



**3<sup>rd</sup> Conference on Evaluation Research**

**October 27, 2006, ZEW Mannheim**

**Estimating the Returns to Endogenous  
Schooling Decisions for Australian Workers via  
Conditional Second Moments (CSM)**

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# Australia and (West-)Germany: Situation

- No policy shocks available
- Limited data sets to control for unit specific endogeneity
- Current debate: who pays for higher education, given that there are returns to education?
- Urgent need for empirical evidence on returns to education

## Australia and (West-)Germany: Findings

- HILDA 2001; SOEP various waves, 2004, BIBB/IAB 1998/99
- years of education: 12.47 vs. 12.33
- hourly wage: 13.76€ (20.54 AD in 2001) vs. 13.96€
- males: 54 vs. 53 percent
- tenure: 6.5 vs. 11.3 (years)
- returns to education Australia: 6 percent OLS, 10 percent IV, CSM
- returns to education West Germany: 6 to 10 percent various methods, 8.7 percent ate (individual heterogeneity, conditional mean independence)

## Remarks

- Interesting innovative strategy of identification
- Econometrics and findings are convincing
- I enjoyed reading: clear in style and exposition
- My suggestion: Read it!
  
- Policy implications: who has to pay for higher education?
- Homogenous or heterogeneous returns to education?



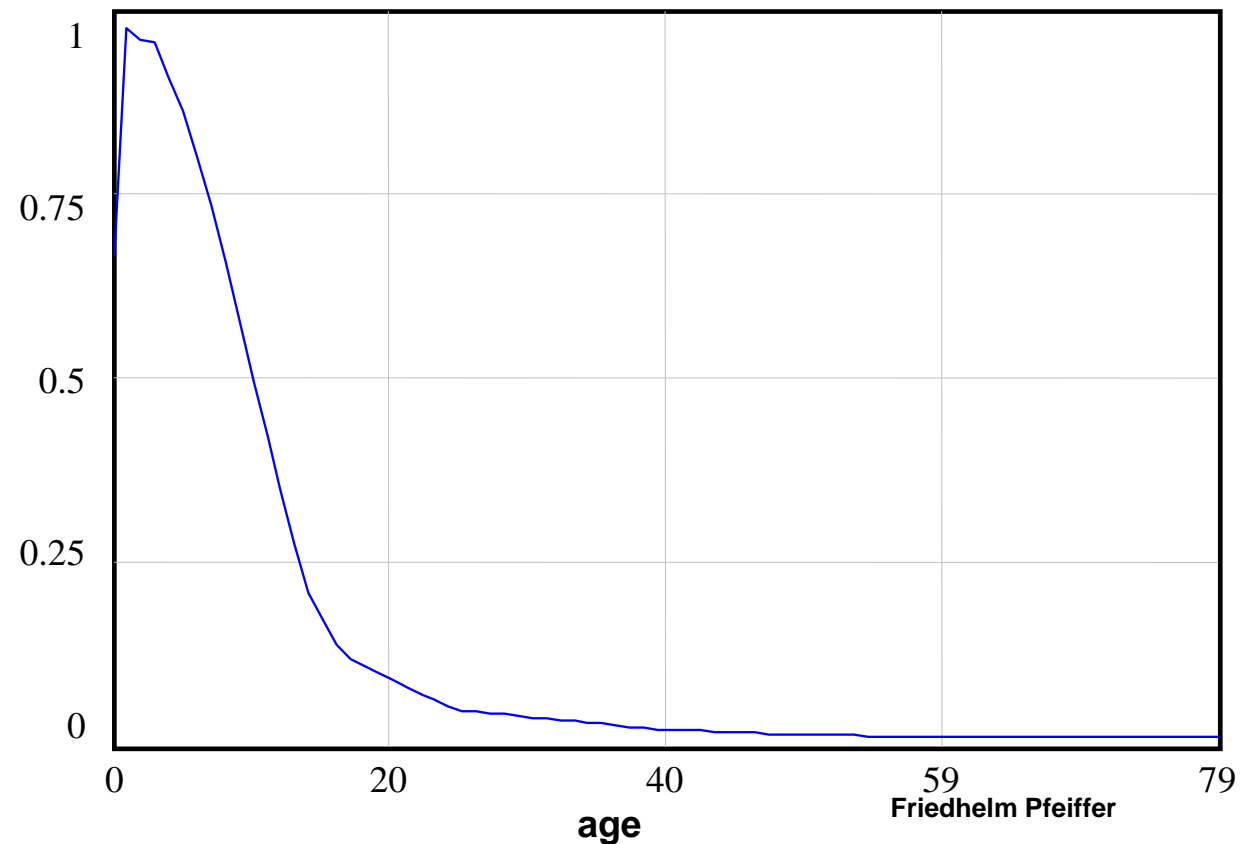
# **Skill Formation and Returns to Education: Evidence from a Simulation Approach**

