: SHIW, 2012-2014. **Note**: women (men) aged between 45 and 59 (45-64), with at least 10 (20) accrued years of contribution, eligible to retire neither before nor after the reform. Data are at the individual level.

- Men: most exposed (expect to retire under seniority regime)
- Women: most exposed (expect to retire under old age regime)

# Data

- For now: the Italian Survey of Household Income and Wealth (SHIW) from 2004 to 2014
  - biannual survey on 8,000 households per wave
  - information on accrued years of contribution
  - information on partners (family level analysis)
  - information on expected retirement age and benefits
- Now working on running the analysis with administrative social security data
  - administrative data
  - panel structure (previous employment status)
  - information on absences and type of firms and jobs

# Empirical Strategy and Results at the Individual Level

# Main regression equation, individual level analysis

**Separately for men and women by age groups** in 2004-2014:

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

- $Y_{iqt}$ is a dummy equal to 1 if the individual $i$ in cell $q$ is active at $t$
- $T_q$ is the time invariant measure of exposure to the policy
- $post2011_t$ is a dummy that indicates the post reform period
- $\alpha_q$ are the fixed effects for: age*years of contribution; $\alpha_t$ are year-fixed effects
- $W_{iqt}$ are controls (marital status, region, sector)
- $\epsilon_{iqt}$ is an error term
- standard errors clustered at the $q$ level

for individuals **not eligible to retire even before the reform but reasonably close to retirement**

