

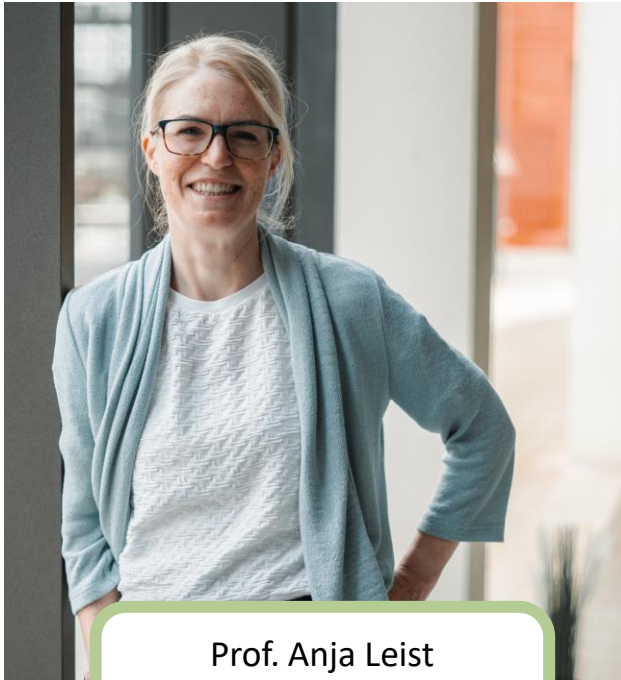
Understanding Cognitive Ageing Through a Life-Course Lens

Theoretical mechanisms and empirical insights

Ariane Bertogg · University of Konstanz

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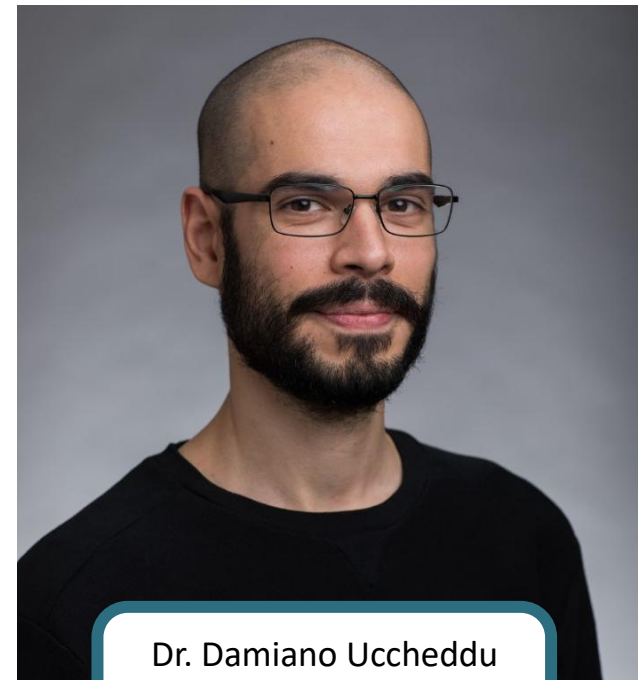
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Outline

1 Introduction: Why care about cognitive ageing?

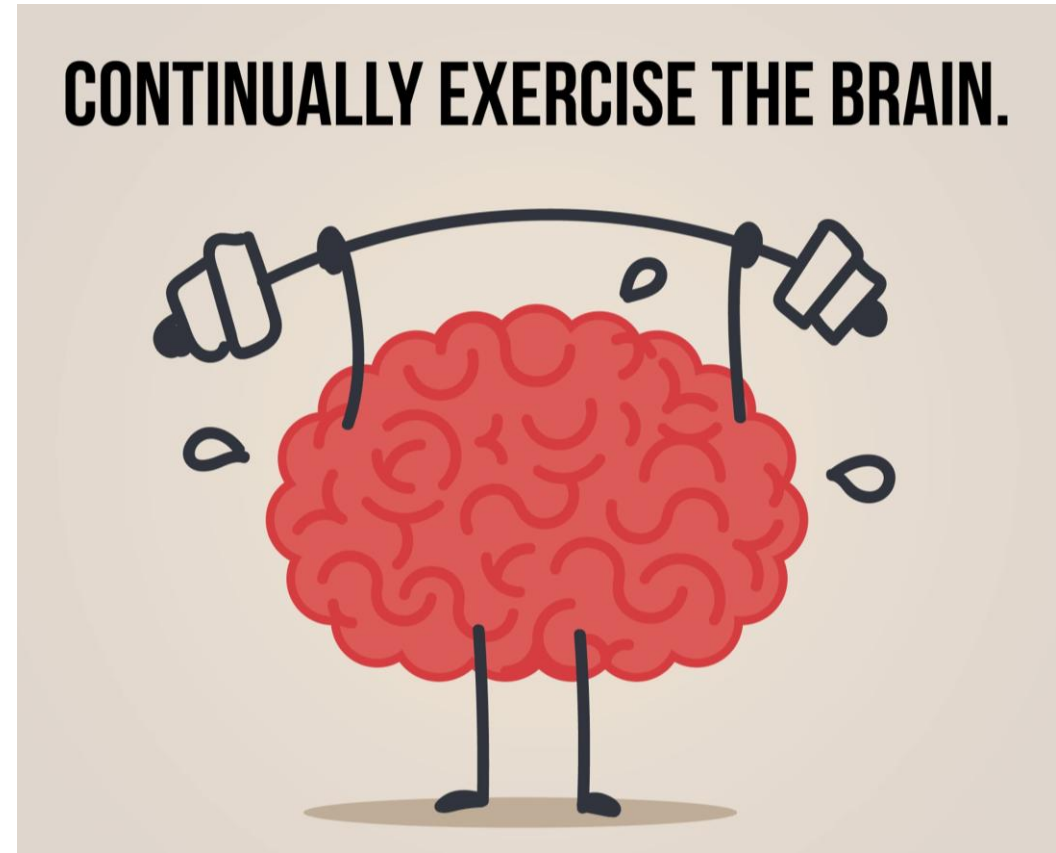
2 Framework and mechanisms

3 Empirical application 1: early life

4 Empirical application 2: midlife

5 Empirical application 3: later life

6 Summary and outlook



Cognitive ageing — a societal challenge

Individual and systemic costs

- Top 7 leading causes deaths worldwide are dementia-related (OECD, 2021)
- Estimated 1.3 trillion USD global cost of dementia in 2019 (WHO, 2021)
- No universal affordable, accessible and safe pharmaceutical intervention

→ Prevention remains key

Modifiable factors

- Up to 40% of dementia risk is potentially modifiable (Livingston et al., 2017, 2020 – The Lancet Commission)
- Modifiable factors: biological, behavioural, psychological and **social**
- Cognitive decline = normal feature of aging (Albert, 2011)

→ But not everyone develops dementia

Cognitive Reserve

- Early endowment, lifelong accumulation
- Stimulating activities and environments
- Substitution and capacity maintenance under physiological pathologies (Stern, 2002)

