

Mental Retirement:

National-level Policy Variations and Pooled
Cross-sectional Data from HRS, ELSA, and SHARE
to identify a Causal Effect of Early Retirement on Cognition

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For better life and health“
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Use it or lose it

- Can people stave off cognitive decline through mental exercise?
- A large popular and scholarly literature endorses this idea
- Improve your cognitive ability by
 - Playing bridge, chess or go
 - Doing cross word puzzles
 - Engaging in civic activities

Evidence Is Weak

- Hultch et al. (1999), for example, find a statistical association between leading an “engaged life style” and smaller declines in cognition among middle-aged and older adults but explicitly note that they are unsure of the causal direction.

Evidence Is Weak (cont.)

- Salthouse (2006) review of literature
 - “at the present time the mental-exercise hypothesis is more of an optimistic hope than an empirical reality.”
- Reasons
 - Causal direction not established in observational studies
 - Experiments involve
 - Small scale stimulus
 - Short duration of follow-up so cannot tell if rate of cognitive decline has been slowed

“Use or Lose It”

Retirement and Cognitive Ability

- The HRS is being replicated around the world, with the ELSA study in England, the SHARE project in 18 countries in Europe, new studies in Korea, Japan, China and India
- Availability of cross-nationally comparable data promises to create many new research findings
- This paper illustrates this promise using data from SHARE, ELSA and HRS to investigate the idea that people can avoid cognitive decline at older ages by being in a more mentally stimulating home or work environment

Suggestive Evidence from SHARE

- Sergio Perelman presented an interesting graph at a HRS/SHARE/ELSA conference at RAND in 2006 showing that the cognitive performance of men 60-64 relative to those 50-54 is lower in countries in which men retire earlier

“Use or Lose It” (cont.)

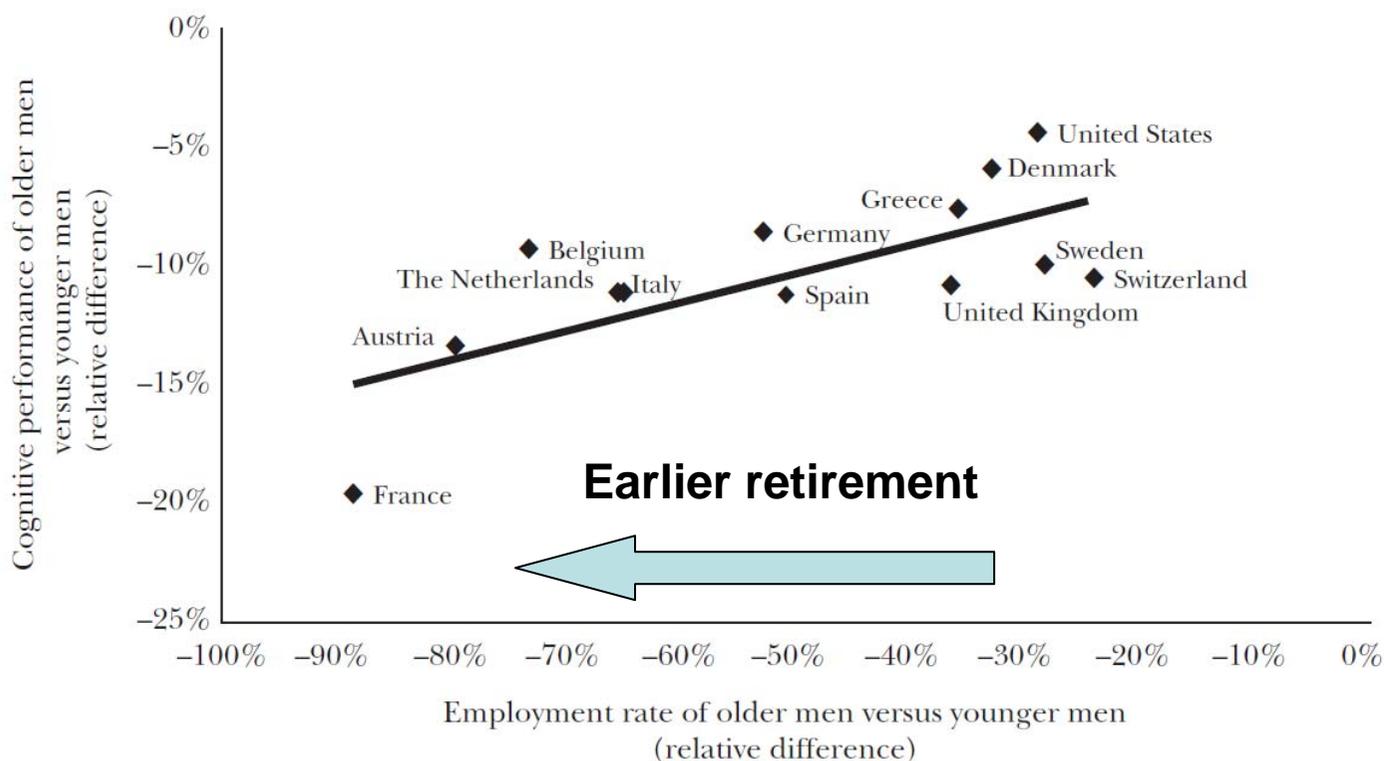
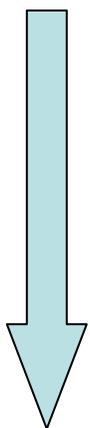
- They used a cross-country, cross-sectional analysis to examine the relationship between early retirement for men and cognitive decline between age 50-54 and 60-64
- Cognition measured by immediate and delayed word recall task that was conducted in survey in each country
 - Measures verbal long term memory (Park, et. al., 2002).
- For each country, they calculate the mean values of
Early Retirement = $LFPR(60-64)/LFPR(50-54)$
Cognitive Decline = $Cog(60-64)/Cog(50-54)$

