Occupation, Retirement and Cognitive Functioning

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Purpose

• To examine the causal impact of retirement on cognitive functioning of elder workers using the panel of National Survey of Japanese Elderly (NSJE).
• Test the “use-it-or-lose-it” hypothesis
• We explore the effects of the longest tenure job (career job) on cognitive functioning.
Estimation model

\[ COG_i = \tau_1 RET_i + \tau_2 (RET_i \cdot DOTJ_i) + \tau_3 DOTJ_i + X_i \beta + u_i \]  

1. \( COG_i \): memory test score
2. \( RET_i \): duration of retirement
3. \( DOTJ_i \): 0-1 dummy variable relating to the \( J \)th occupational characteristics of the respondent’s career job
Methods

• Focus on the cumulative effects of job tasks on cognitive functioning using the Dictionary of Occupational Titles (DOT).

• We use “the duration of retirement” as a measure of retirement.

• We take into account for endogeneity and left-censoring when using “the duration of retirement”.

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Accounting for Endogeneity

\[ COG_i = \tau_1 RET_i + \tau_2 (RET_i \cdot DOTJ_i) + \tau_3 DOTJ_i + X_i \beta + u_i \]  
(1)

\[ RET_i^* = \beta Z_i + \gamma DOTJ_i + X_i \delta + w_i \]  
(2)

\[ RET_i = 0 \quad \text{if } RET_i^* \leq 0 \]  
(3a)

\[ = RET_i^* \quad \text{if } 0 < RET_i^* \]  
(3b)
The results

• Those who performed mathematical tasks in their career job are less likely to suffer memory loss after retirement than those who did not perform those tasks.

• On the other hand, those who performed physical tasks in their career job are more likely to suffer memory loss after retirement than those who did not perform such tasks.
# Issues in the Previous Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Data</th>
<th>Def of Retirement</th>
<th>IV</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rohwedder and Willis (2010)</td>
<td>ELSA (England), SHARE (11 European countries), HRS (US)</td>
<td>binary</td>
<td>the age of eligibility for early retirement, at the time of the interview</td>
<td>negative</td>
</tr>
<tr>
<td>Mazzonna and Peracchi (2012)</td>
<td>SHARE</td>
<td>duration</td>
<td>the eligibility ages at the time when individuals faced their retirement decisions.</td>
<td>negative</td>
</tr>
<tr>
<td>Bonsang et al. (2012)</td>
<td>HRS (US)</td>
<td>binary (ret at least 1 year), duration</td>
<td>the age of eligibility for early and normal retirement at the time of the interview</td>
<td>negative</td>
</tr>
<tr>
<td>Coe et al. (2012)</td>
<td>HRS (US)</td>
<td>duration</td>
<td>the offers of early retirement windows</td>
<td>In-significant</td>
</tr>
</tbody>
</table>
Issues in the Previous Studies

• The impact of occupation
  – Some research suggested that cognitive decline is related to occupation.
  – However, the effects of occupations on cognitive functioning are still ambiguous.
    • Rough occupational division (blue collar vs. white collar or professional vs. non-professional)
Our Approach

• Definition of Retirement (DR)
  – Duration
  – Left-censoring

• Choice of Instruments
  – Eligibility ages of pension benefits
  – self-employed dummy when individuals faced their retirement decisions.

• Occupational Characteristics.
  – Occupational Characteristics in DOT
Duration of Retirement

• We cannot observe RD* for those who are currently employed. => Left-censoring problem
  – RD=0
  • People who are employed.
  • People who have just retired.

• The retired and the employed could be structurally different in terms of how the covariates influence on cognitive functioning.
  – Tobit model may be a better option in the first stage estimation.
Dictionary of Occupational Titles (DOT)

- Standardized occupational information to support job placement activities.
  - Physical demand
  - Mathematical Development
  - Reasoning Development
  - Language Development
**DOTJ}_i**

- =1 if the score of job characteristic $J$ is higher than the median value.
- =0 otherwise.