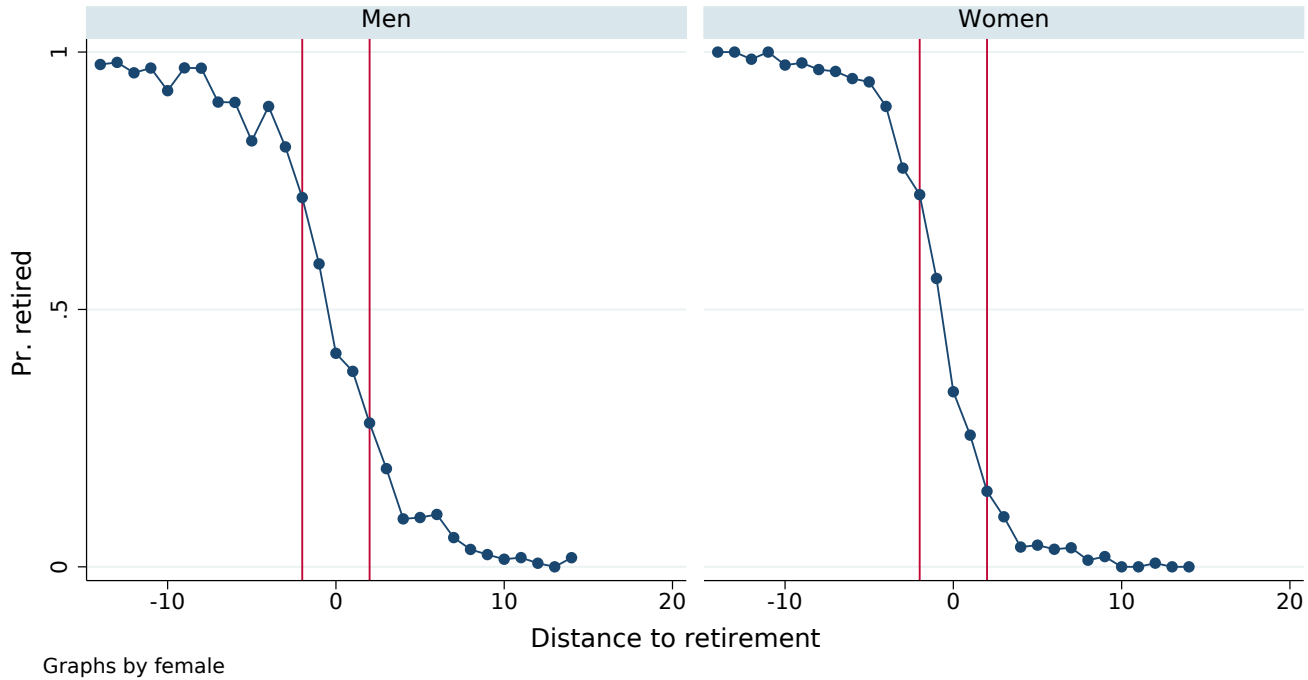
▸ Descriptive statistics

# Three identifying assumptions

## 1. Variations in MRA proxy variations in actual retirement age

Individuals retire as soon as they become eligible

Figure: Prob. of retiring and distance to MRA



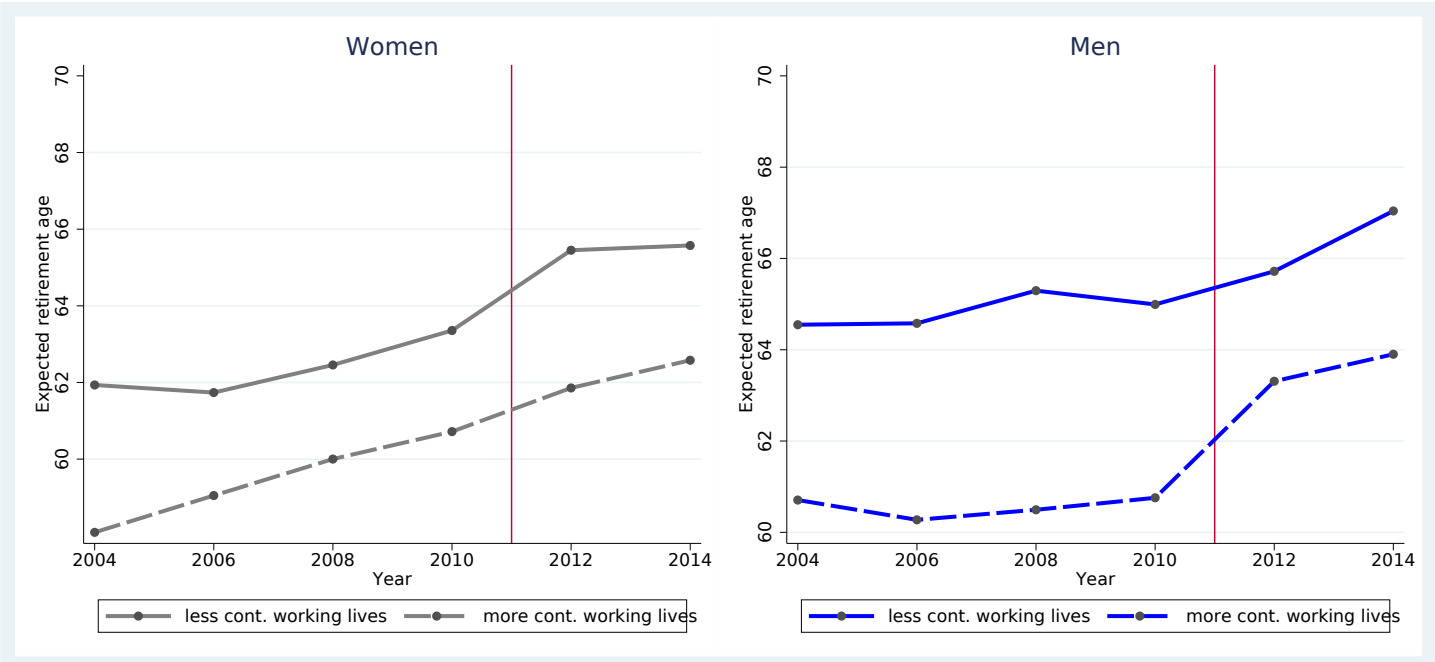

**Source**: SHIW, 2008-2010-2012-2014.
**Note**: Distance to retirement measures distance to minimum retirement age, depending on the time varying pension rules.