Cross-Country Correlation of Retirement and Cognitive Performance

Figure 1

Drop in Cognitive Performance as a Function of Drop in Employment Rate between Men 50–54 and 60–64 Years Old

Decreasing
Cognition

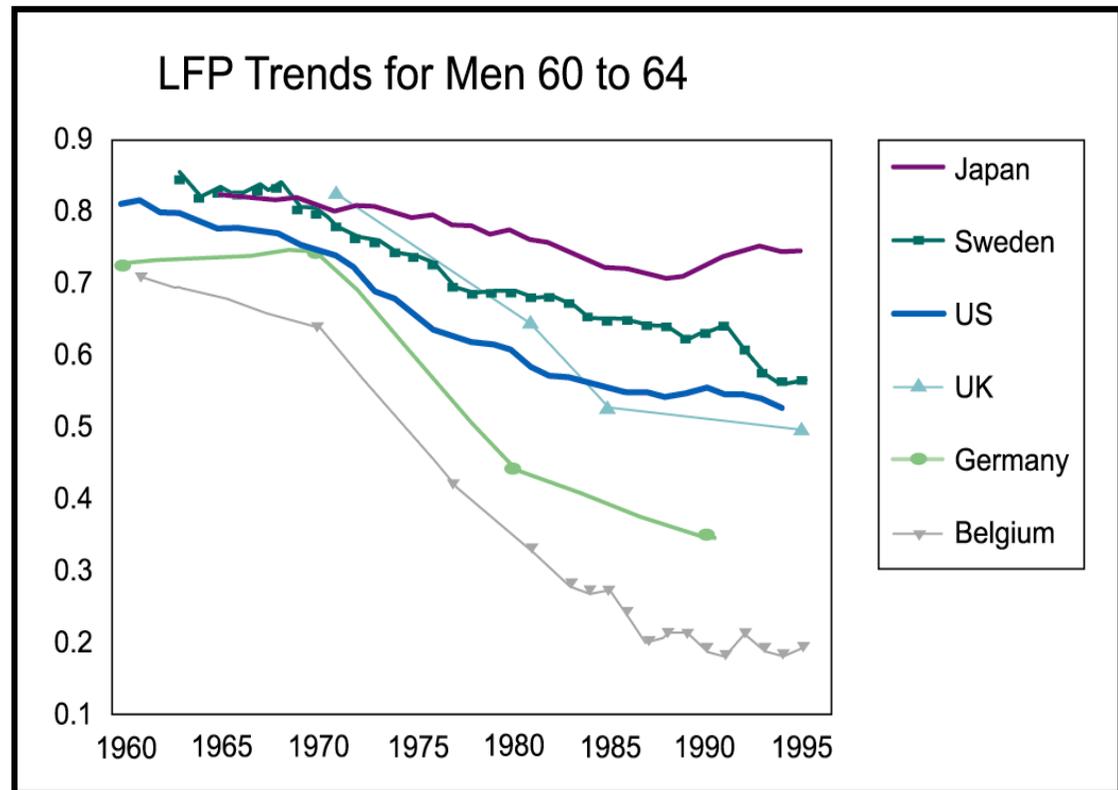


Causal Effect of Retirement on Cognitive Performance

- In her discussion of Perelman's paper, Susann Rohwedder suggested that the evidence in this graph might be interpreted as a causal effect because
 - Most of the cross-country variation in retirement is due to the incentive effects created by public pension, disability and tax policies (Gruber-Wise, 1999)
 - Unlikely that these policies have been set in response to observed age patterns of cognition in country's populations
 - Thus, policies provide valid instruments to remove reverse causation of cognition on retirement behavior in micro data