## Formation of cognitive skills ( $S_t^C$ )

$$S_t^C = I_{t-1}^C \cdot \left\{ \frac{1}{3} (S_{t-1}^C)^\alpha + \frac{1}{3} (S_{t-1}^N)^\alpha + \delta \cdot \frac{1}{3} (I_t^C)^\alpha \right\}^{\frac{1}{\alpha}} + S_{t-1}^C - \frac{S_{t-1}^C}{V_{t-1}}$$

$I_t^C$  = Multiplier cognitive skills

$$V_t = ag \cdot (Le - t)$$

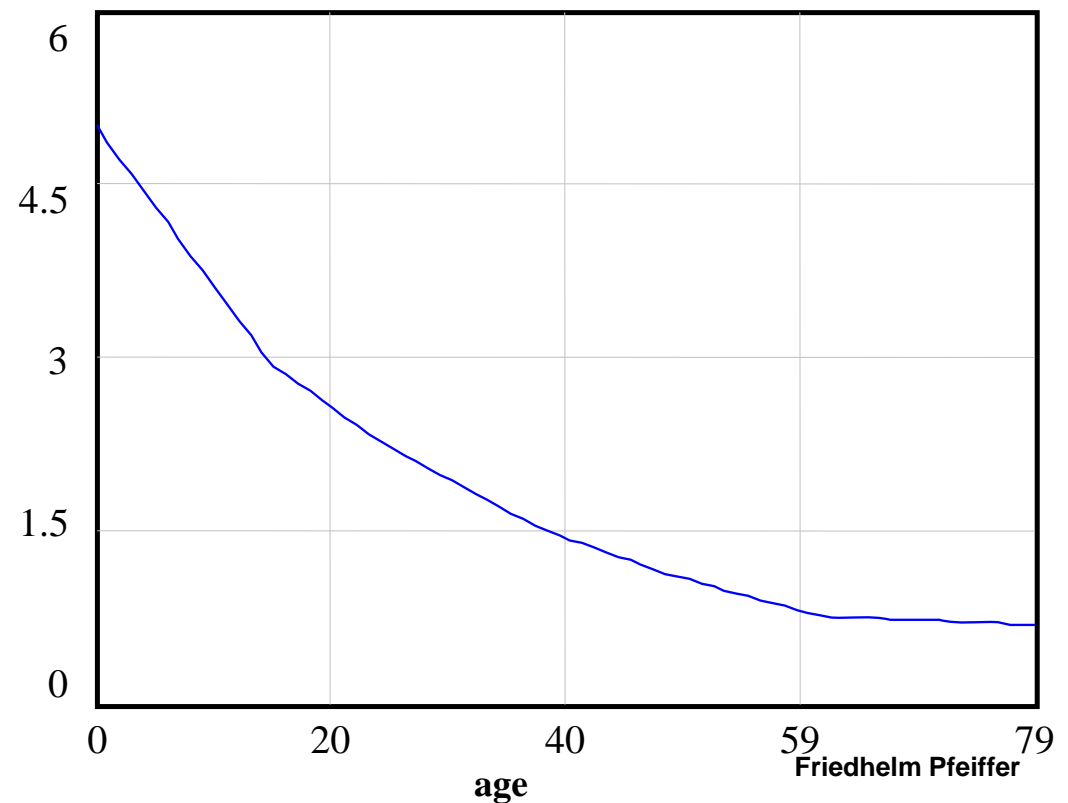