# Three identifying assumptions

## 2. Expected retirement age changes according to the rules

Expected RA increases more for treated individuals, women (men) with less (more) continuous working life

Figure: Expected RA by continuity of previous working life




**Source**: SHIW, 2008-2010-2012-2014.
**Note**: continuity of one's working life depends on the amount of contribution years by age.

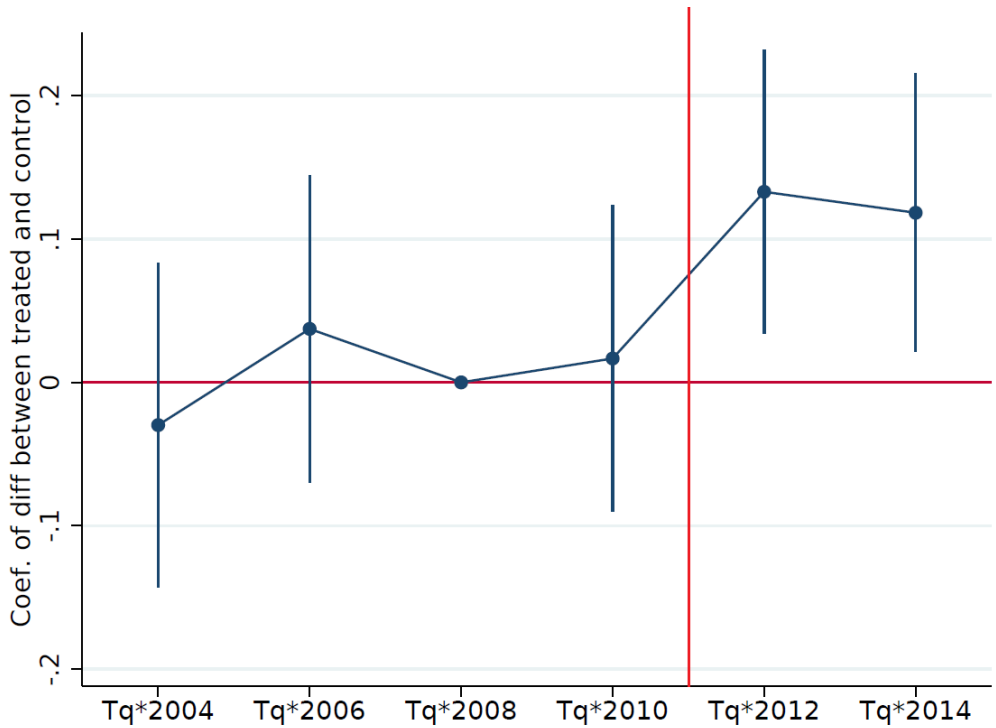
No changes in expected benefits ▸ Expected RR

# Three identifying assumptions

## 3. Parallel trends in the outcome, women

Evolution of the difference in the probability of being active between more and less exposed individuals, **women**

$$Y_{iqt} = \sum_{r=2004}^{2014} \gamma_r \left( T_q * \delta_r \right) + \gamma W_{iqt} + \delta_q + \delta_t + \eta_{iqt}$$