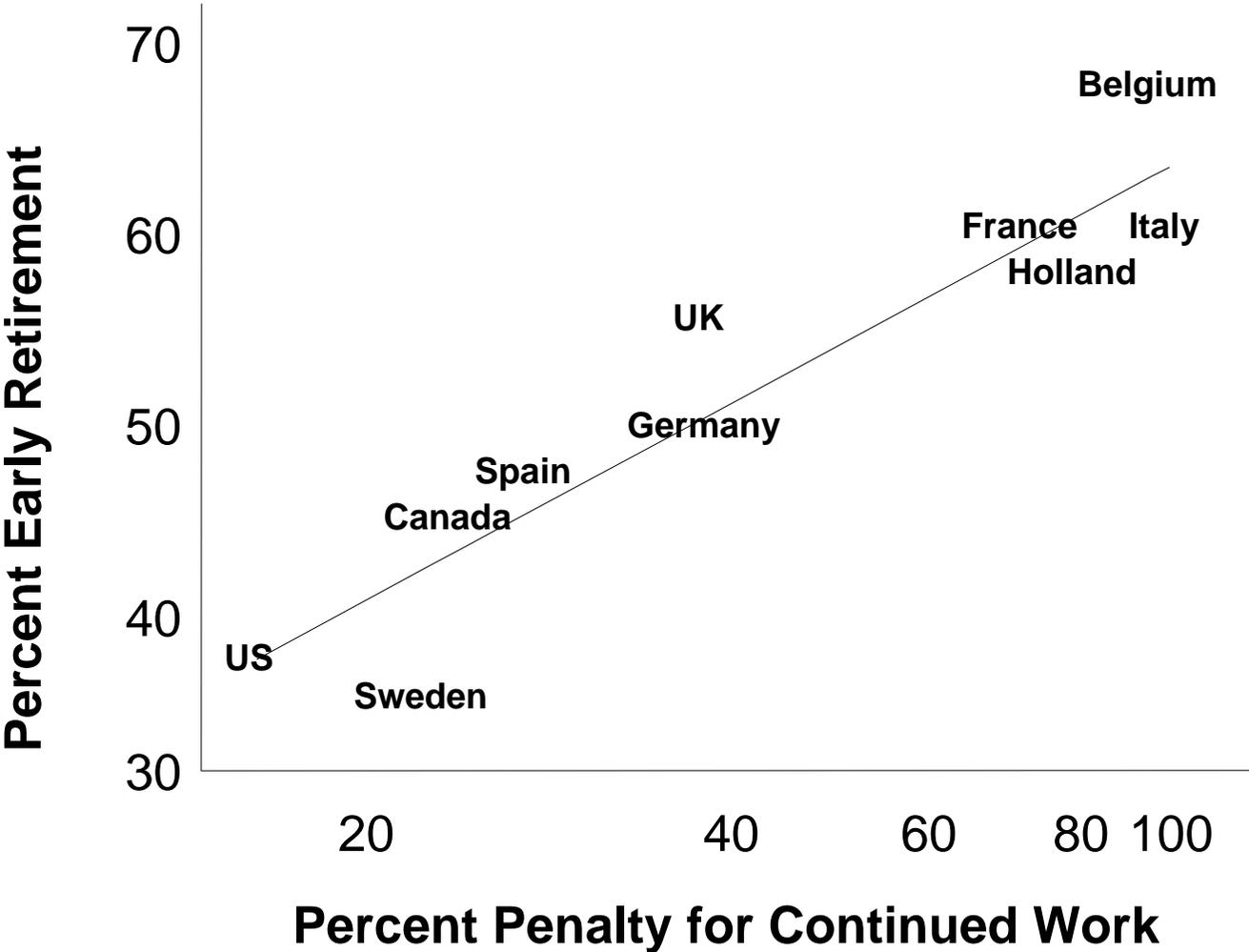
Cross-National Age Trends in Labor Force Participation: 1960-1995

- Trend toward lower labor force participation at older ages was much sharper in a number of European countries
- Why?



Source: J. Gruber and D. Wise, *Social Security Programs and Retirement Around the World*, U. Chicago Press, 1999.

Retirement Policy Shapes Retirement Behavior



Source: J. Gruber and D. Wise, Social Security and Retirement Around the World (NBER, 1999)

Mental Retirement Hypothesis

- In this paper, Susann Rohwedder and I investigate the hypothesis that retirement has a causal effect on cognitive status of older persons
- Outline
 - Identification Issues
 - Discuss theoretical relationship between cognition and human capital
 - Two hypotheses about mechanism for mental retirement effects
 - Present estimates of the mental retirement effect in micro data using IV methods
 - Speculate about welfare implications

Identification Issues

- Retirement is a self-selected status
 - Psychological problems including depression or reduced cognitive ability may induce a person to retire
- Is Retirement Depressing?
 - In HRS, Kerwin Charles (2002) found in cross-section that retired people are more depressed
 - Using IV (instrumental variables) related to Social Security policy incentives and panel data, he found that retirement actually reduces depressive symptoms

Identification Issues (cont.)

- Based on evidence from Gruber-Wise, we use cross-country variation in early and full retirement ages to obtain IV estimates of a mental retirement effect in pooled HRS/ELSA/SHARE data.
- Before doing this we consider the theoretical basis for a mental retirement effect in cognitive psychology and human capital theory

Theory of Fluid and Crystallized Intelligence

- Fluid Intelligence is the “thinking part” of ability
 - Abstract reasoning, short term memory, working memory, coordination of mental processes involved in planning and problem solving
- Crystallized Intelligence is the “knowing part” of ability
 - Encompasses the main accumulation of influence from education and lifetime experience

