



# Cognitive functioning and retirement in Europe

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# Motivation and literature

- Ageing societies put pressure on sustainability of pension systems. Individuals are increasingly asked to work longer (retire later)
- Questions: what are the effects of retirement on health and/or cognitive abilities?
- Previous findings on cognition are mixed: Rohwedder and Willis (2010), Bonsang et al. (2012), Mazzonna and Peracchi (2012) find a negative effect of retirement on cognitive abilities; Coe et al. (2012) and Coe and Zamarro (2011) do not find a causal relationship between retirement and cognitive functioning.

# This paper

- Estimates effect of retirement on total word recall. While immediate effect is absent, delayed effect is positive.
- Uses a panel data set with fixed effects to control for unobserved characteristics such as innate ability
- Tests for learning effects
- Investigates possible heterogeneous effect of retirement on word recall (gender, education...)

# Empirical strategy

- $WR_{it} = \alpha_1 R_{it} + \beta X_{it} + \varepsilon_{it} + v_t + \mu_i$
- $WR_{it} = \alpha_2 (age_{it} - age_i^R) R_{it} + \beta X_{it} + \varepsilon_{it} + v_t + \mu_i$
- Fixed effects, 2SLS estimator. Instruments constructed using legal ages for old age and early retirement, vary with time and country.
- Sample selection: individuals aged 50 to 70, who were working at the age of 50, who declare themselves as either working or retired, living in Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland and Belgium. We exclude individuals who returned to work after retirement and individuals who report themselves sick, unemployed or homemaker. Our final sample is unbalanced and consists of 23,619 observations.

## The effect of retirement status and duration on word recall

|                              | FE              | FE-2SLS         | FE              | FE-2SLS          |
|------------------------------|-----------------|-----------------|-----------------|------------------|
|                              | b/se            | b/se            | b/se            | b/se             |
| <b>retirement status</b>     | <b>-0.0262</b>  | <b>0.0348</b>   |                 |                  |
|                              | <b>(0.0821)</b> | <b>(0.5032)</b> |                 |                  |
| <b>retirement duration</b>   |                 |                 | <b>0.0254</b>   | <b>0.4055***</b> |
|                              |                 |                 | <b>(0.0191)</b> | <b>(0.0916)</b>  |
| <b>age<sup>2</sup>/100</b>   | 2.5136          | 2.0867          | 2.4093          | 3.6097           |
|                              | (2.2911)        | (4.1543)        | (2.2310)        | (2.2782)         |
| <b>age<sup>3</sup>/10000</b> | -1.6544         | -1.4228         | -1.6535         | -3.1414**        |
|                              | (1.2673)        | (2.2668)        | (1.2377)        | (1.2995)         |
| <b>learning</b>              | 0.1546*         | 0.1554*         | 0.1554*         | 0.1626*          |
|                              | (0.0889)        | (0.0890)        | (0.0889)        | (0.0903)         |
| <b>contextual factor</b>     | -0.4703***      | -0.4697***      | -0.4685***      | -0.4452***       |
|                              | (0.0937)        | (0.0937)        | (0.0937)        | (0.0951)         |
| <b>Year dummies</b>          | yes             | yes             | yes             | yes              |
| <b><u>FIRST STAGE</u></b>    |                 |                 |                 |                  |
| <b>old age</b>               |                 | 0.1207***       |                 | 0.3133***        |
|                              |                 | (0.0109)        |                 | (0.0182)         |
| <b>early age</b>             |                 | 0.0803***       |                 | 0.0881***        |
|                              |                 | (0.0101)        |                 | (0.0118)         |
| <b>Number of obs</b>         | 23619           | 23619           | 23619           | 23619            |