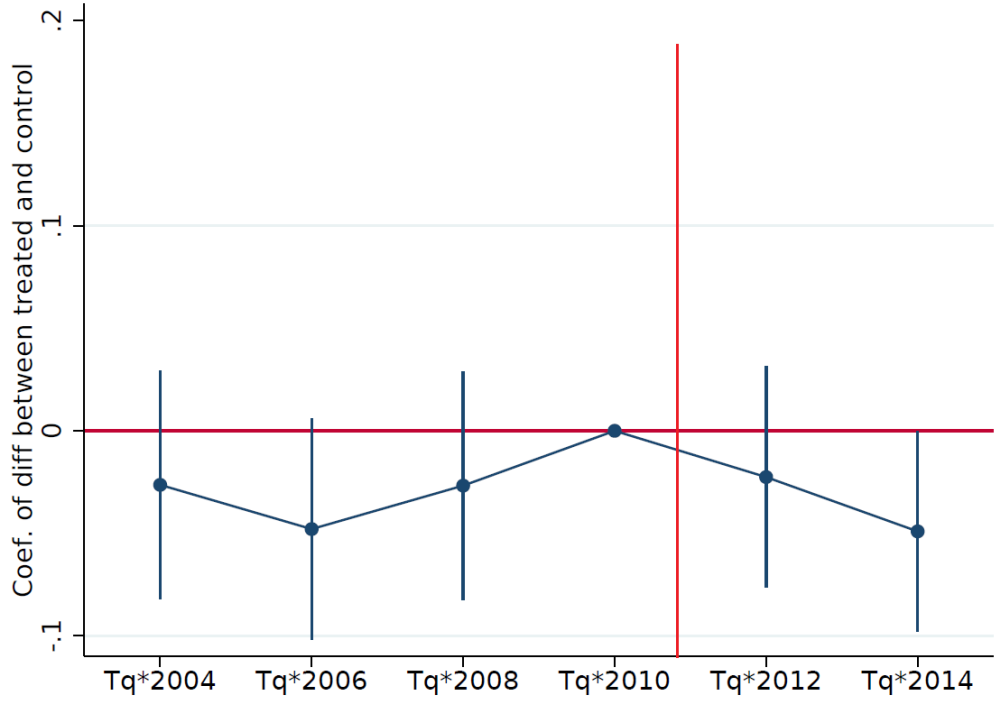



**Note**: The graphs plots the coefficients $\gamma_r$ and the corresponding 5% confidence intervals.

# Three identifying assumptions

## 3. Parallel trends in the outcome, men

Evolution of the difference in the probability of being active between more and less exposed individuals, **men**




**Note**: The graphs plots the coefficients $\gamma_r$ and the corresponding 5% confidence intervals.

# Positive effects on female participation at all ages

| | Women | | | Men | | |
|---|---|---|---|---|---|---|
| | 55-59 | 50-54 | 45-49 | 55-64 | 50-54 | 45-49 |
| | [1] | [2] | [3] | [4] | [5] | [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) |
| 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. Only individuals with at least 10 (20) accrued years of contribution, not eligible to retire even with pre-reform rules. Robust standard errors clustered at the cell $q$ level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

▸ Demand or supply?

# Results

- Intensive margin of employment: all women are more likely to find employment in full time jobs, either moving from part-time to full-time (younger women) or moving from non-employment (older women). ▸ type

- Heterogeneity by education: effects concentrated on individuals with lower education levels (less than high school), because their marginal benefits from working and searching more are greater. ▸ education

# Empirical Strategy and Results at the Household Level

# Main regression equation, family level analysis

We estimate the following equation for husbands and wives in 2004-2014:

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

- $Y^s_{jq_{s'}t}$ is a dummy that indicates the labour force status of spouse $s$ in household $j$, where partner $s'$ belongs to 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 $s'$
- $\alpha^s_{q_{s'}}$ and $\alpha^s_{q_s}$ are fixed effects for the cell $q_{s'}$ and $q_s$; $\alpha^s_t$ are year-fixed effects
- $W_{jt}$ is a vector of controls at the individual and household level **including changes in distance to retirement of spouse** $s$ (if different from $s'$)
- $u^s_{jq_{s'}t}$ is an error term