Life Cycle Pattern of Fluid and Crystallized Intelligence

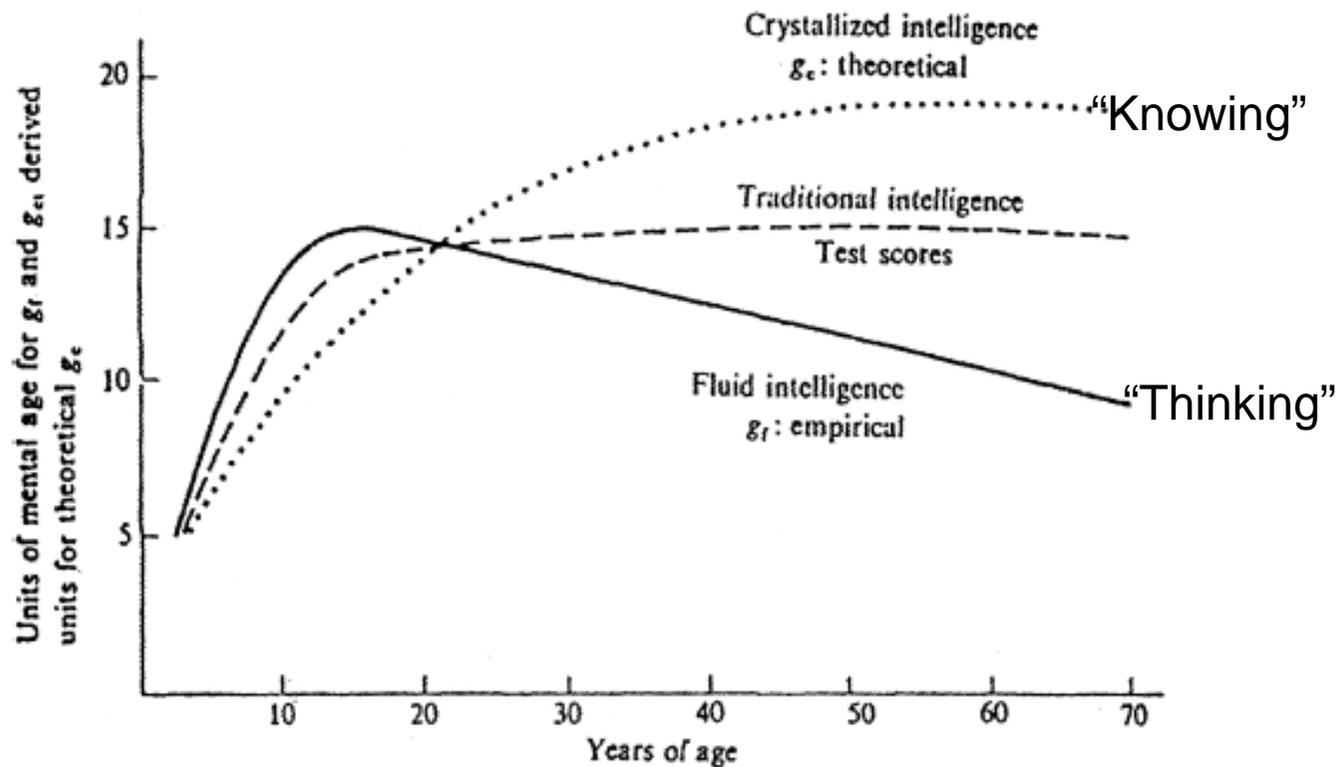
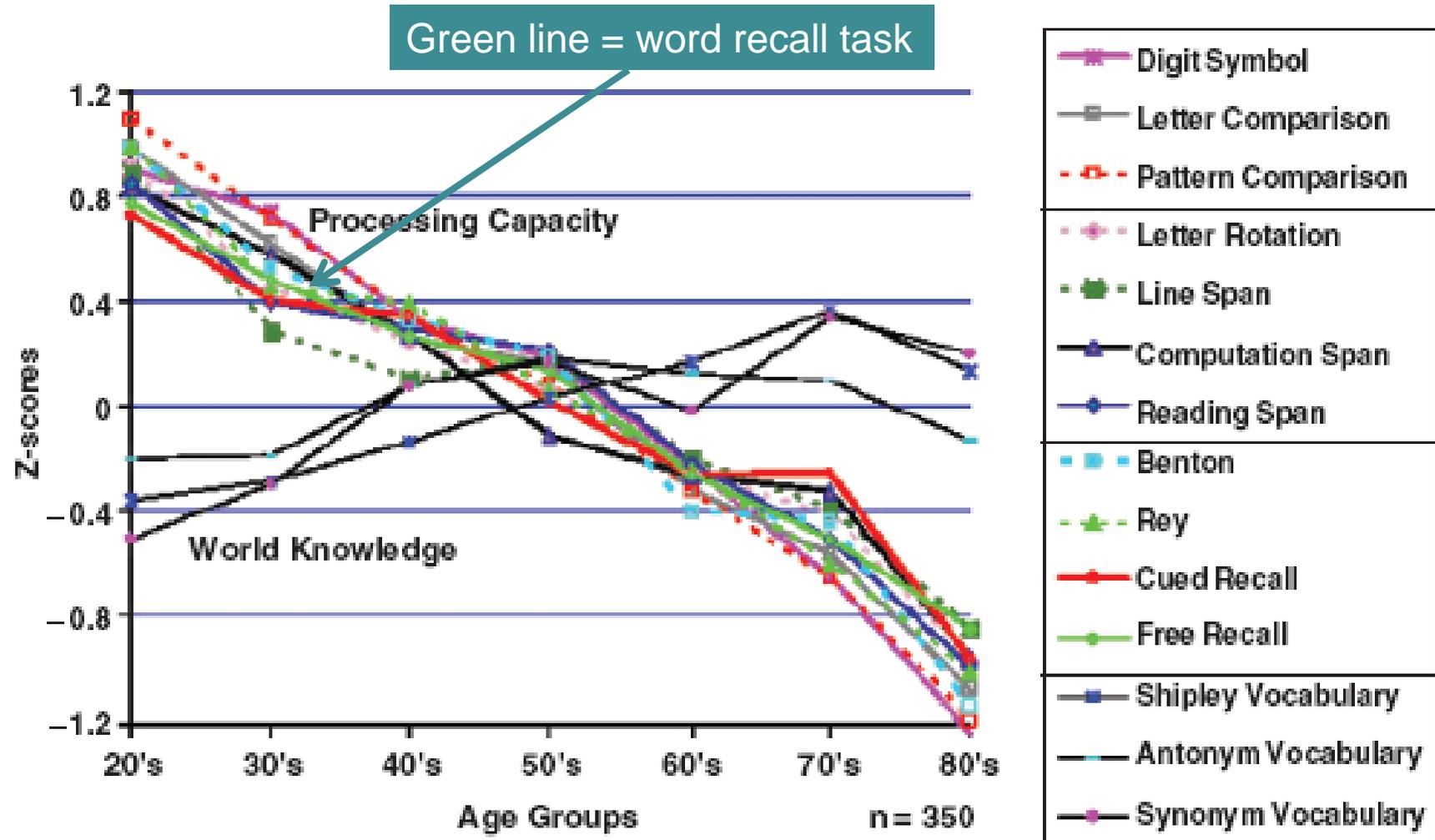