→ Moving the threshold to impairment and diagnosis

Aim: explore opportunities of life course research

ESTABLISHED FINDINGS

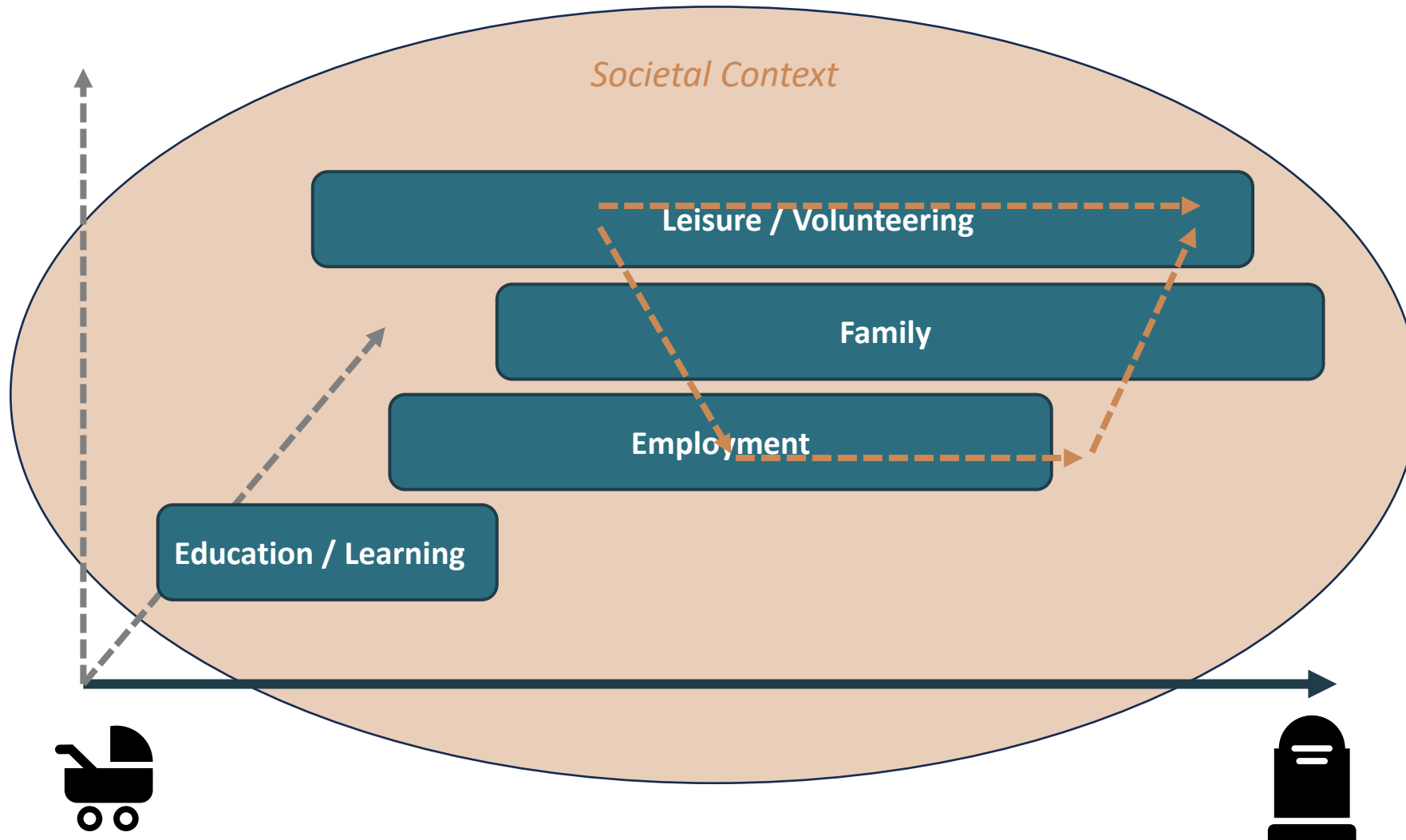
- Education & occupational complexity (Leist et al., 2013; Lövdén et al., 2020; Kratz & Klee, 2026)
- Employment, family relationships & participation (Tattarini et al., 2026; Schmitz et al., 2026)
- Cumulative nature, dose-response relationship
- “Cognitive footprint”: early disadvantage, environmental exposure (Rossor & Knapp, 2015; Zong, 2026)
- Reserve is socially stratified, trajectories are group-specific (Tattarini & Loi, 2026)

CONTRIBUTIONS

Conceptual and methodological toolbox:

- Macro-meso-micro linkages
- Heterogeneity in patterns and outcomes
- Mechanisms (especially, accrued resources)
- Methods of longitudinal data analysis
- Combined frameworks (e.g., life course theory * Cumulative Advantage)

The life course – central tenets and new developments



CENTRAL TENETS

- Lifelong development
- Time and place
- Role of timing (critical / sensitive periods)
- Interdependence across domains
- Linked lives
- Agency within structures

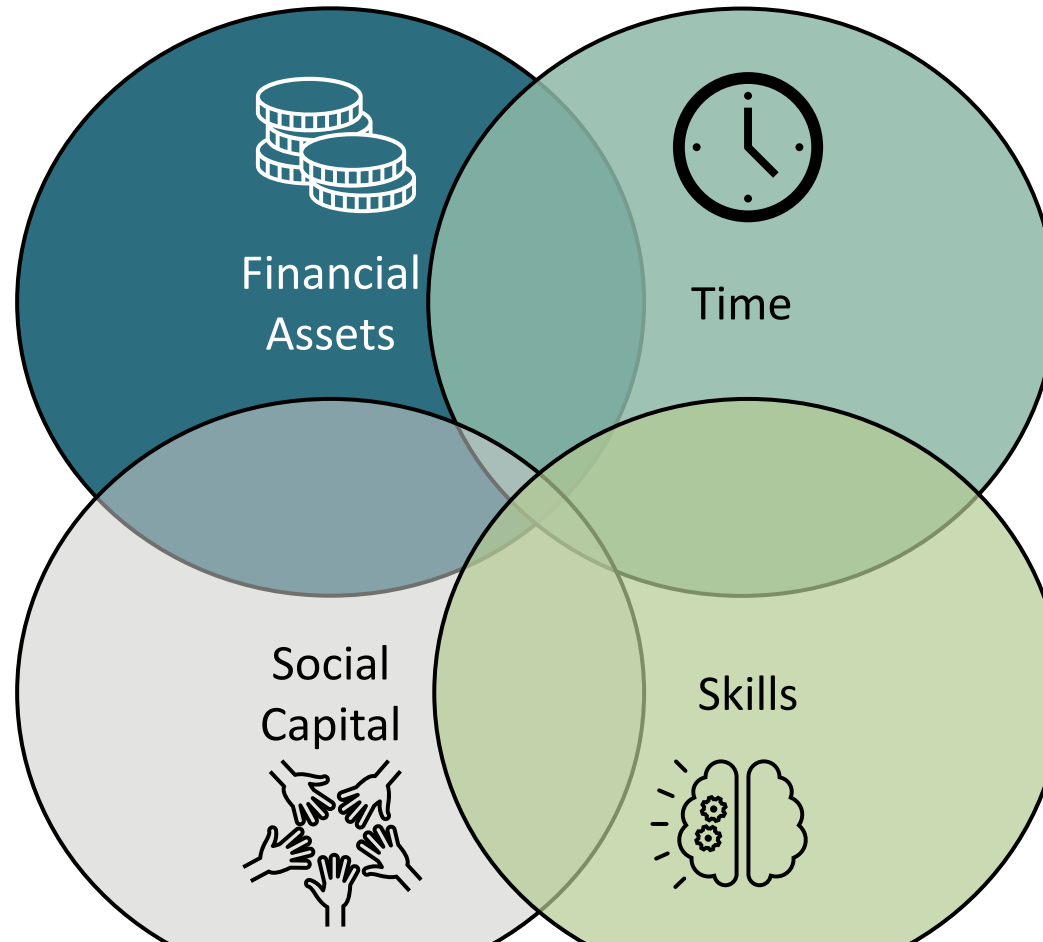
Bernardi et al., 2019: Life Course Cube
Fasang et al., 2024: Life Course Boat

Resource-based mechanisms

Mr. B (38 years) recently got divorced. He struggles to pay the **monthly rent** and the alimony for his children, who are **estranging** from him. He would like to **go back to studies** to improve his career chances, but it is **too costly**. He often feels depressed and **lacks energy** to go to the gym or see people.

Mid-life risk factor

- Forgone reserve accumulation
- Physiological & psychological health risks as precursors



Interacting mechanisms: **Altering, reinforcing, mitigating, preconditioning or precluding**

(Fasang et al 2024)

Mrs. A (69 years) cares for her husband who had a stroke. Due to **time constraints**, she had to give up her hobby, a book club. She **misses her friends** and the **stimulating discussions**, but she feels **too stressed** to care for herself and **sleeps poorly**.