- $Physical_i$: Physical demand
- $Math_i$: Mathematical Development
- $Reasoning_i$: Reasoning Development
- $Language_i$: Language Development
Longitudinal Study of a National Survey of Japanese Elderly (NSJE)

– The Tokyo Metropolitan Institute of Gerontology and the University of Michigan.
– The data was provided by the Social Science and the Social Science Japan Data Archive, Information Center for Social Science Research on Japan, Institute of Social Science, the University of Tokyo

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The population of aged 60+ extracted by two-stage stratified random sampling.

Observations where for health reasons a family member answered the survey on behalf of the respondent are excluded from the analysis.

We use Waves 1 and the supplementary samples in Wave 2 and Wave 4.

Because individuals in their early 60s are over-represented in the sample, we use an appropriate weight for estimation.
Estimation model

\[ COG_i = \tau_1 RET_i + \tau_2 (RET_i \cdot DOTJ_i) + \tau_3 DOTJ_i + X_i \beta + u_i \]  
(1)

\[ RET_i^* = \gamma_1 PENSION_i + \gamma_2 SELF_i + \gamma_3 DOTJ_i + X_i \delta + w_i \]  
(2)

\[ RET_i = 0 \quad \text{if} \quad RET_i^* \leq 0 \]  
(3a)

\[ = RET_i^* \quad \text{if} \quad 0 < RET_i^* \]  
(3b)
Cognitive Test Score (NSJE)

1. Respondent’s address
2. Date of the interview
3. Day of the interview
4. Respondent’s mother’s maiden name
5. Respondent’s date of birth
6. Respondent’s age
7. Question that requires the respondent to continuously deduct 3 from 20.

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Duration of Retirement

• Self-reported retirement

• Duration of retirement
  = (Age of the respondent) – (Age of the retirement)

• If those who do not retire, the duration of retirement = 0.
\[ \text{DOT} J_i \]

\[ \text{COG}_i = \tau_1 \text{RET}_i + \tau_2 (\text{RET}_i \cdot \text{DOT} J_i) + \tau_3 \text{DOT} J_i + X_i \beta + u_i \]

- Merge the occupation codes in the DOT with our data set using the occupation codes in the NSJE.
  - =1 if the score of job characteristic \( J \) is higher than the median value.
  - =0 otherwise.

- \( \text{Physical}_i \): Physical demand
- \( \text{Math}_i \): Mathematical Development
- \( \text{Reasoning}_i \): Reasoning Development
- \( \text{Language}_i \): Language Development

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“Instruments”

– $PENSION_i$
  • The eligibility age for pension benefits when individuals faced their retirement decisions

– $SELF_i$
  • Dummy variable which takes a unit value if the respondent’s career job is a self-employed job, and zero otherwise.

– These instruments are both statistically significant in the first stage estimations.

– $X_i$ includes age, education, and the survey year dummies.
### Main Results (With weighting)

<table>
<thead>
<tr>
<th></th>
<th>(3b)</th>
<th>(4b)</th>
<th>(5b)</th>
<th>(6b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RET</td>
<td>0.024</td>
<td>-0.018</td>
<td>-0.013</td>
<td>-0.014</td>
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<tr>
<td>RET*Physical</td>
<td>-0.039*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RET*Math</td>
<td></td>
<td>0.044**</td>
<td></td>
<td></td>
</tr>
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<td>RET*Reasoning</td>
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<td>0.037</td>
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<tr>
<td>RET*Language</td>
<td></td>
<td></td>
<td></td>
<td>0.039</td>
</tr>
</tbody>
</table>

1) *, ** and *** indicate statistical significance at 10%, 5% and 1% levels respectively.
2) "Duration of retirement" are calculated from the fitted values of a tobit model, standard errors in brackets are estimated using a bootstrapping technique.