Figure 1. A theoretical description of life span curves of intellectual abilities. From *Intelligence: Its structure, growth and action* (p. 206) by R. B. Cattell, 1987, Amsterdam: North-Holland. Copyright 1987 by Elsevier Science Publishers. Reprinted with permission.

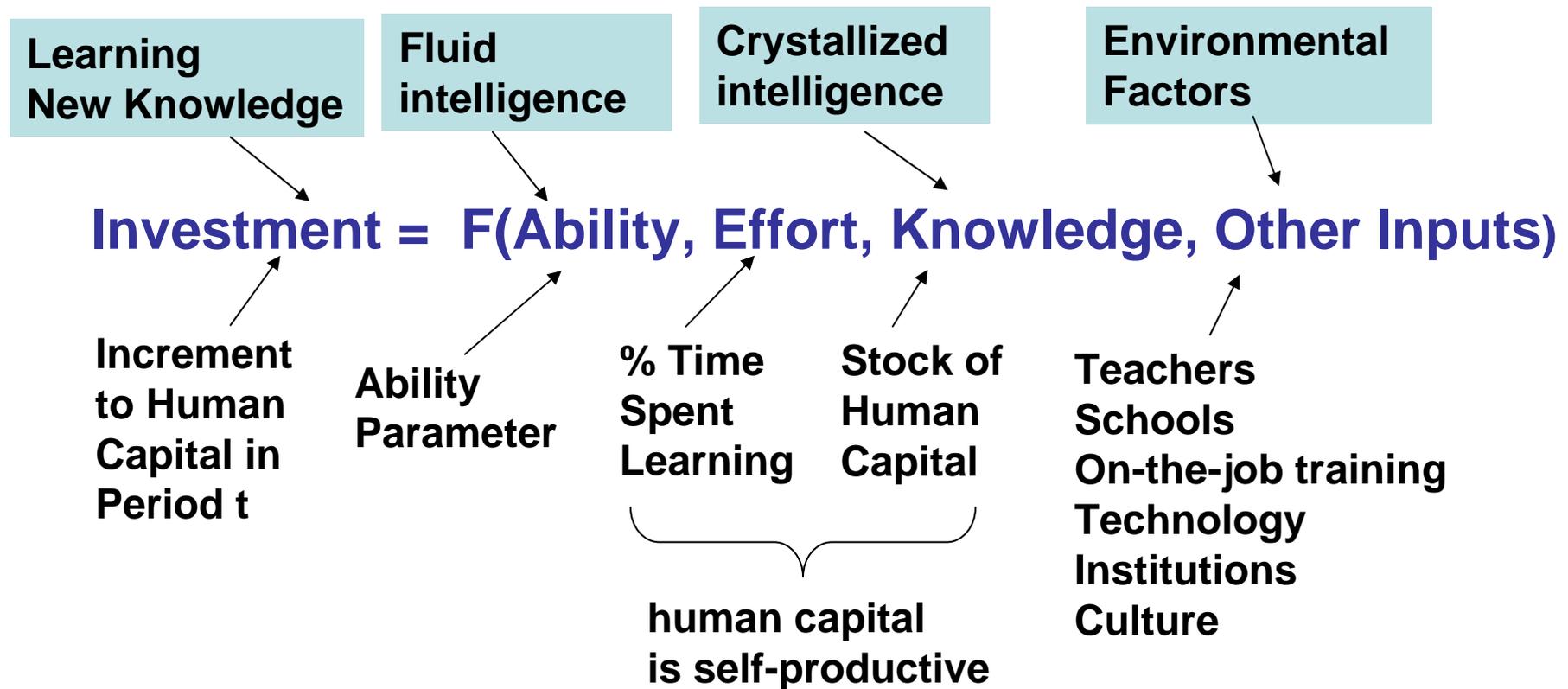
Life Cycle Patterns of Fluid and Crystallized Intelligence



Source: Park and Gutches (2006)

Relationship of Gf/Gc Theory of Intelligence to Human Capital Theory

Ben-Porath (1967) Human Capital Production Function



See Robert J. Willis and John J. McArdle, "Cognitive Aging and Human Capital." (forthcoming)

How Malleable is Intelligence?