# Robustness to age trend

|                       | FE-2SLS           | FE-2SLS          | FE-2SLS          | FE-2SLS          |
|-----------------------|-------------------|------------------|------------------|------------------|
|                       | b/se              | b/se             | b/se             | b/se             |
| retirement duration   | <b>-0.0659***</b> | <b>0.2831***</b> | <b>0.3739***</b> | <b>0.2974***</b> |
|                       | <b>(0.0198)</b>   | <b>(0.0839)</b>  | <b>(0.0944)</b>  | <b>(0.1094)</b>  |
| retirement duration^2 |                   |                  |                  | <b>0.0064</b>    |
|                       |                   |                  |                  | <b>(0.0056)</b>  |
| age^2/100             |                   | -1.5784***       | 72.0703          | 6.6661*          |
|                       |                   | (0.3363)         | (60.1525)        | (3.5605)         |
| age^3/10000           |                   |                  | -79.3618         | -4.8092**        |
|                       |                   |                  | (66.9458)        | (2.0327)         |
| age^4/1000000         |                   |                  | 31.7512          |                  |
|                       |                   |                  | (27.7326)        |                  |

# Practice/retest effects

|                     | all              | all              | all              | wave2-wave4      | Refresh sample  |
|---------------------|------------------|------------------|------------------|------------------|-----------------|
|                     | b/se             | b/se             | b/se             | b/se             | b/se            |
| retirement duration | <b>0.4055***</b> | <b>0.4048***</b> | <b>0.4068***</b> | <b>0.3804***</b> | <b>0.6356*</b>  |
|                     | <b>(0.0916)</b>  | <b>(0.0916)</b>  | <b>(0.0916)</b>  | <b>(0.1345)</b>  | <b>(0.3310)</b> |
| age^2/100           | 3.6097           | 2.7066           | 3.4870           | 2.3808           | 6.2731          |
|                     | (2.2782)         | (2.2402)         | (2.2809)         | (3.4202)         | (6.1348)        |
| age^3/10000         | -3.1414**        | -2.6450**        | -3.0734**        | -2.4793          | -5.2117         |
|                     | (1.2995)         | (1.2791)         | (1.3002)         | (1.9567)         | (3.7889)        |
| Learning (0/1)      | <b>0.1626*</b>   |                  |                  | <b>0.1924*</b>   |                 |
|                     | <b>(0.0903)</b>  |                  |                  | <b>(0.0994)</b>  |                 |
| # retest            |                  | <b>-0.1935</b>   | <b>0.2162</b>    |                  |                 |
|                     |                  | <b>(0.1624)</b>  | <b>(0.2603)</b>  |                  |                 |
| # retest^2          |                  |                  | <b>-0.0897**</b> |                  |                 |
|                     |                  |                  | <b>(0.0457)</b>  |                  |                 |
| contex_fac~r        | -0.4452***       | -0.4472***       | -0.4467***       | -0.6482***       | -0.9288***      |
|                     | (0.0951)         | (0.0951)         | (0.0951)         | (0.1567)         | (0.2479)        |
| year dummies        | yes              | yes              | yes              | yes              | yes             |
| Number of obs       | <b>23619</b>     | <b>23619</b>     | <b>23619</b>     | <b>10812</b>     | <b>3880</b>     |
| Hansen J            | 0.273            | 0.205            | 0.264            | 0.259            | 0.134           |
| P-value             | 0.601            | 0.651            | 0.607            | 0.611            | 0.714           |
| Weak identification | 176.121          | 176.272          | 176.110          | 97.858           | 17.296          |