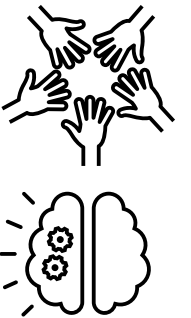
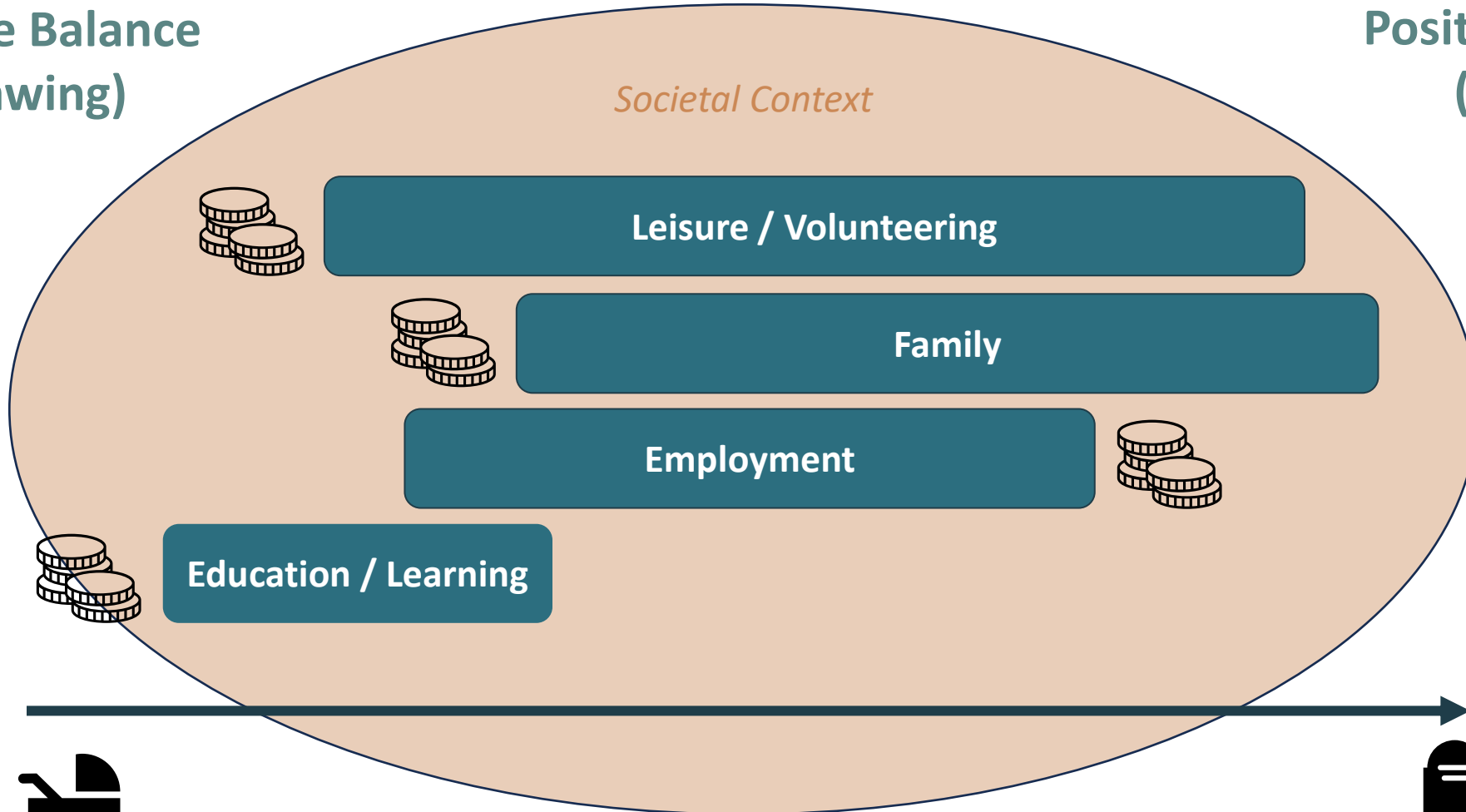
Later-life risk factor

- Loss of buffering resources
- Somatic manifestations of stress can accelerate decline

A life-course framework for cognitive ageing

← Negative Balance
(withdrawing)

Positive Balance →
(providing)



Childhood exposure to societal crises

LIFE STAGE

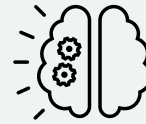
**Early life
(0-5 years)**

CENTRAL TENETS

**Path dependency ·
critical periods**

RESOURCES

**Skills · social
stratification**



CONTEXTUAL FACTOR

**Sociohistorical context ·
crises · authoritarianism**

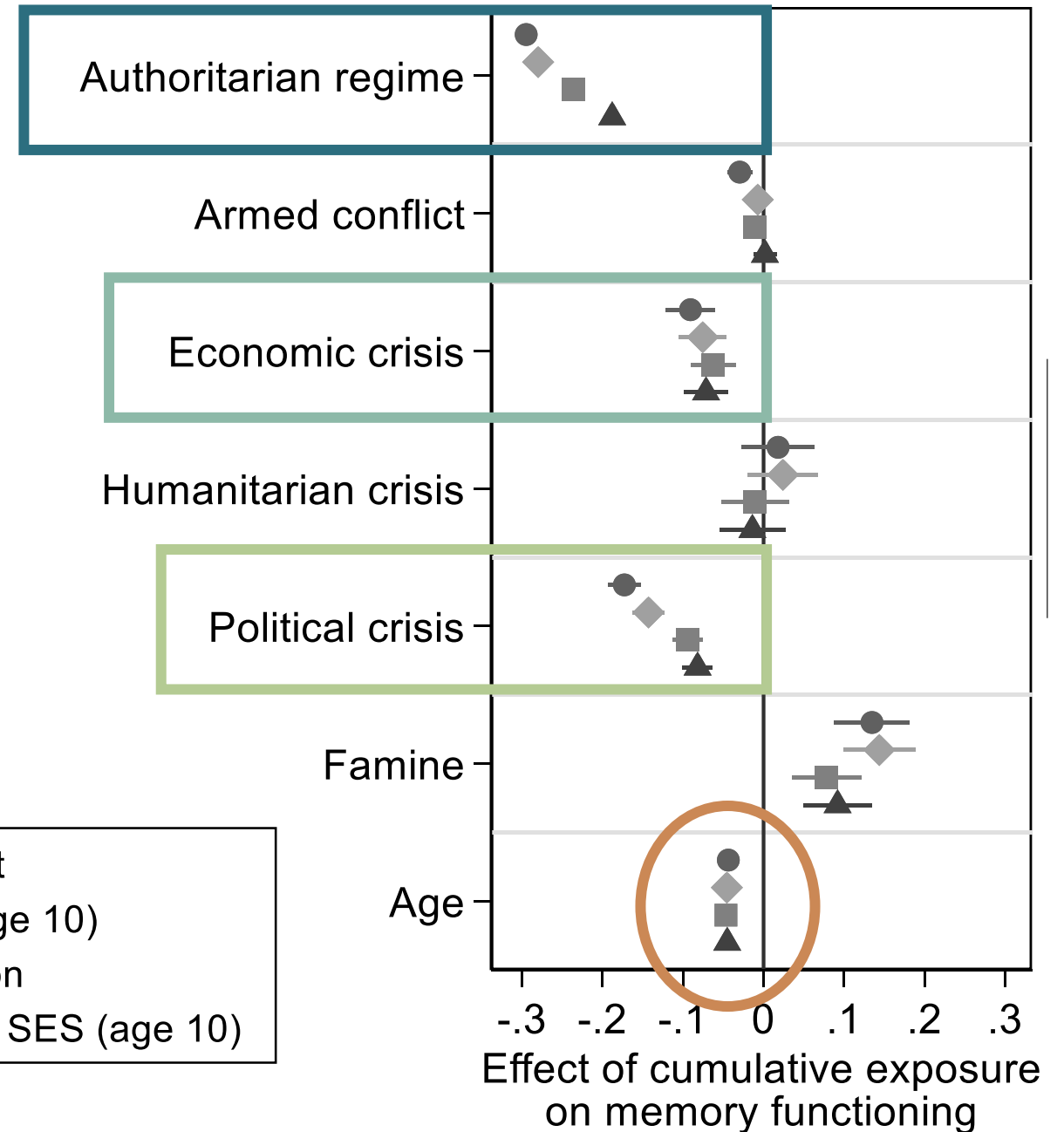
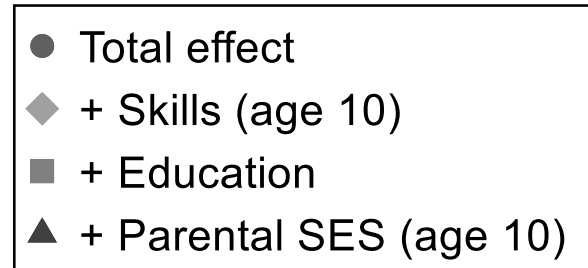
Data and Method:

- Crises: authoritarianism, political crisis, armed conflict, economic crisis, humanitarian crisis, famine
- Cumulative exposure between 0 and 5 years (#years)
- SHARE (panel waves 1–2; 4–9), SHARELIFE (waves 3+7, information on skills and parental SES at age 10)
- Only respondents born in the country of test
- Random Effects Growth Curve models, stepwise model building, interaction terms
- DV: Memory index (10-word learning list, immediate + delayed recall, 0-20 words)

Results

KEY FINDINGS

- Longer exposure to political & economic crises → lower levels
- Politics > economics
- Skills and education partially explain effect
- **Effect size** for each year of exposure: about 2-4 years of normal ageing
- War / humanitarian / famine: not a risk factor



Gendered work-family biographies



LIFE STAGE

**Mid-adulthood
(20-50)**

CENTRAL TENETS

**Interlinked domains ·
cumulative (dis)advantage**

RESOURCES

**Financial, social
capital, health**



CONTEXTUAL FACTOR

**Welfare states &
normative framing**

Data and Method:

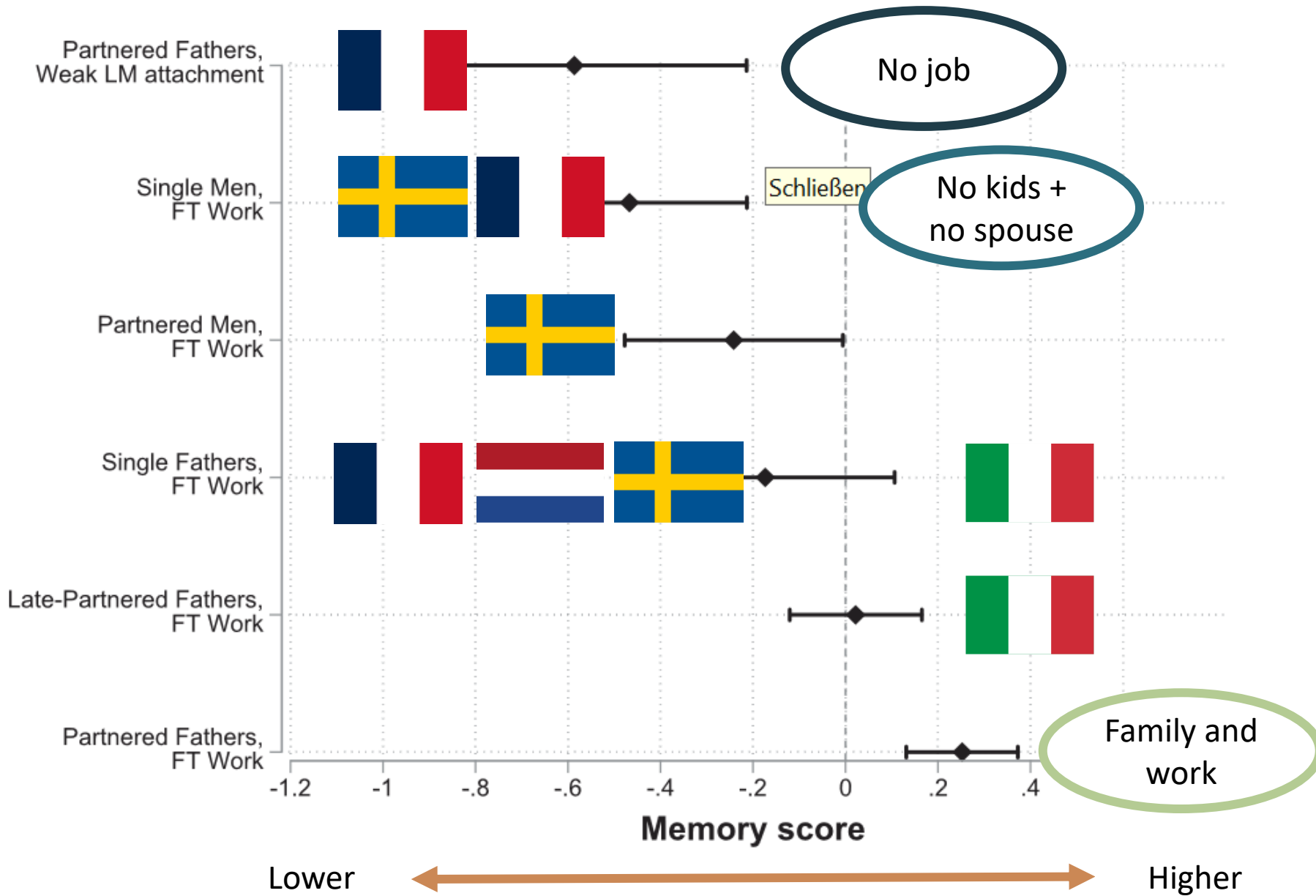
- SHARE (waves 1–9), SHARELIFE (biographies)
- Four work-family regimes: IT, FR, NL, SE
- Multichannel sequence analysis + cluster analysis → random-effects linear regression models w/binary contrasts
- DV: Memory (10-word learning list, immediate + delayed recall, 0-20 words)

Results: Men

KEY FINDINGS



- Family + employment
- Partnership > no partner
- No work OR no family (single men)

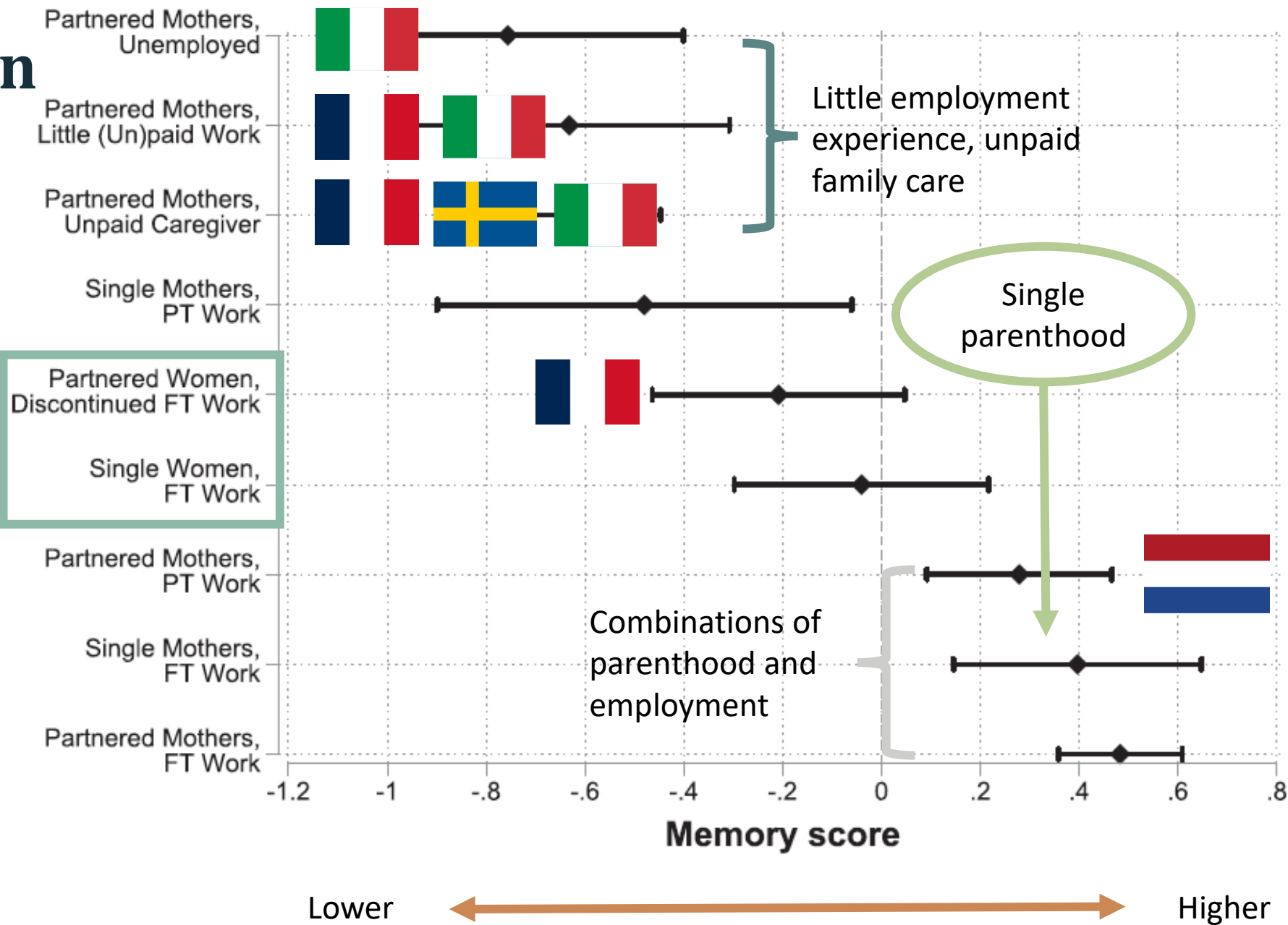


Results: Women

KEY FINDINGS



- Parenthood + employment
- Partnership not decisive
- Single parenthood depends on working time
- Parenthood + non-employment / unpaid care



Partnership transitions



LIFE STAGE

Later life (50+)