**Partner $s'$ not eligible to retire even with pre-reform rules; partner $s$ no restrictions**

▸ Descriptive statistics

# Evolution of the difference in the spouse's probability of being active between more and less exposed individuals

Figure: Husbands, wife treated

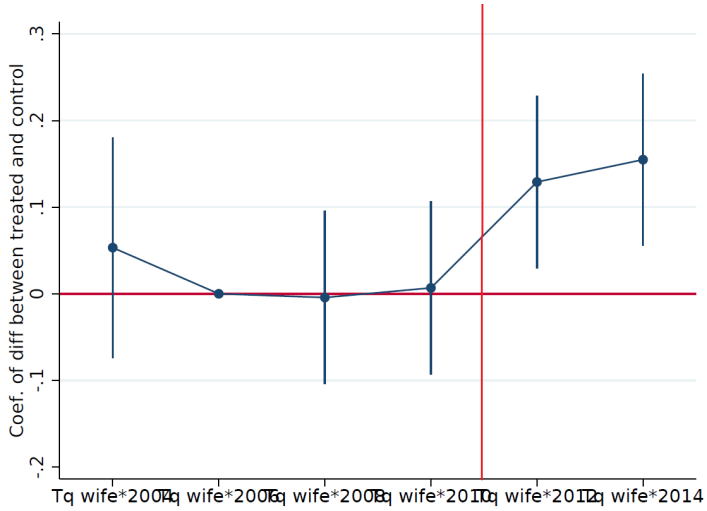
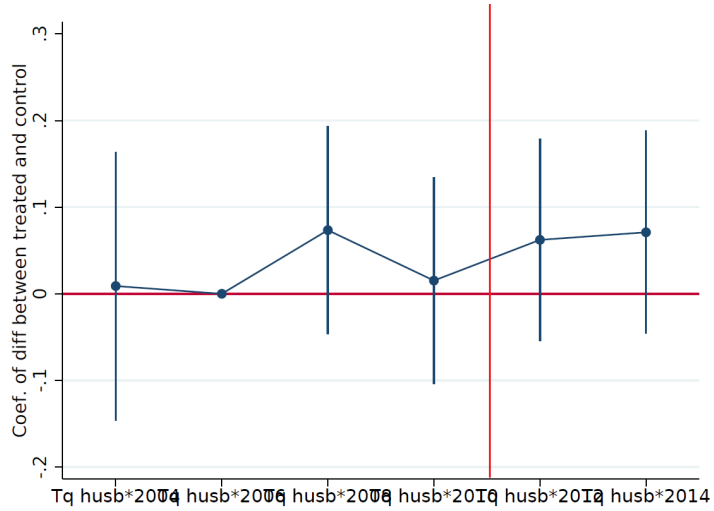



Figure: Wives, husbands treated




**Source**: SHIW, from 2004 to 2014.

**Note** The graphs test the parallel trend assumption by plotting the coefficients $\zeta_r^s$ and the corresponding 5% confidence interval obtained from estimating equation $Y^s_{iq_{s'}t} = \sum_{r=2004}^{2014} \zeta_r^s \left( T_{q_{s'}} * \alpha_r^s \right) + \beta^s W_{iq_{s'}t} + \alpha^s_{q_{s'}} + \alpha^s_t + \alpha^s_{q_s t} + u^s_{iqt}$. Pre reform years: 2004-2006-2008-2010, post-reform years: 2012-2014.

# Cross elasticities among partners

| | **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 | 0.013** | 0.014** | | |
| | (0.006) | (0.007) | | |
| T husb*post2011 | | | 0.000 | 0.006 |
| | | | (0.004) | (0.007) |
| Dep var. | | **1=unemployed** | | |
| T wife*post2011 | 0.010** | 0.010*** | | |
| | (0.005) | (0.004) | | |
| T husb*post2011 | | | -0.005 | 0.006 |
| | | | (0.006) | (0.004) |
| Dep var. | | **1=employed** | | |
| T wife*post2011 | 0.003 | 0.002 | | |
| | (0.007) | (0.007) | | |
| T husb*post2011 | | | 0.004 | -0.001 |
| | | | (0.007) | (0.007) |
| N | 3633 | 3633 | 3220 | 3220 |