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Robustness Check (With weighting)

\[
DOTJ = 1 \quad \text{if} \quad \geq 65\text{th percentile} \\
= 0 \quad \text{if} \quad < 35\text{th percentile}
\]

<table>
<thead>
<tr>
<th></th>
<th>(3b)</th>
<th>(4b)</th>
<th>(5b)</th>
<th>(6b)</th>
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<tbody>
<tr>
<td>( RET )</td>
<td>0.040</td>
<td>-0.018</td>
<td>-0.013</td>
<td>-0.014</td>
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<tr>
<td>( RET*\text{Physical} )</td>
<td>( -0.055^* )</td>
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<tr>
<td>( RET*\text{Math} )</td>
<td></td>
<td>( 0.052^{**} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( RET*\text{Reasoning} )</td>
<td></td>
<td></td>
<td>( 0.064^{**} )</td>
<td></td>
</tr>
<tr>
<td>( RET*\text{Language} )</td>
<td></td>
<td></td>
<td></td>
<td>( 0.041 )</td>
</tr>
</tbody>
</table>

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Conclusion

• Purpose
  – We examine the impact of the longest tenure job on cognitive functioning.

• The results
  – The requirements such as mathematical skills and physical demand in a person’s career job have statistically significant impacts on the cognitive functioning after retirement.

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Thank you!

Let me know if you have any questions. It would be helpful if you could please speak slowly.
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<td>panel</td>
<td>the offers of early retirement windows</td>
<td>Insignificant</td>
<td></td>
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<tr>
<td>DOT 3 Digit</td>
<td>DOT OCCUPATIONAL GROUP</td>
<td>Physical Strength</td>
<td>Reasoning Development</td>
<td>Mathematical Development</td>
<td>Language Development</td>
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<td>-------------------</td>
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<tr>
<td>001</td>
<td>ARCHITECT (profess. &amp; kin.)</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
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<tr>
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<td>SUPERVISOR, BLUEPRINTING-AND-PHOTOCOPY (any industry)</td>
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<td>4</td>
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<tr>
<td>008</td>
<td>SUPERVISOR, PUBLICATIONS PRODUCTION (print. &amp; pub.) alternate titles: supervisor, layout</td>
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<tr>
<td>008</td>
<td>TYPE-COPY EXAMINER (machinery mfg.)</td>
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<td>2</td>
<td>1</td>
<td>2</td>
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<tr>
<td>008</td>
<td>INSPECTOR, FURNITURE DECALS (furniture)</td>
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<td>2</td>
<td>1</td>
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<td>008</td>
<td>GENERAL WORKER, LITHOGRAPHIC (print. &amp; pub.)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
### Examples of How to Merge 3 Digit Code in DOT with NSJE

<table>
<thead>
<tr>
<th>NSJE OCCUPATIONAL CODE</th>
<th>DOT 3 DIGIT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 Researcher in Natural Science</td>
<td>020 021 022 023 024 025 040 041 045</td>
</tr>
<tr>
<td>002 Researcher in Humanities and Social Science</td>
<td>050 051 052 054 055</td>
</tr>
<tr>
<td>003 Mining engineer</td>
<td>010 011</td>
</tr>
<tr>
<td>004 Metallurgical Engineer</td>
<td>011</td>
</tr>
<tr>
<td>005 Mechanic Engineer</td>
<td>007</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>287 Sanitation worker</td>
<td>381</td>
</tr>
</tbody>
</table>
NSJE

– Conducted every three years since 1987.
– Observations where for health reasons a family member answered the survey on behalf of the respondent are excluded from the analysis.

• We could not include these extreme cases of deterioration of cognitive function into our analysis.
NSJE- Continued

– We use Waves 1 and the supplementary samples in Wave 2 and Wave 4.
  • In Wave 2 (1990), 580 individuals who are aged 60 to 62 are added.
  • In Wave 4 (1996), 1210 individuals who are aged 60 to 65 are added.

– Individuals in their early 60s are over-represented in the sample.
  • Use an appropriate weight for estimation.

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“Instruments”

- \( PENSION_i \)
  - The eligibility age for pension benefits when individuals faced their retirement decisions

- \( SELF_i \)
  - Dummy variable which takes the value unity if the respondent’s career job is a self-employed job, and zero otherwise.