CENTRAL TENETS

**Linked lives,
interlinked domains**

RESOURCES

**Financial, social
capital, behavioral**

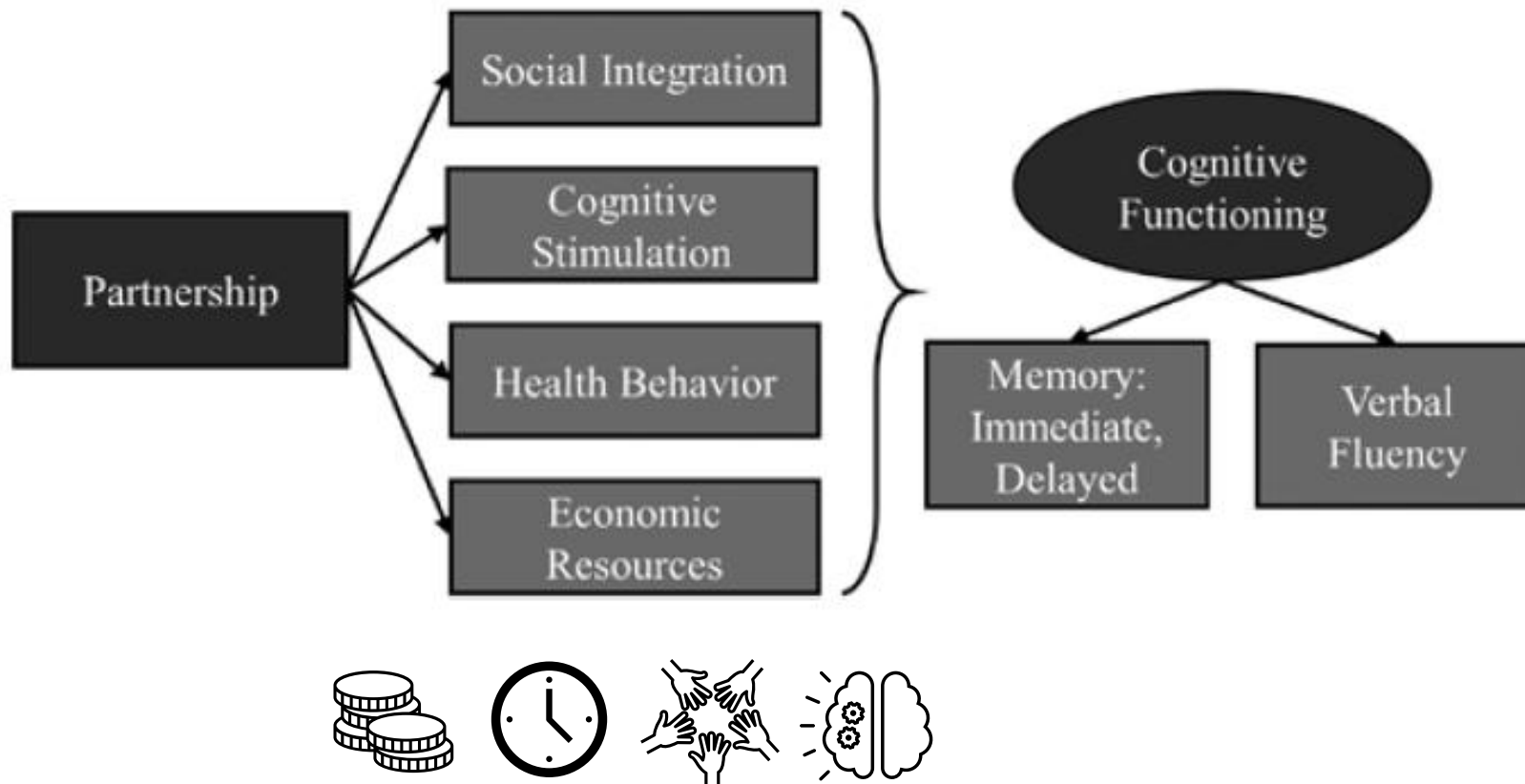
CONTEXTUAL FACTOR

**Social stratification
(education as reserve)**

Data and Method:

- SHARE (waves 1–2 and 4–7; 20 countries, 2004–2017)
- Loss of partner via divorce or widowhood
- Fixed-effects linear regression models: without and with explanatory factors
- DV: memory (immediate + delayed, 0-10 words); verbal fluency (animal naming test)

Explanatory Factors (aka “Mechanisms”)



MEASURES

Social Integration

- Children, grandchildren, giving / receiving support

Stimulation

- Educational activities, volunteering / social activities

Behaviours

- Smoking, drinking, working out

Economic resources

- Employment, income, homeownership

Results

	Memory (immediate)		Memory (delayed)		Verbal Fluency	
<i>Explanatory factors?</i>	<i>without</i>	<i>with</i>	<i>without</i>	<i>with</i>	<i>without</i>	<i>with</i>
Stays partnered (ref.)						
Repartners	−0.041 (0.028)	−0.028 (0.027)	0.057 (0.031)	−0.039 (0.031)	−0.034 (0.036)	−0.018 (0.034)
Stays unpartnered	−0.094 (0.081)	−0.073 (0.081)	−0.070 (0.065)	−0.057 (0.063)	−0.119 (0.077)	−0.104 (0.077)
Divorces	−0.054** (0.017)	−0.018 (0.016)	−0.038* (0.017)	−0.004 (0.016)	−0.074* (0.029)	−0.042 (0.027)
Becomes a widow or widower	−0.083*** (0.021)	−0.033 (0.021)	−0.061* (0.023)	−0.009 (0.022)	−0.045* (0.016)	−0.002 (0.016)
n(person-years)	213,023		213,023		213,023	

KEY FINDINGS

Dynamics

- Partner loss via divorce or widowhood **accelerates** cognitive decline
- Change in resources **explains** the decline

Social Stratification

- Associations pronounced among **lower-educated** (lower reserve, more vulnerability)

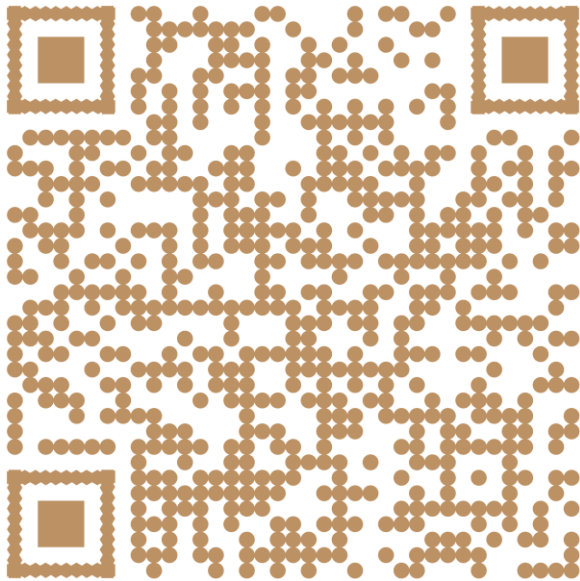
Insights & Outlook

- Central tenets of the life course: meaningful for explaining brain health and cognitive ageing
- Cumulative exposure to risks / opportunities → link with cognitive reserve
- Mechanisms not always measurable, causal mediation designs not always possible
- Contextual characteristics moderate accumulation of reserve across all stages of life
- → Potential **sociological contribution** to understanding a major public health challenge

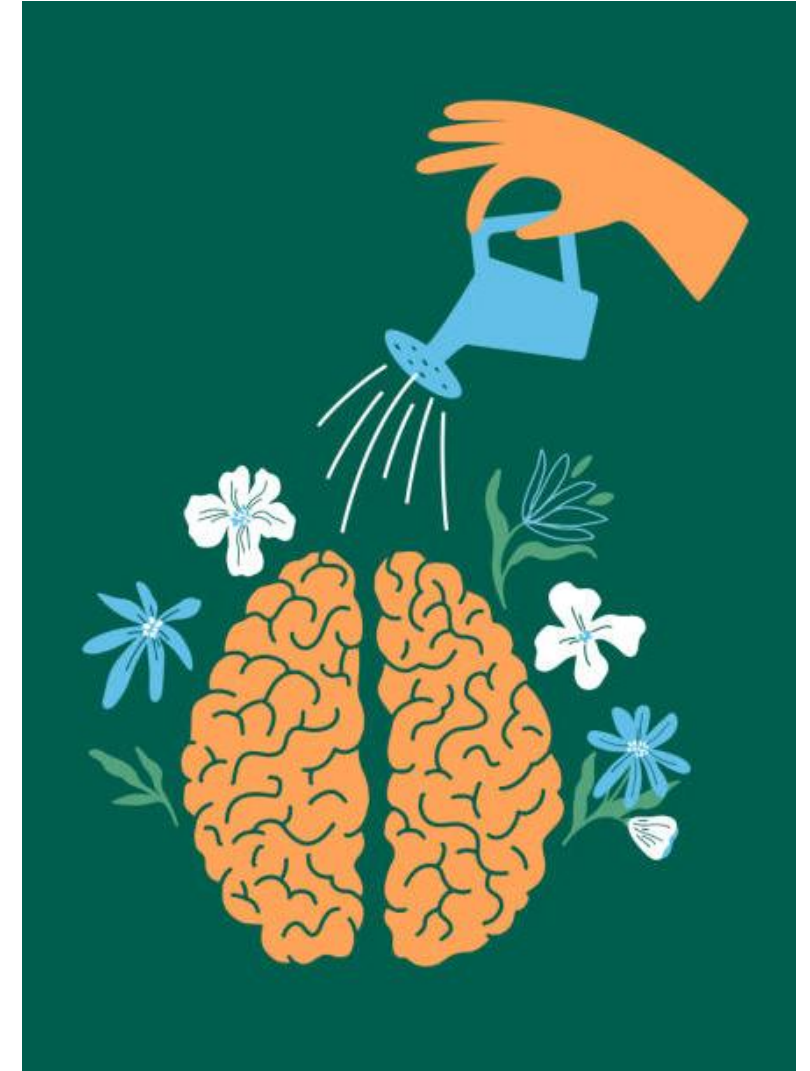
Next steps

- Widening scope (outcomes and mechanisms)
- Mechanisms: bio-psycho-social (stress, sleep, behaviours, agency), epigenetics
- Research frontiers: crises (climate change / green transition, gender backlash / autocratic backsliding / polarization)
- New inequalities: intersectionality, migration, gender diversity, global ageing