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

# Results

- Husbands respond to their wives' shock, the contrary does not hold
  - no effect on husbands in the first place
  - men belonging to couples in which the wife is treated are less likely to participate (already eligible to retire) **the effect comes from men who postpone retirement**
  - some evidence men are very responsive to partner's behaviour (asymetric preferences joint leisure, hh production) [Zweimuller et al. 1996, Coile 2004, Bingley and Lanot 2007]

- Heterogeneity by education: low educated individuals are the ones who respond the most to changes in their spouse's working horizon, given the higher marginal utility from income

▸ education

# Conclusion

- **The effects of delaying MRA on labour supply go beyond those individuals who lose eligibility**, it affects younger individuals whose working horizon increases
- Positive effects on women participation at different age, not on men; in particular on women less attached to the labour market (low educated)
- The effect has spillovers on their husbands' participation
- Extensions:
  - use **administrative data** and look at previous employment status and at differences on job quality and type
  - obtain some information on **reservation wages** to explore the mechanisms

# Thank you

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# Seniority/early pension eligibility

| 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).

# Examples of treated and control group

## Employees in the private sector

| | 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 |
| Valerio, $C = 26$ | 67 | **65** | 75 | **67** | 2 |

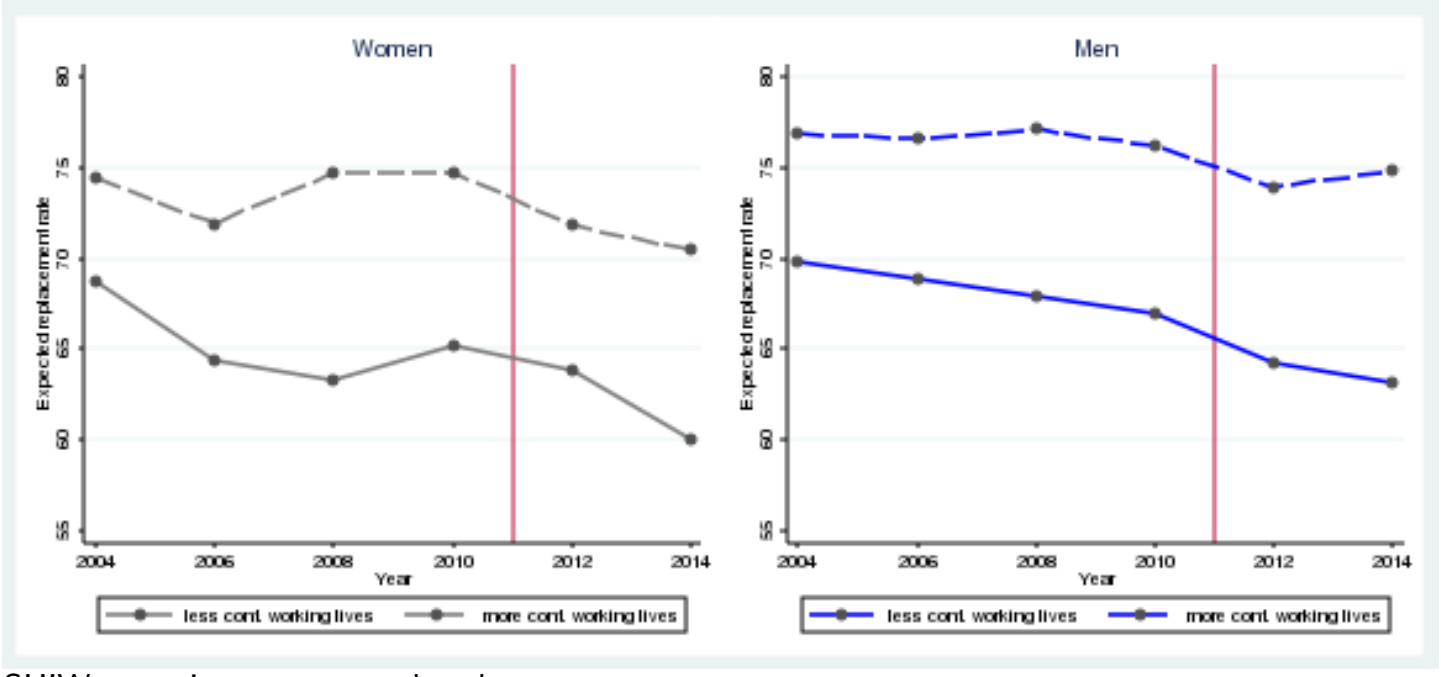
**Notes:** Mandated retirement age by type of pension benefit for individuals working as employees in the private sector. $C$ is the number of accrued years of contribution. Delta distance is the difference between the minimum retirement age (the minimum between the mandated retirement age for old age and seniority regime) after and before the reform that took place in 2012.