## Formation of non-cognitive skills ( $S_t^C$ )

$$S_t^N = I_{t-1}^N \cdot \left\{ \frac{1}{3} (S_{t-1}^C)^\alpha + \frac{1}{3} (S_{t-1}^N)^\alpha + \delta \cdot \frac{1}{3} (I_t^N)^\alpha \right\}^{\frac{1}{\alpha}} + S_{t-1}^N - \frac{S_{t-1}^N}{\vartheta \cdot v_{t-1}}$$

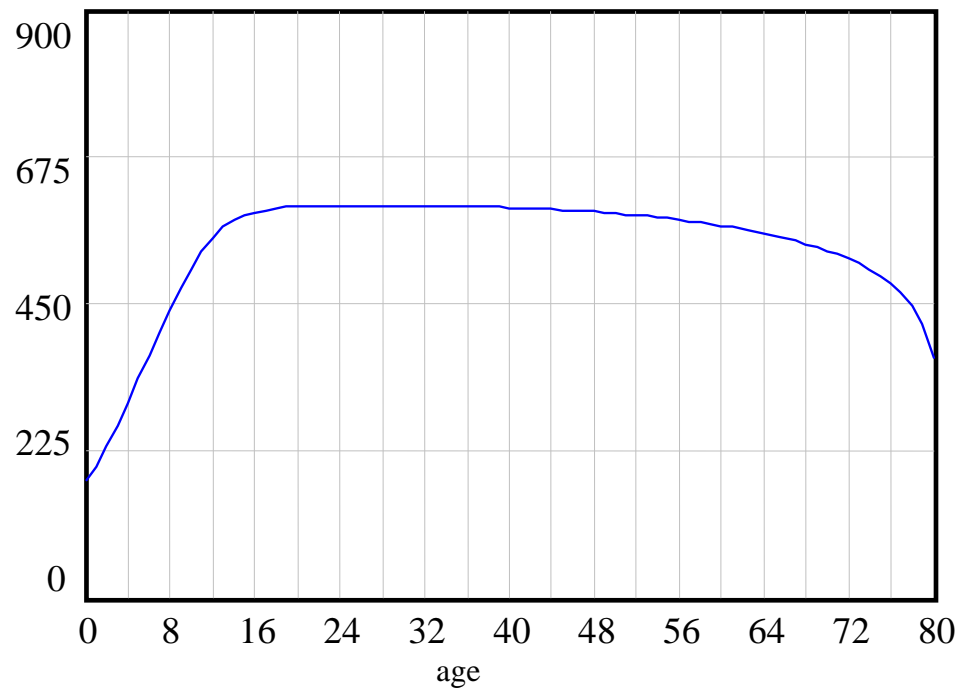
$I_t^N =$  Multiplier non-cognitive skills