## Additional controls and gender heterogeneity

|                            |                   |                   |                   |
|----------------------------|-------------------|-------------------|-------------------|
| retirement duration        | <b>0.3941***</b>  | <b>0.3896***</b>  | <b>0.3199***</b>  |
|                            | <b>(0.0917)</b>   | <b>(0.0918)</b>   | <b>(0.0866)</b>   |
| ret. duration*female       |                   |                   | <b>0.0187</b>     |
|                            |                   |                   | <b>(0.0245)</b>   |
| Age^2/100                  | 3.3098            | 2.9982            | 2.8021            |
|                            | (2.2758)          | (2.2777)          | (2.2655)          |
| Age^3/10000                | -2.9498**         | -2.7656**         | -2.5233*          |
|                            | (1.2986)          | (1.2998)          | (1.2877)          |
| couple                     | 0.1445            | 0.1442            | 0.1451            |
|                            | (0.1411)          | (0.1411)          | (0.1407)          |
| smoke                      | 0.0981            | 0.0981            | 0.0963            |
|                            | (0.0721)          | (0.0721)          | (0.0718)          |
| drink                      | <b>-0.1382*</b>   | <b>-0.1376*</b>   | <b>-0.1457*</b>   |
|                            | <b>(0.0814)</b>   | <b>(0.0814)</b>   | <b>(0.0810)</b>   |
| physical inactivity        | <b>-0.4556***</b> | <b>-0.4366***</b> | <b>-0.4364***</b> |
|                            | <b>(0.1386)</b>   | <b>(0.1390)</b>   | <b>(0.1387)</b>   |
| learning                   | 0.1859**          | 0.1861**          | 0.1859**          |
|                            | (0.0915)          | (0.0916)          | (0.0912)          |
| contextual factor          | -0.4502***        | -0.4462***        | -0.4506***        |
|                            | (0.0949)          | (0.0950)          | (0.0946)          |
| 2 or more chronic dis.     |                   | 0.0456            | 0.0489            |
|                            |                   | (0.0617)          | (0.0613)          |
| self-perceived health (us) |                   | -0.0394           | -0.0403           |
|                            |                   | (0.0310)          | (0.0309)          |
| # limitations adl          |                   | 0.0229            | 0.0188            |
|                            |                   | (0.0833)          | (0.0829)          |
| # limitations iadl         |                   | -0.0837           | -0.0790           |
|                            |                   | (0.0887)          | (0.0883)          |



# Education and previous job

|                              | FE-2SLS          | FE-2SLS          | FE-2SLS          | FE-2SLS          |
|------------------------------|------------------|------------------|------------------|------------------|
|                              | b/se             | b/se             | b/se             | b/se             |
| retirement duration          | <b>0.3463***</b> | <b>0.3432***</b> | <b>0.3313***</b> | <b>0.2948***</b> |
|                              | (0.0879)         | (0.0869)         | (0.0917)         | (0.0921)         |
| ret.dur.* higher edu         | 0.0327           |                  |                  |                  |
|                              | (0.0247)         |                  |                  |                  |
| Ret.dur.*college             |                  | <b>0.0983***</b> |                  |                  |
|                              |                  | (0.0299)         |                  |                  |
| ret.dur.* blue collar        |                  |                  | -0.0399          |                  |
|                              |                  |                  | (0.0281)         |                  |
| ret.dur.*high skilled worker |                  |                  |                  | <b>0.0613**</b>  |
|                              |                  |                  |                  | (0.0267)         |

## Previous job characteristics (sharelife)

|                                   | FE-2SLS   | FE-2SLS   | FE-2SLS   | FE-2SLS   |
|-----------------------------------|-----------|-----------|-----------|-----------|
|                                   | b/se      | b/se      | b/se      | b/se      |
| <b>Retirement duration</b>        | 0.4835*** | 0.4531*** | 0.5114*** | 0.5120*** |
|                                   | (0.1703)  | (0.1696)  | (0.1729)  | (0.1697)  |
| <b>ret.dur.*skill development</b> | 0.0585*   |           |           |           |
|                                   | (0.0304)  |           |           |           |
| <b>ret.dur.*little freedom</b>    |           | -0.0264   |           |           |
|                                   |           | (0.0287)  |           |           |
| <b>ret.dur.*adequate salary</b>   |           |           | -0.0312   |           |
|                                   |           |           | (0.0279)  |           |
| <b>ret.dur.*gave recognition</b>  |           |           |           | 0.0144    |
|                                   |           |           |           | (0.0313)  |