# Descriptive statistics

| | Women | | Men | |
|---|---|---|---|---|
| | Control $T_q < 7$ [1] | Treated $T_q \geq 7$ [2] | Control $T_q < 4$ [3] | Treated $T_q \geq 4$ [4] |
| continuity w.l. | 0.515 | **0.304** | 0.538 | **0.557** |
| Age | 51.110 | 51.193 | 54.859 | 50.301 |
| | (3.903) | (4.386) | (4.056) | (3.947) |
| Y. contrib | 26.349 | 15.598 | 29.508 | 27.986 |
| | (6.314) | (4.178) | (6.573) | (4.005) |
| 1=married | 0.727 | 0.736 | 0.847 | 0.851 |
| 1=sec. edu | 0.640 | 0.502 | 0.423 | 0.585 |
| 1=children | 0.269 | 0.347 | 0.353 | 0.194 |
| 1=active | 0.916 | 0.741 | 0.955 | 0.992 |
| 1=unemployed | 0.031 | 0.086 | 0.070 | 0.035 |
| 1=part time | 0.127 | 0.174 | 0.021 | 0.013 |
| 1=perm. contr | 0.700 | 0.433 | 0.623 | 0.709 |
| log(wage net) | 9.626 | 9.266 | 9.785 | 9.864 |
| | (0.487) | (0.687) | (0.459) | (0.414) |
| Observations | 5711 | 1904 | 3306 | 5806 |

**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 2012 reform. Years 2004 and 2010. Continuity w.l.=y. contrib/age. *** p<0.01, ** p<0.05, * p<0.1.

# Characterizing the treatment: changes in expected benefits




**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 continuity of the working life.

# Results: demand or supply?

| | 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 | 0.039*** | 0.016** | 0.002 | -0.012 | -0.009 | 0.004 |
| | (0.010) | (0.007) | (0.008) | (0.010) | (0.006) | (0.003) |
| T*post2011*low vacancy | -0.023 | -0.013 | 0.011 | 0.028** | 0.008 | -0.001 |
| | (0.015) | (0.010) | (0.011) | (0.014) | (0.009) | (0.005) |
| | | | Dep. Var: *1=unemployed* | | | |
| T*post2011 | 0.013 | 0.010* | 0.003 | -0.011 | -0.006 | 0.016 |
| | (0.009) | (0.005) | (0.005) | (0.014) | (0.012) | (0.010) |
| T*post2011*low vacancy | -0.016 | -0.001 | 0.011 | 0.019 | -0.022 | -0.018 |
| | (0.011) | (0.008) | (0.008) | (0.016) | (0.017) | (0.023) |
| | | | Dep. Var: *1=employed* | | | |
| T*post2011 | 0.026** | 0.006 | -0.001 | -0.002 | -0.004 | -0.013 |
| | (0.013) | (0.008) | (0.008) | (0.016) | (0.014) | (0.010) |
| T*post2011*low vacancy | -0.007 | -0.012 | 0.000 | 0.010 | 0.025 | 0.018 |
| | (0.017) | (0.014) | (0.011) | (0.019) | (0.021) | (0.023) |
| N | 1355 | 2185 | 2158 | 2109 | 2710 | 2346 |