Thank you for your attention



Link to special issue in SSM



References

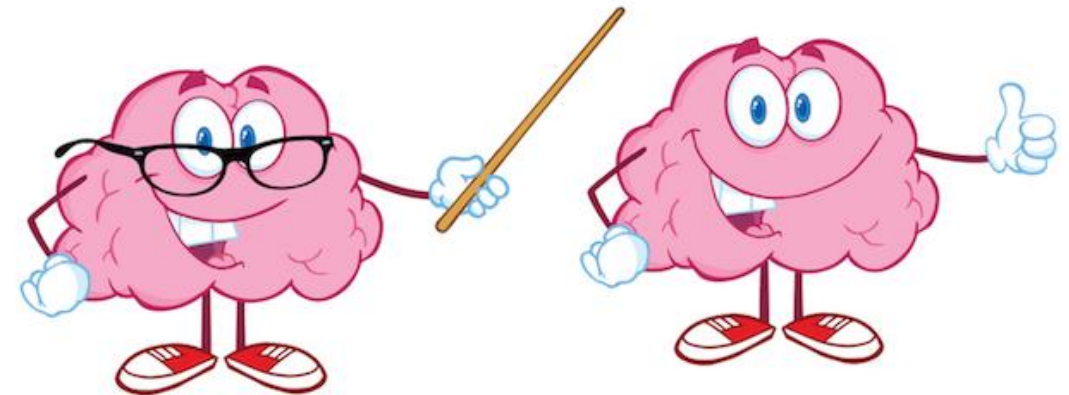
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- World Health Organization. (2021). *Global status report on the public health response to dementia*. WHO.

How do we Measure Cognitive Functioning?

- Standardized cognitive test / work with your neighbour
- All you need is a clock / mobile phone
- One person is the test subject, the other the administrator

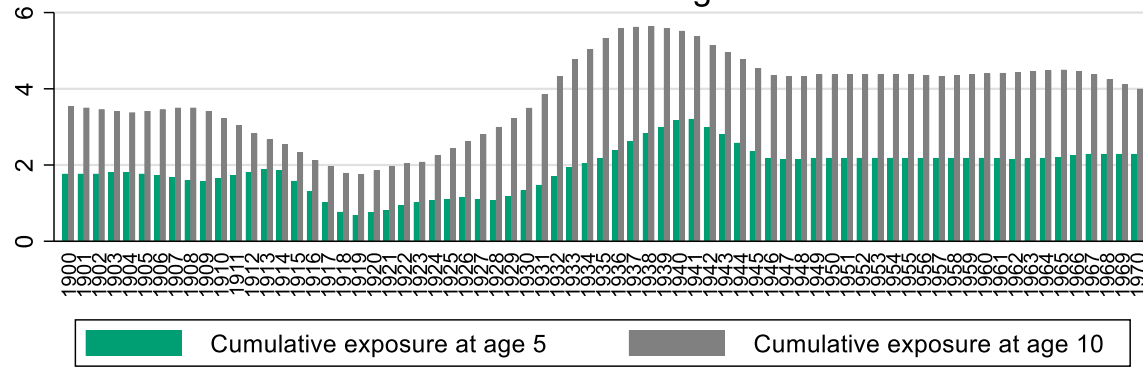
„In one minute, name as many animals as you can“

- Rules: No repeated animals, no pet names (“Fido”), no sub-branches within an animal (Golden Retriever, Labrador...), no mere descriptions (black cat, white cat, ...)