- “Bell Curve” argued that IQ is largely fixed by genetic endowment
 - If true, there would be little room for a “mental retirement” effect
- Flynn (1984, 1987) discovered large cohort growth in fluid abilities

The Flynn Effect: Secular Change in IQ

(note: there is little cross-cohort change in crystallized intelligence)

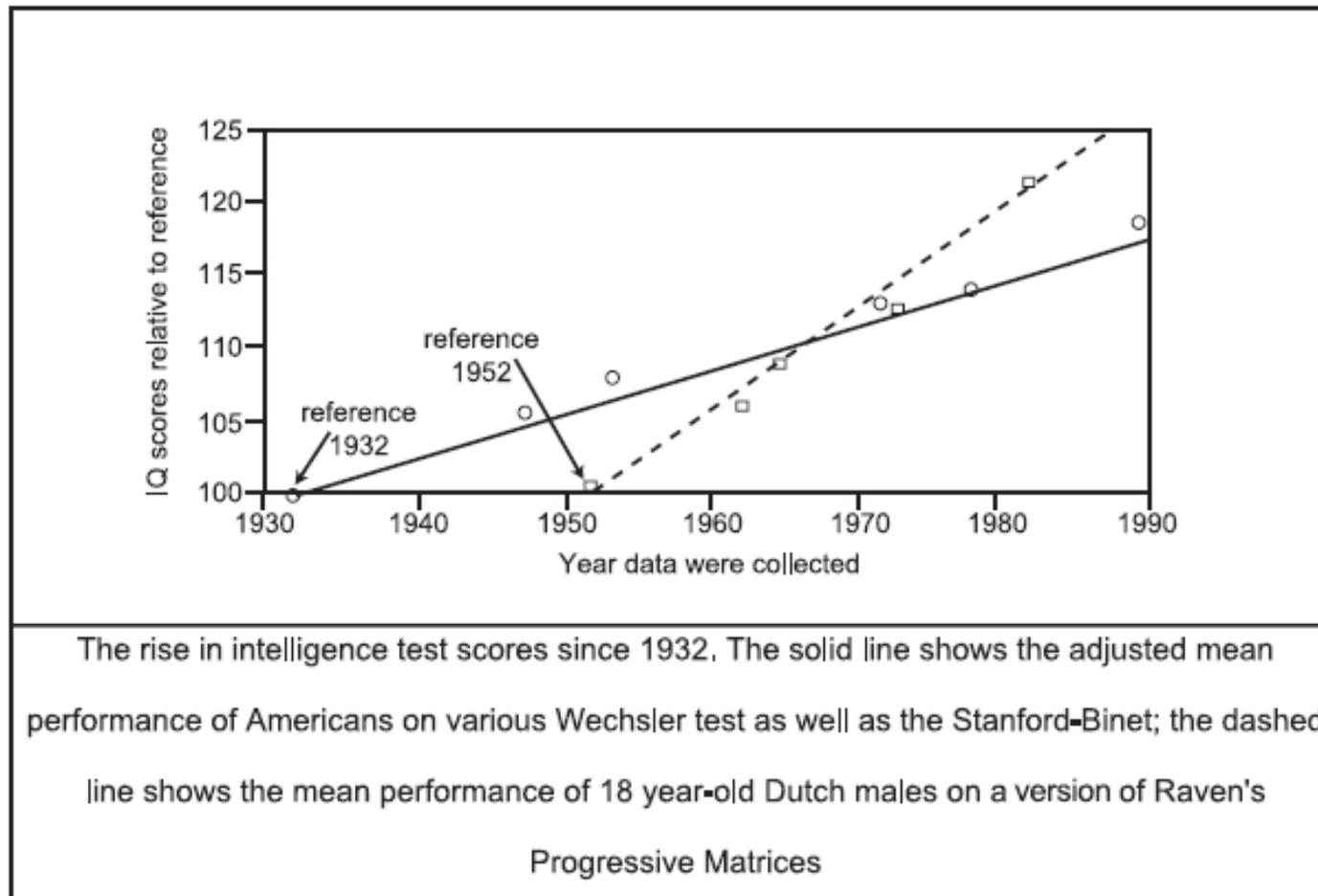


Fig. 1. IQ increase over the 20th century.

