



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
- RET_i : duration of retirement
- $DOTJ_i$: 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”.



Accounting for Endogeneity

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

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

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

$$= RET_i^* \quad \text{if } 0 < RET_i^* \quad (3b)$$



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

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



Issues in the Previous Studies

- The impact of occupation
 - Some research suggested that cognitive decline is related to occupation.
 - (Evans et al., 1993, Schooler et al., 1999, Stern et al., 1994, Stern 2002).
 - 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



NSJE- Continued

- 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

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

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

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

$$= RET_i^* \quad \text{if } 0 < RET_i^* \quad (3b)$$



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.



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.



$DOTJ_i$

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

- 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.
 - $Physical_i$: Physical demand
 - $Math_i$: Mathematical Development
 - $Reasoning_i$: Reasoning Development
 - $Language_i$: Language Development



“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)

	(3b)	(4b)	(5b)	(6b)
<i>RET</i>	0.024	-0.018	-0.013	-0.014
<i>RET*Physical</i>	-0.039*			
<i>RET*Math</i>		0.044**		
<i>RET*Reasoning</i>			0.037	
<i>RET*Language</i>				0.039

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.

Robustness Check (With weighting)

$$\begin{aligned}
 DOTJ &= 1 \quad \text{if } \geq 65\text{th percentile} \\
 &= 0 \quad \text{if } < 35\text{th percentile}
 \end{aligned}$$

	(3b)	(4b)	(5b)	(6b)
<i>RET</i>	0.040	-0.018	-0.013	-0.014
<i>RET*Physical</i>	-0.055*			
<i>RET*Math</i>		0.052**		
<i>RET*Reasoning</i>			0.064**	
<i>RET*Language</i>				0.041

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.

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.



Thank you!

Let me know if you have any questions.
It would be helpful if you could please speak
slowly.



	Data	Data Type	Def of R	IV	Results
Rohwedder and Willis (2010)	ELSA (England), SHARE (11 European countries), HRS (US)	cross-sectional	binary	the age of eligibility for early retirement, at the time of the interview	negative
Mazzonna and Peracchi (2012)	SHARE	cross-sectional	duration	the eligibility ages at the time when individuals faced their retirement decisions.	negative
Bonsang et al. (2012)	HRS (US)	panel	binary (ret at least 1 year), duration	the age of eligibility for early and normal retirement at the time of the interview	negative
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DOT 3 Digit	DOT OCCUPATIONAL GROUP	Physical Strength	Reasoning Development	Mathematical Development	Language Development
001	ARCHITECT (profess. & kin.)	2	6	6	6
001	ARCHITECT, MARINE (profess. & kin.) alternate titles: architect, naval; naval designer	2	6	6	6
001	LANDSCAPE ARCHITECT (profess. & kin.) alternate titles: community planner; environmental	2	5	5	5
001	SCHOOL-PLANT CONSULTANT (education)	1	5	5	5
001	DRAFTER, ARCHITECTURAL (profess. & kin.)	1	4	4	4
001	DRAFTER, LANDSCAPE (profess. & kin.)	1	4	4	3
.....					
008	SUPERVISOR, BLUEPRINTING-AND-PHOTOCOPY (any industry)	2	4	2	2
008	SUPERVISOR, PRINTING-SHOP (print. & pub.) alternate titles: lead printer	2	4	3	4
008	SUPERVISOR, PUBLICATIONS PRODUCTION (print. & pub.) alternate titles: supervisor, layout	2	4	2	4
008				
008	TYPE-COPY EXAMINER (machinery mfg.)	1	2	1	2
008	INSPECTOR, FURNITURE DECALS (furniture)	3	2	1	1
008	GENERAL WORKER, LITHOGRAPHIC (print. & pub.)	3	2	2	2



Examples of How to Merge 3 Digit Code in DOT with NSJE

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



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.



“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.