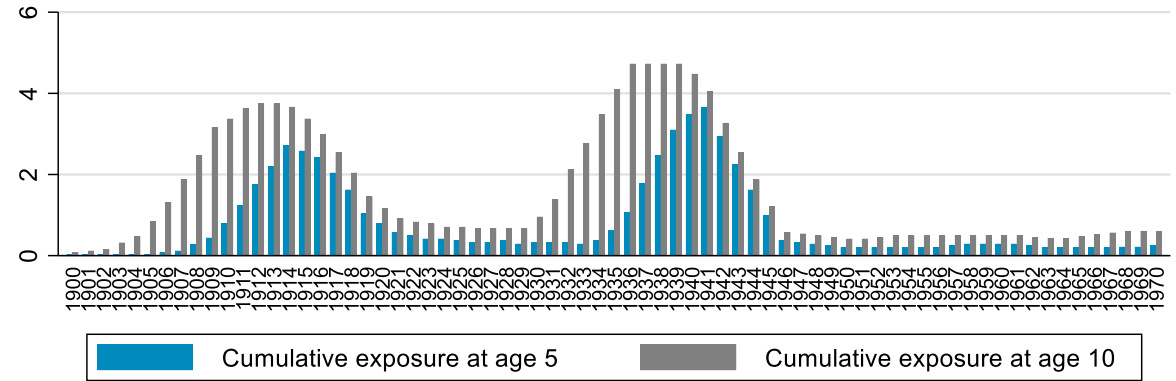


Crises

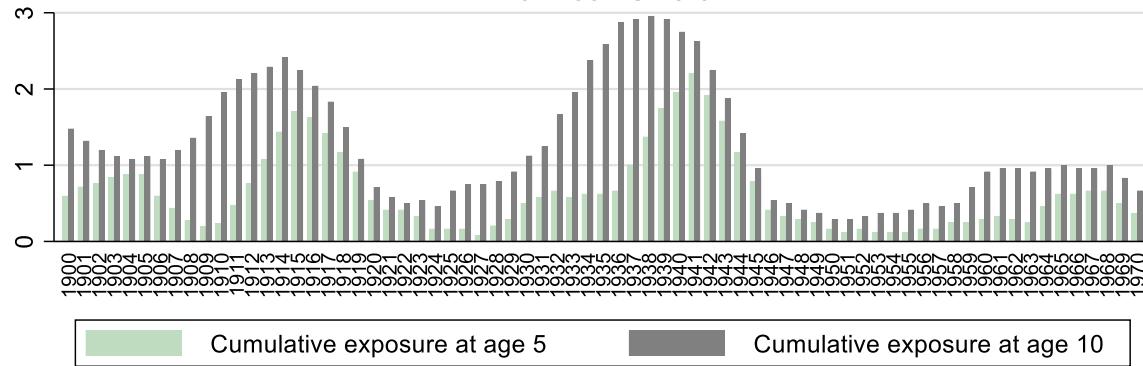
Authoritarian Regime



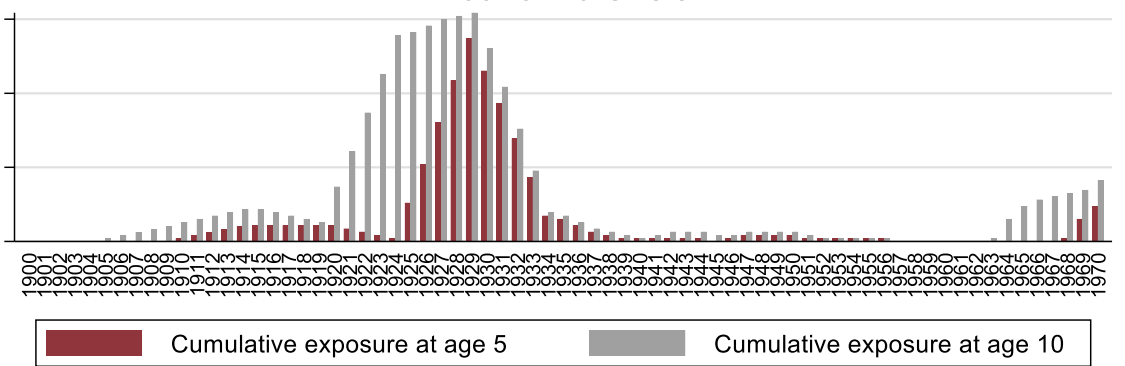
Armed Conflict



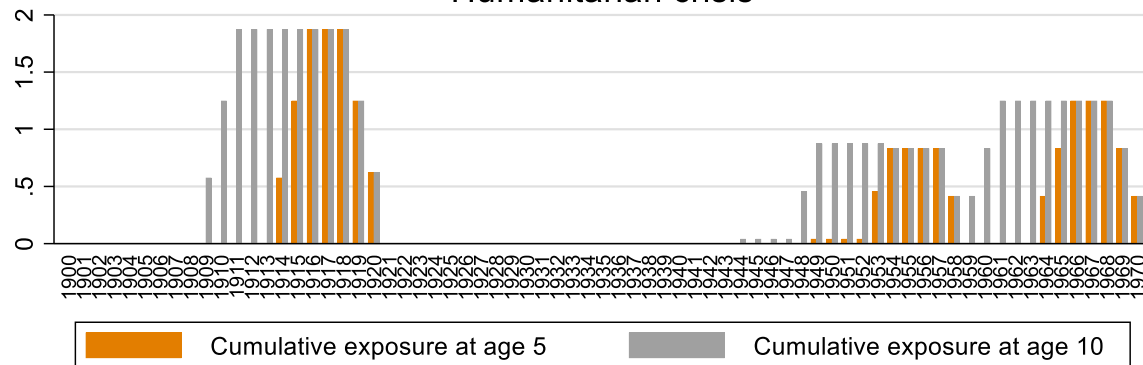
Political Crisis



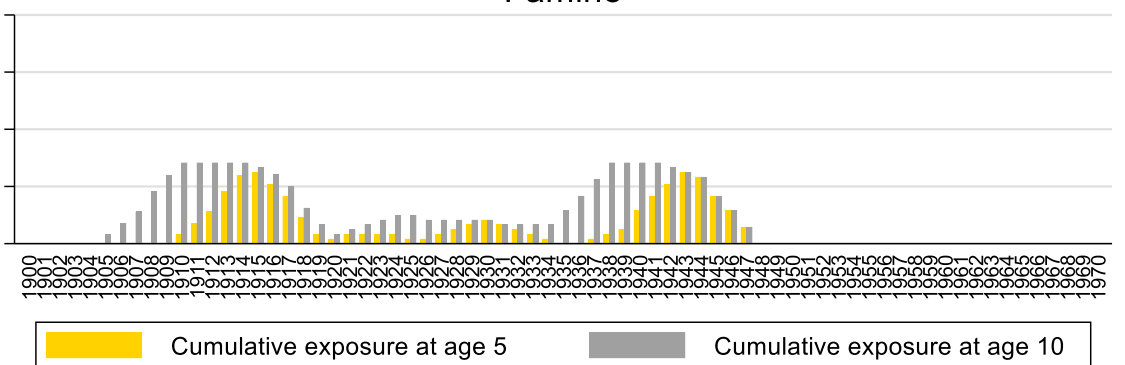
Economic Crisis



Humanitarian crisis

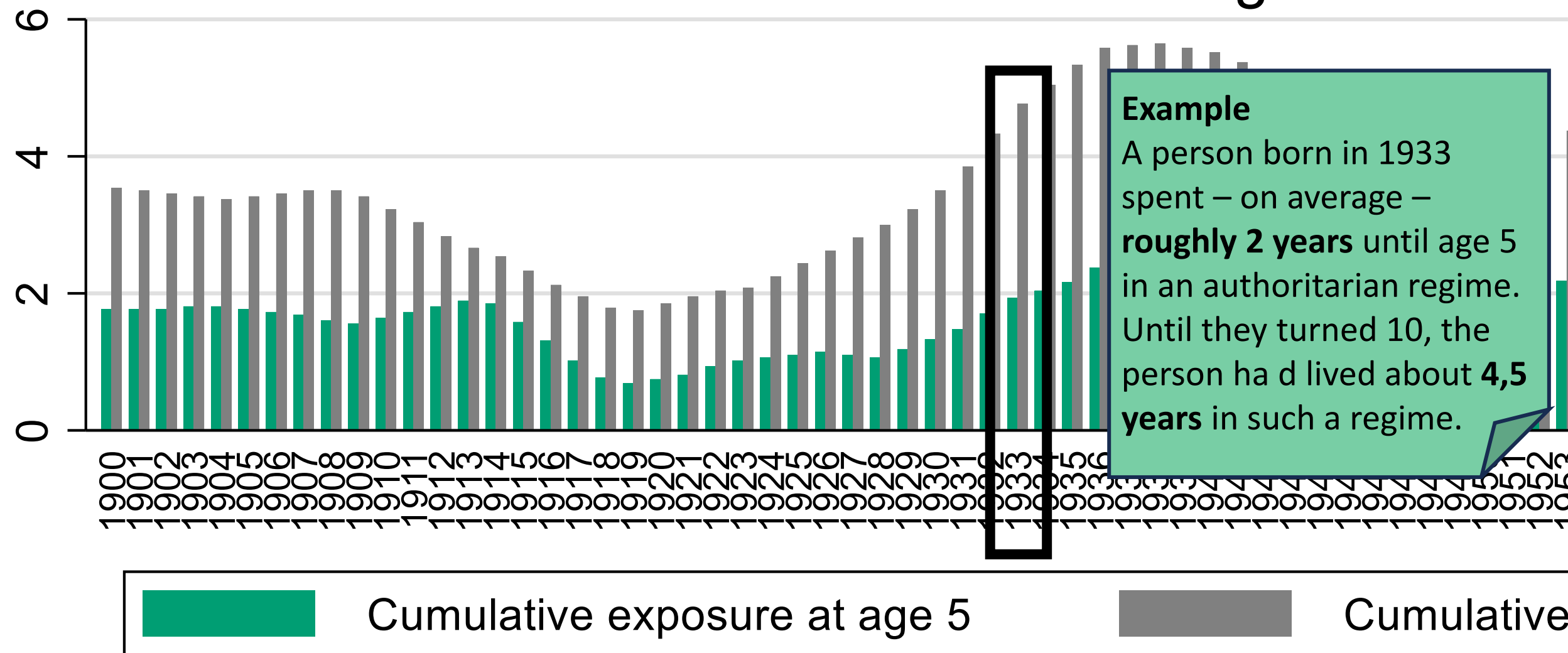


Famine



Measuring Crises

Authoritarian Regime



Educational Constellations in Couples



Educational Assortative Mating

= higher likelihood of partnering with someone of same educational level

- Mechanism of inequality accumulation
- Educational health benefits well-known, but spillover of partner's education overlooked

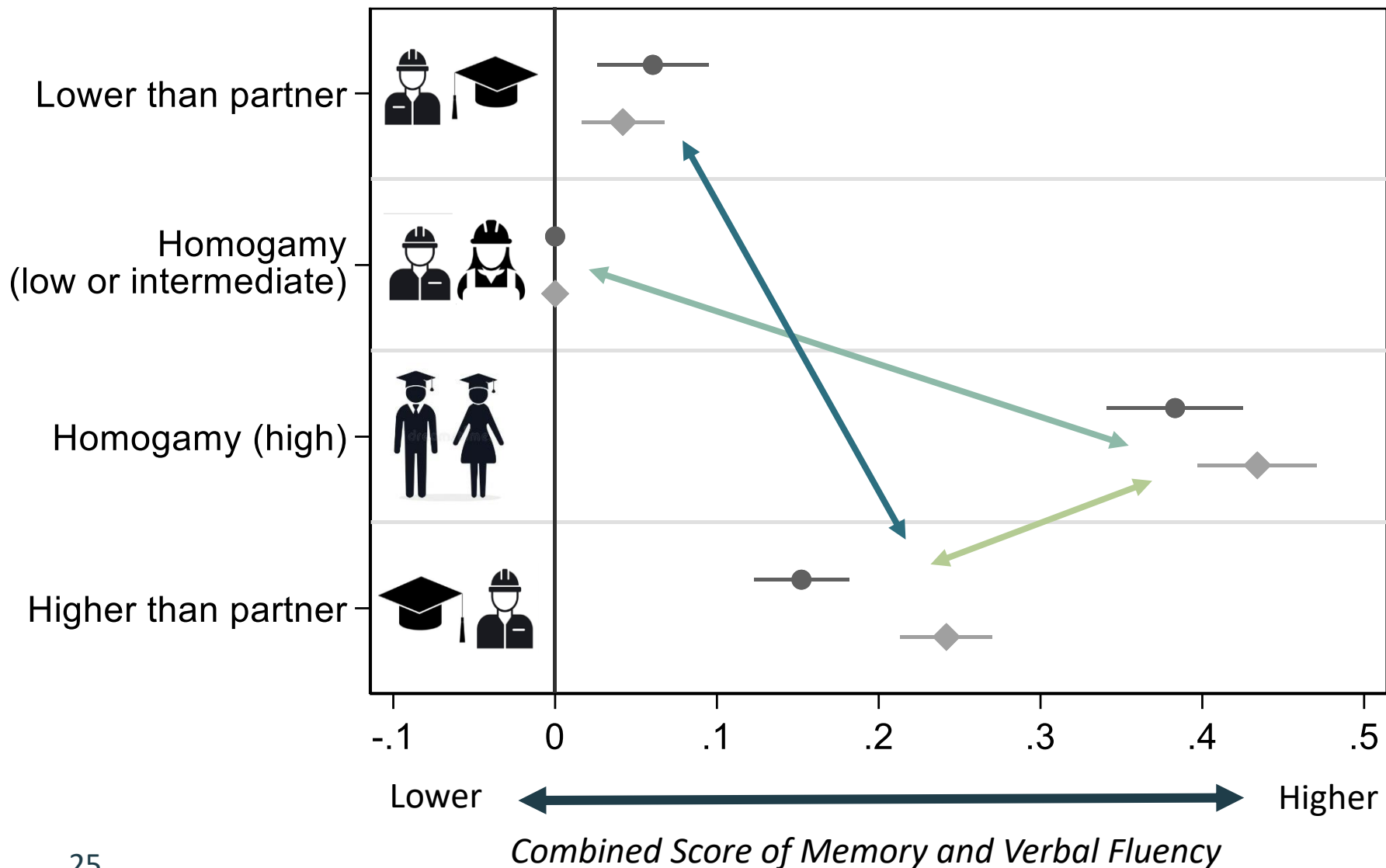
→ Is partner's education as protective?