$$v_t = ag \cdot (Le - t)$$

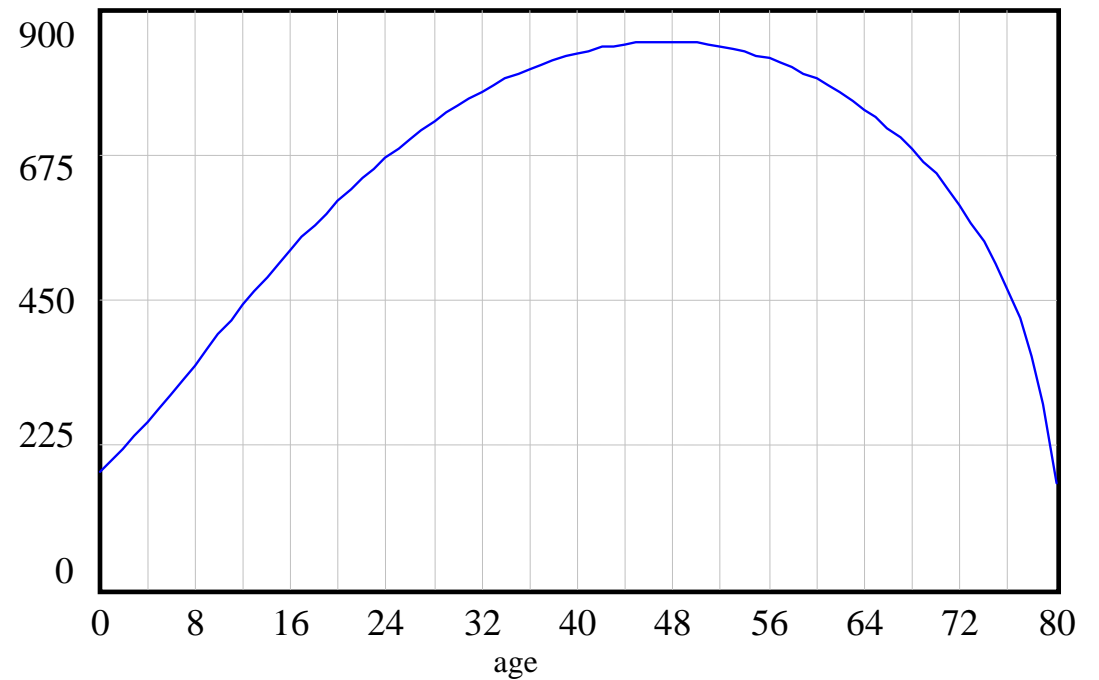


## Formation of cognitive and non-cognitive skills over the life span

cognitive skills



Non-cognitive skills



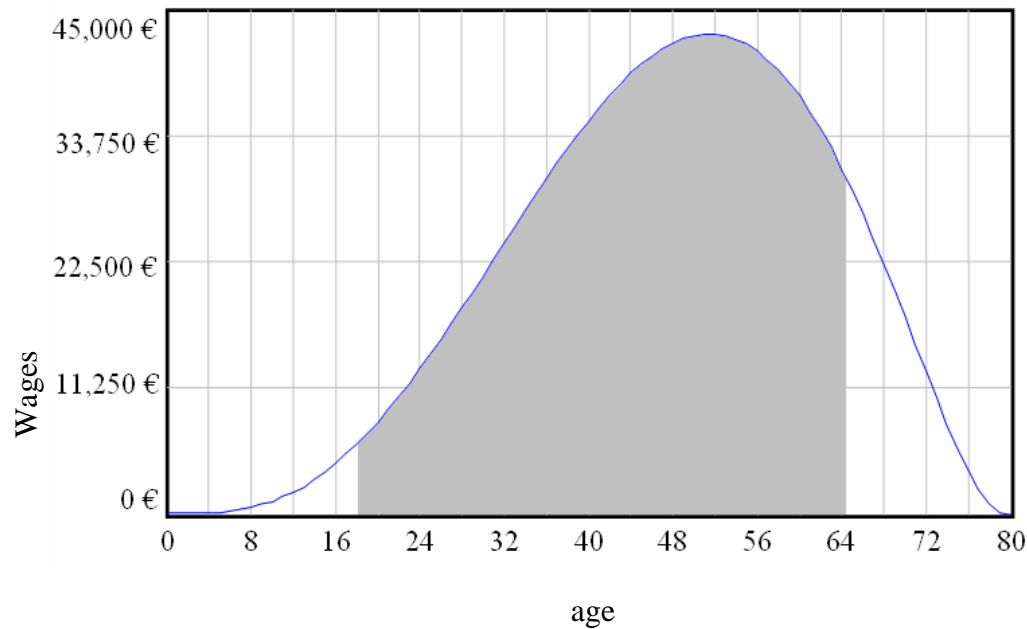


# School test scores and human capital over the life span

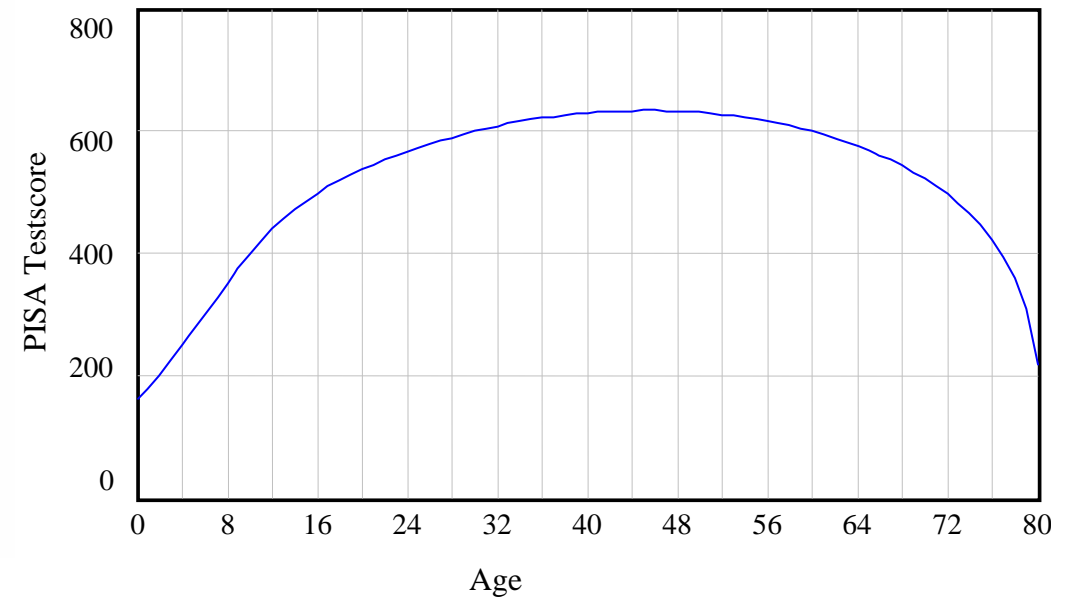
$$L_t = \sqrt{S_t^C \cdot S_t^N}$$