source: Blair, et. al. (2005) *Intelligence*

Flynn Effects Explained by Growth in Human Capital

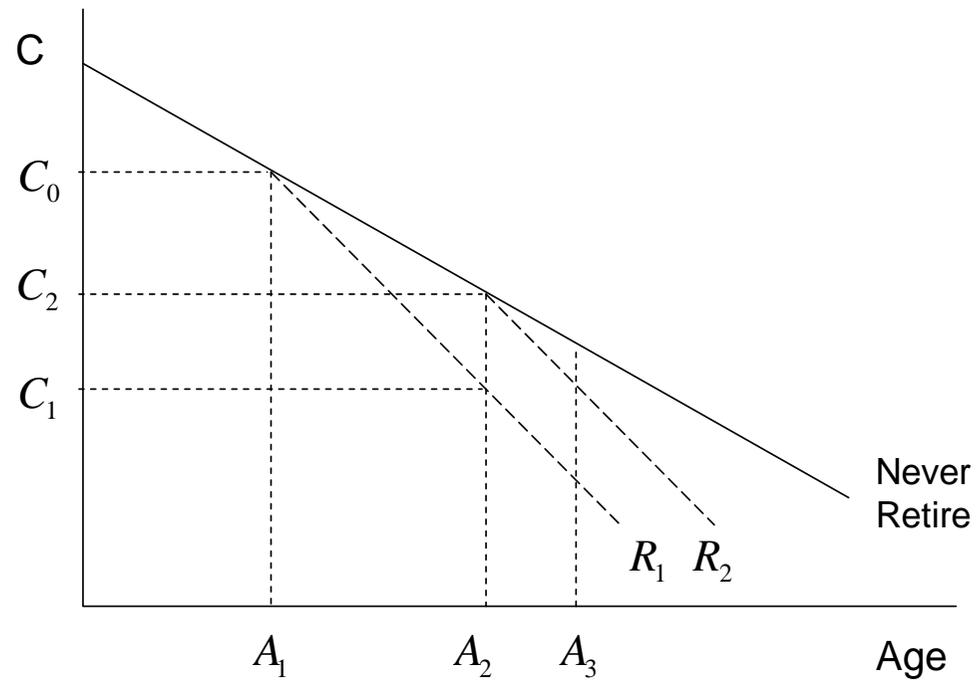
- Rönnlund and Nilsson (2007) show that almost all the cohort growth in test scores in a Swedish city can be explained by
 - Growth in education
 - Reduced size of sibships
 - Growth in height
- Dickens and Flynn (2000) provide theoretical model showing how gene-environment interactions can generate cohort growth in IQ

Two Hypotheses to Explain the Mental Retirement Effect

- **Disengaged Lifestyle Hypothesis**
 - Work environment more stimulating than home environment
 - Early retirement removes this stimulation, causing a decline in fluid intelligence
- **On-the-job Retirement Hypothesis**
 - Human capital investment needed to cope with technical change, work reorganization, etc.
 - Incentives to invest are low for a 50 year old Frenchman who expects to work only a few more years compared to a 50 year old American who may expect another 15 years of work

Identification of Effect of Retirement on Cognition

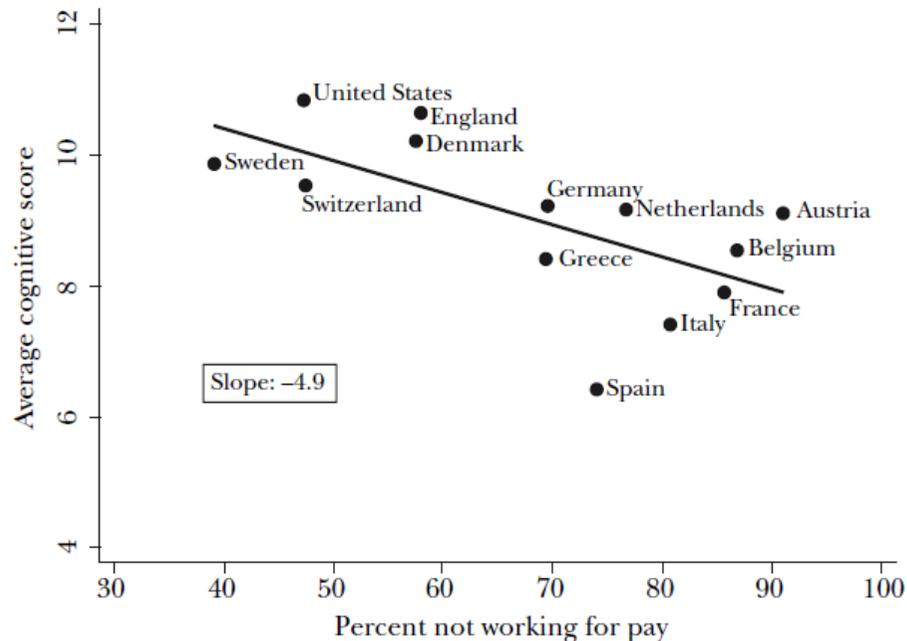
Figure 4. Identification of Retirement Effect on Cognition