**Notes:** Additional controls: year and cell $q$ fixed effects, region and sector fixed effects, time fixed effects, marital status. Only individuals with at least 10 and less than 40 accrued years of contribution. Robust standard errors clustered at the cell $q$ level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

# Results: type of employment

| | 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=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. Only individuals with at least 10 and less than 40 accrued years of contribution. Robust standard errors clustered at the cell $q$ level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

# Results: heterogeneity by education

| | 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) |
| 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. Only individuals with at least 10 and less than 40 accrued years of contribution. 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. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

# Descriptive statistics at the family level

| | **Treated Wives** | | **Treated Husbands** | |
|---|---|---|---|---|
| | Control $T_q^w < 7$ [1] | Treated $T_q^w \geq 7$ [2] | Control $T_q^h < 4$ [3] | Treated $T_q^h \geq 4$ [4] |
| Cont. w.l. w | 0.516 | **0.304** | 0.300 | 0.308 |
| Cont. w.l. h | 0.579 | 0.544 | 0.542 | **0.556** |
| Age w | 51.154 | 51.292 | 51.512 | 47.143 |
| | (3.972) | (4.452) | (4.943) | (5.032) |
| Age h | 54.046 | 53.822 | 54.784 | 50.204 |
| | (5.383) | (6.136) | (4.047) | (3.939) |
| Y. contrib w | 26.412 | 15.568 | 15.468 | 14.499 |
| | (6.468) | (4.208) | (13.362) | (11.507) |
| Y. contrib h | 31.321 | 29.306 | 29.701 | 27.918 |
| | (8.238) | (10.447) | (6.512) | (4.011) |
| 1=children | 0.280 | 0.336 | 0.343 | 0.163 |
| 1=active w | 0.907 | 0.691 | 0.544 | 0.632 |
| 1=active h | **0.831** | **0.799** | 0.961 | 0.993 |
| 1=unempl w | 0.033 | 0.109 | 0.040 | 0.046 |
| 1=unempl h | 0.036 | 0.058 | 0.075 | 0.028 |
| Observations | 3103 | 1066 | 2074 | 3485 |

**Notes panel a:** Sample of cohabiting women aged 45-59, with at least 10 years of contr, not eligible to retire with pre-2012 rules. **Notes panel b:** Sample married men aged 45-64, with at least 20 years of contr, not eligible to retire with pre-2012 rules.

# Results: heterogeneity by education

| | shock to wife MRA | | shock to husb MRA | |
|---|---|---|---|---|
| | on wife | on husband | on husband | on wife |
| | [1] | [2] | [3] | [4] |
| T $s'$*post2011 | 0.020** | 0.019** | 0.003 | 0.002 |
| | (0.008) | (0.009) | (0.007) | (0.010) |
| T $s'$*post 2011*edu $s$ | -0.015* | -0.004 | -0.004 | 0.009 |
| | (0.008) | (0.008) | (0.008) | (0.014) |
| Dep var. | | *1=unemployed* | | |
| T $s'$*post2011 | 0.019*** | 0.013** | -0.018 | 0.002 |
| | (0.007) | (0.005) | (0.011) | (0.007) |
| T $s'$*post 2011*edu $s$ | -0.015** | -0.004 | 0.021 | 0.005 |
| | (0.006) | (0.005) | (0.014) | (0.008) |
| Dep var. | | *1=employed* | | |
| T $s'$*post2011 | 0.001 | 0.004 | 0.021* | -0.000 |
| | (0.009) | (0.009) | (0.012) | (0.010) |
| T $s'$*post 2011*edu $s$ | -0.001 | -0.001 | -0.026* | 0.005 |
| | (0.009) | (0.008) | (0.015) | (0.014) |
| N | 3633 | 3633 | 3220 | 3220 |

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