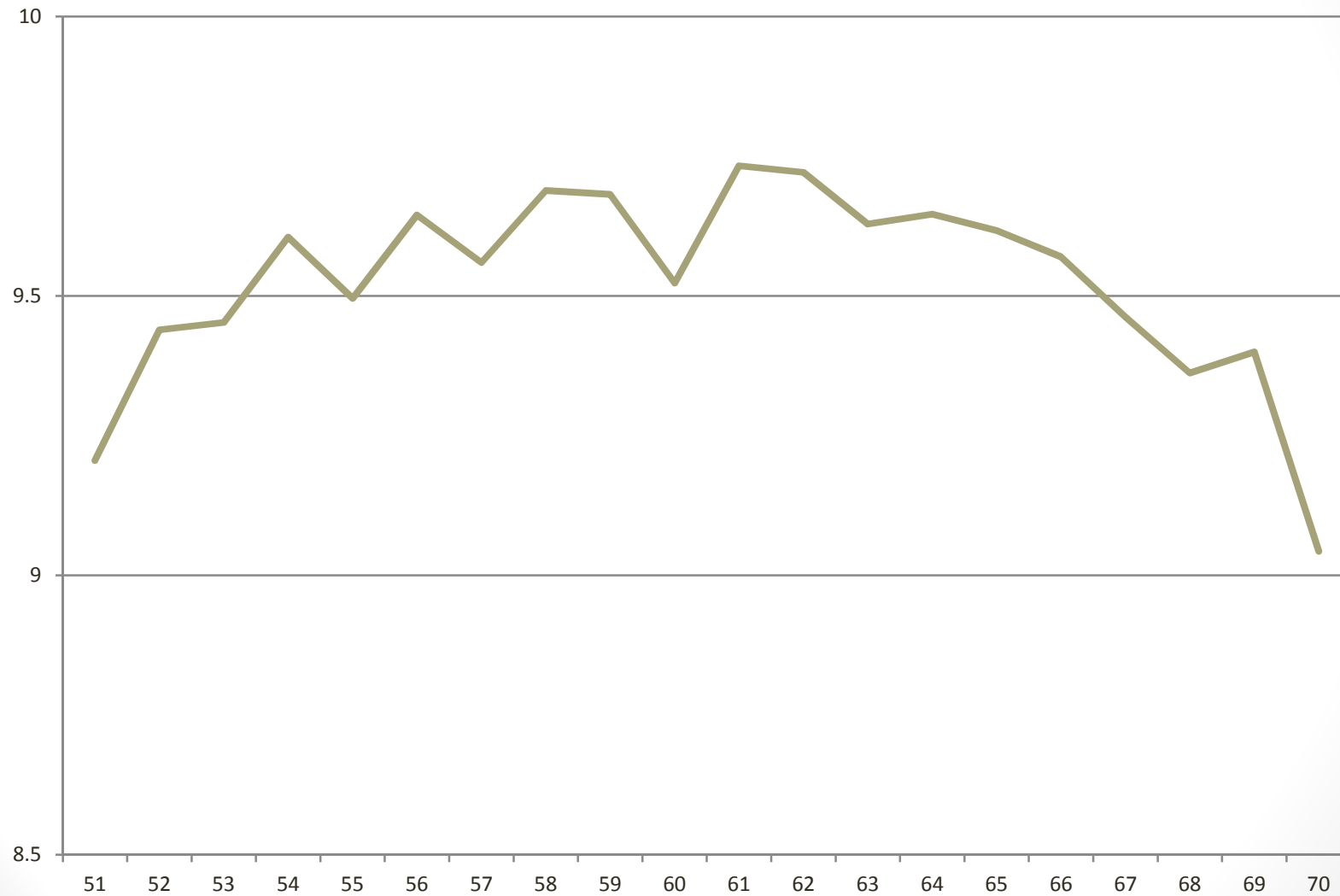
## Activities after retirement (wave 4)

|                            | FE-2SLS   | FE-2SLS   | FE-2SLS   |
|----------------------------|-----------|-----------|-----------|
|                            | b/se      | b/se      | b/se      |
| retirement duration        | 0.3866*** | 0.3964*** | 0.2638*** |
|                            | (0.0916)  | (0.1030)  | (0.0942)  |
| ret.dur.*still working     | -0.0304   |           |           |
|                            | (0.0242)  |           |           |
| ret.dur.*activities social |           | -0.0014   |           |
|                            |           | (0.0362)  |           |
| ret.dur.*read              |           |           | 0.1227**  |
|                            |           |           | (0.0507)  |

# Heterogeneity of the effect of retirement on word recall

- We test for differences in the effect of retirement on WR, and find:
  - no statistically significant difference for men/women
  - positive difference for college graduates
  - positive difference for skilled workers
  - positive difference for individuals who read books
- Evidence is consistent with theories highlighting role of cognitive reserve in shaping old-age cognitive decline. Individual's lifestyle is associated to effect of retirement on cognition.

## Total word recall fixed-effects age profile



## Retirement status fixed-effects age profile