OLS Regression of Labor Force Participation on Cognition in HRS, ELSA, SHARE

Figure 5

Cognition by Percent Not Working for Pay, 60–64 Year-Old Men and Women, Weighted

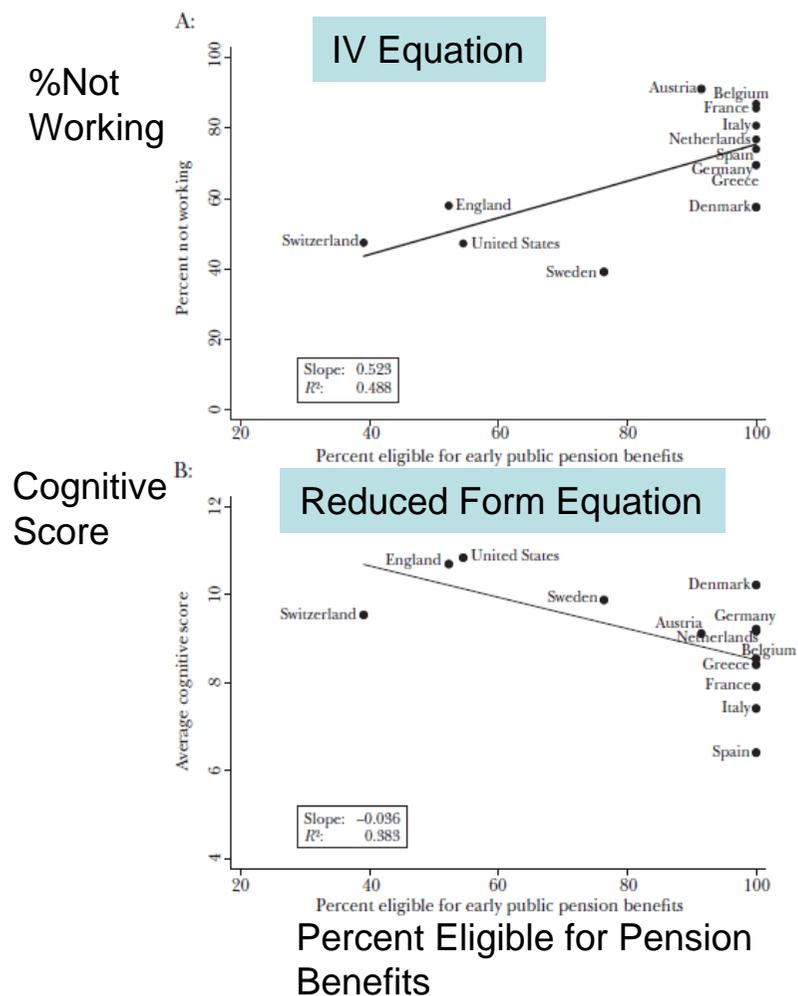


Worry that “effect” of retirement on cognition is biased because

- (a) Reverse causation: i.e., cognition affects retirement behavior
- (b) Omitted variables: i.e., common factors affect both work and cognition

Graphical Illustration of Instrumental Variable (IV) Method to Identify Causal Effect of Retirement on Cognition

Figure 6
Graphical Illustration of the IV-Estimation
(for 60–64 year-olds)



Unbiased structural estimate

= slope of reduced form divided
by slope of IV equation x 100

$$= (-0.036/0.523) \times 100$$

= -6.88 points

That is, moving from work=1 to
work = 0 causes a 6.88 point drop
in total word recall score

IV Estimate with Two Instrumental Variables

Table 1
Instrumental Variable Estimation of the Effect of Retirement on Cognition

	<i>Coefficient</i>	<i>p-Value</i>
First stage		
<i>(Dependent variable: not working)</i>		
Eligible for early benefits	0.191	0.000
Eligible for full benefits	0.163	0.023
Constant	0.438	0.000
Adjusted R^2	0.059	
Second stage		
<i>(Dependent variable: cognition score)</i>		
Not working	-4.660	0.000
Constant	12.592	0.000
<i>N</i>	8,828	

← Causal effect

Note: In the first stage, we use retirement status (measured by whether the respondent is working for pay) as our dependent variable and national pension policies as the explanatory variables. In the second stage, we use the cognition score as the dependent variable, and as the explanatory variable, we use the retirement of each individual as predicted from the first-stage regression.

Interpretation of magnitude of mental retirement effect

- The weighted mean and standard deviation of the total recall measure in the pooled SHARE/ELSA/HRS data are
Mean = 10, Std. Dev. = 3.3
- The coefficient of retirement in the IV regression is -4.660
- Thus, not working reduces cognition by about 1.5 standard deviations.
- Effect is large relative to effects surveyed by Salthouse because (a) retirement is a big change, (b) duration of difference substantial

Conclusions

- Early retirement has a significant negative impact on the cognitive ability of people in their early 60s that is both quantitatively important and causal
- These findings are consistent with research showing that fluid intelligence is affected by human capital

Conclusions (cont)

- We suggest two mechanisms for this effect. Both assume that mental exercise can affect cognitive ability
 - **Disengaged lifestyle hypothesis:**
the work environment is more cognitively stimulating than the home environment
 - **On-the-job Retirement Hypothesis:**
Incentives to continue investing in new human capital are weak for workers who expect to retire early.

Conclusions (cont)

- For Americans, evidence that there has been a reversal of the century-long trend toward early retirement
- This is good news for the fiscal balance of the Social Security and Medicare systems.
- Our findings suggest that it may also be good news for the cognitive capacity of our aging nation