$$H_t = \psi \cdot \left( S_{t-1}^C \frac{1}{3} \cdot S_{t-1}^N \frac{1}{3} \cdot H_{t-1} \frac{1}{3} \right) + H_{t-1} - \frac{H_{t-1}}{V_{t-1}^H}$$

Human capital



Test scores





**Simulation of returns to  
interventions at different ages**

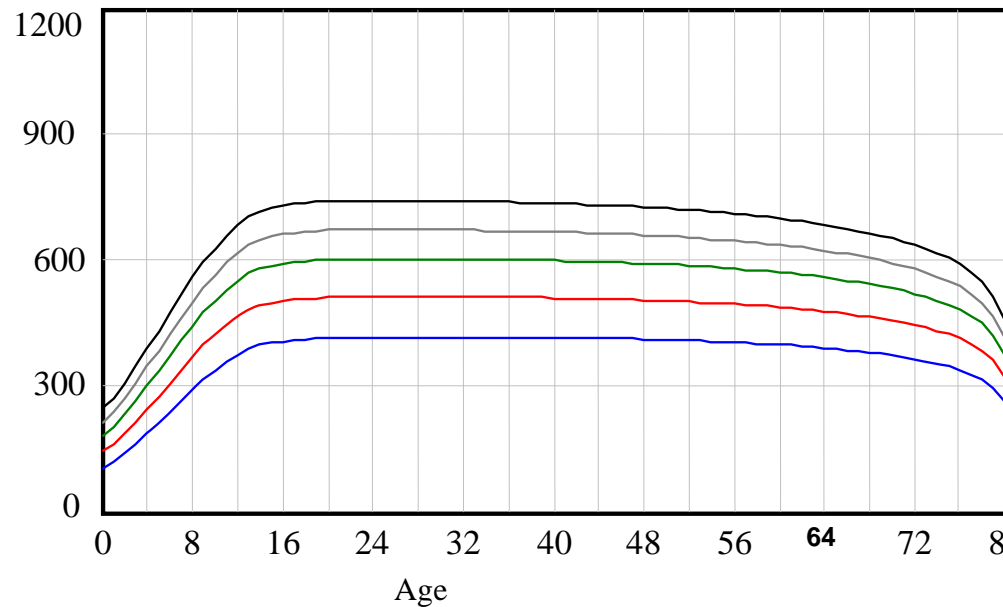
## PISA distribution from different family environments

$$S_t^i = f(l_{t-1}^i, \alpha, S_{t-1}^i, \delta, \mathbf{I}_t^i, v_{t-1}) \quad \text{with} \quad i = C, N$$

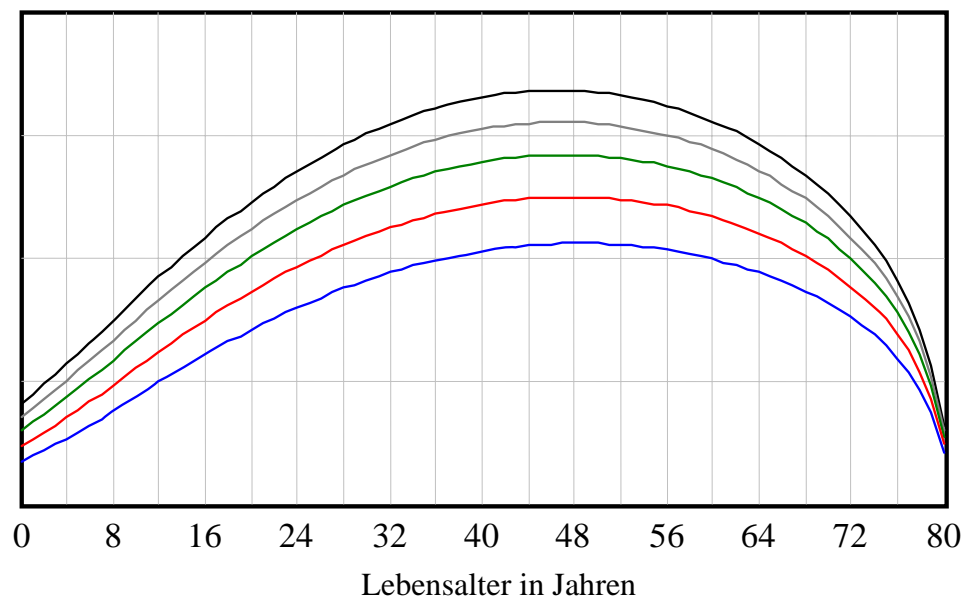
<b>Perzentil</b>	<b>PISA</b>	<b>Environment ( <math>\mathbf{I}_t^i</math> )</b>
<b>1 %</b>	<b>187</b>	<b>0.0035</b>
<b>10 %</b>	<b>342</b>	<b>0.258</b>
<b>25 %</b>	<b>422</b>	<b>0.58</b>
<b>50 %</b>	<b>497</b>	<b>1</b>
<b>75 %</b>	<b>556</b>	<b>1.4</b>
<b>90 %</b>	<b>614</b>	<b>1.855</b>
<b>99 %</b>	<b>707</b>	<b>2.7</b>

# Population of heterogeneous individuals

cognitive skills



Non-cognitive skills



- 10. Perzentil —
- 25. Perzentil —
- 50. Perzentil —
- 75. Perzentil —
- 90 Perzentil —

# Returns to education

## a) heterogeneity from family environment