→ Who benefits most?

Measures

- Homogamy high = both higher-educated
- Self higher than partner
- Partner higher than self
- Homogamy low = both not higher educated

Effects of Educational Constellations



Partner's higher education is protective (compensation), but small effect size

Higher-educated benefit more from higher-educated partner → accumulation

Own education beats partner's

Own education benefits greater among women

● Men ♦ Women

Division and Reunification of Germany

Countervailing hypotheses on East German Impact



Advantage: Early childcare / schooling system → cognitive reserve. Healthier nutrition, sports culture, Fewer cars → less air pollution (and lead)



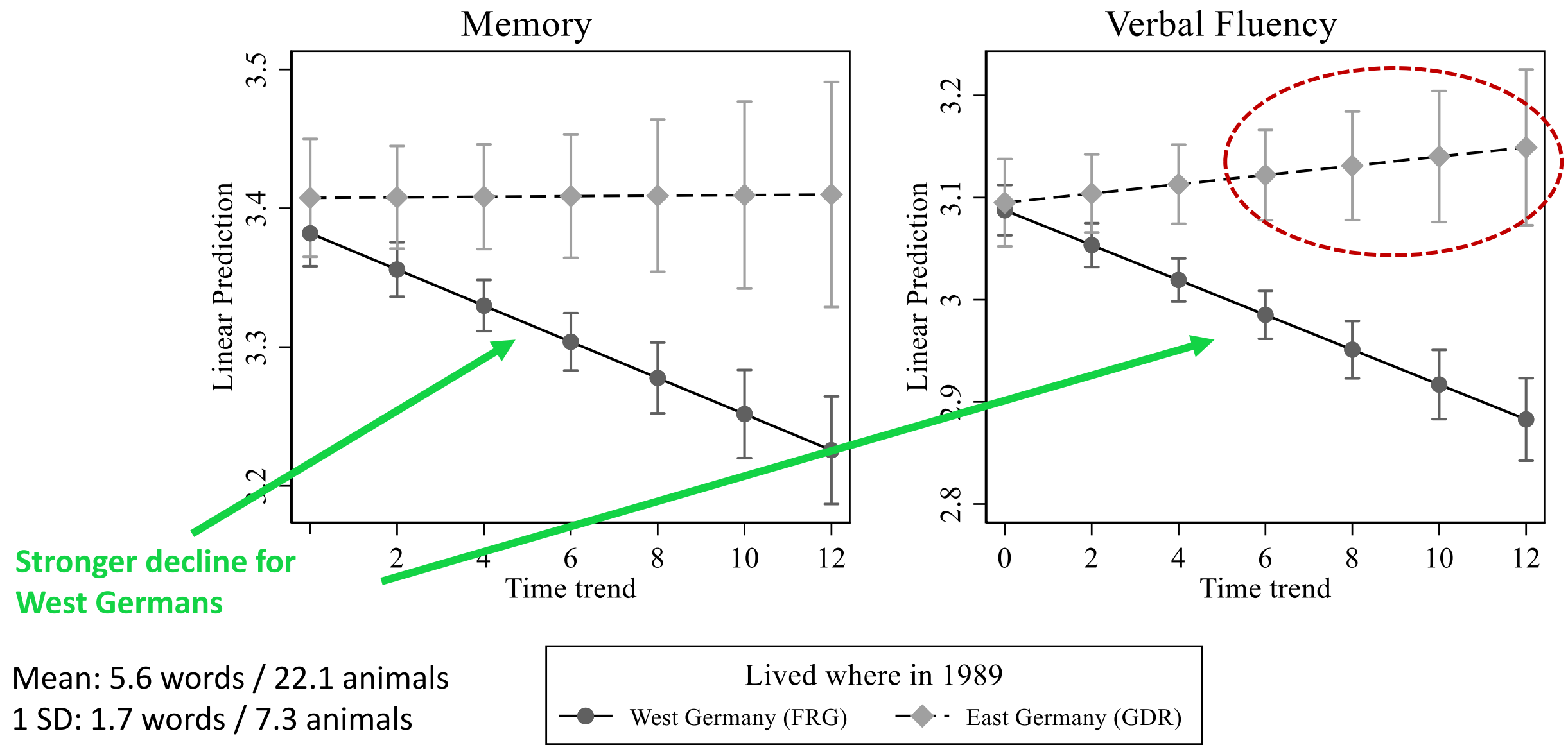
Disadvantage: Spy state → less trust / freedom of expression. Smoking more common → cardiovascular. Reunification as economic shock (especially for women)

Measures

- Where lived in 1989 just before reunification
- Age at reunification (5-year bands, representing fine-grained life course stages)

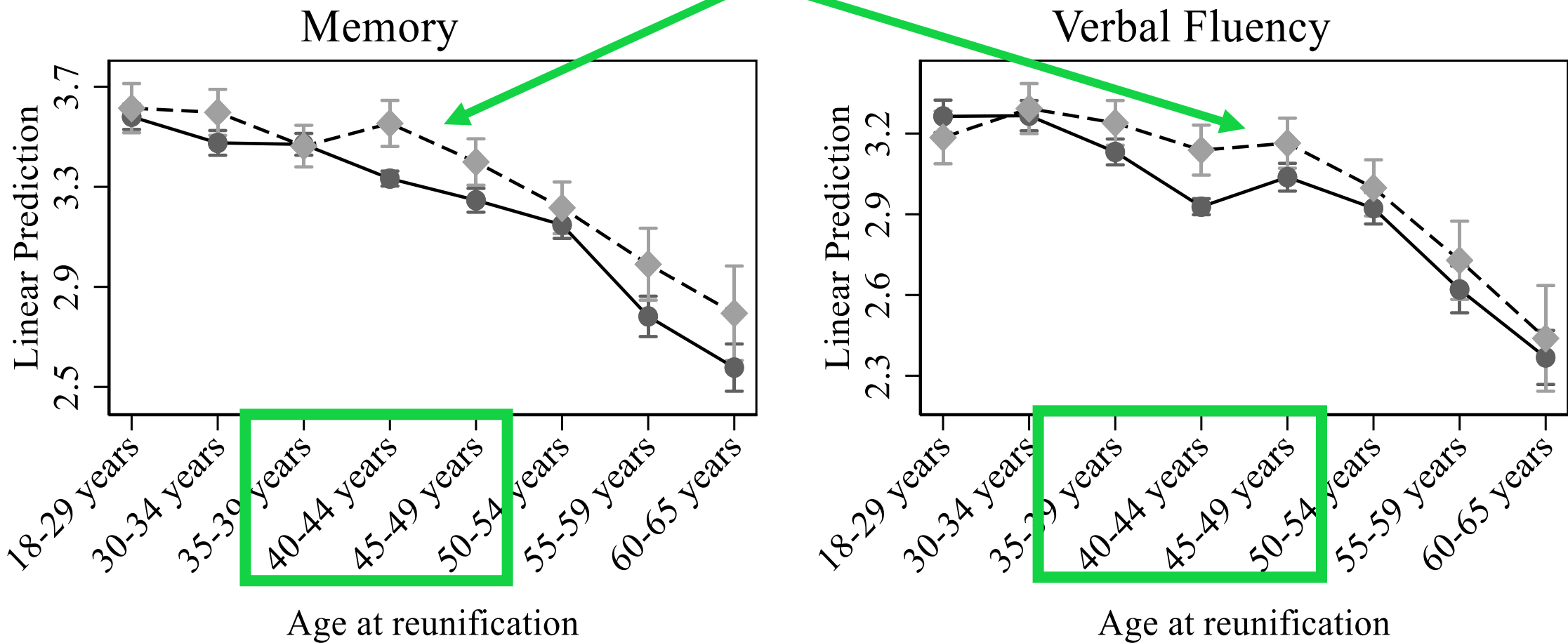


Institutional Change: Division



...and Reunification

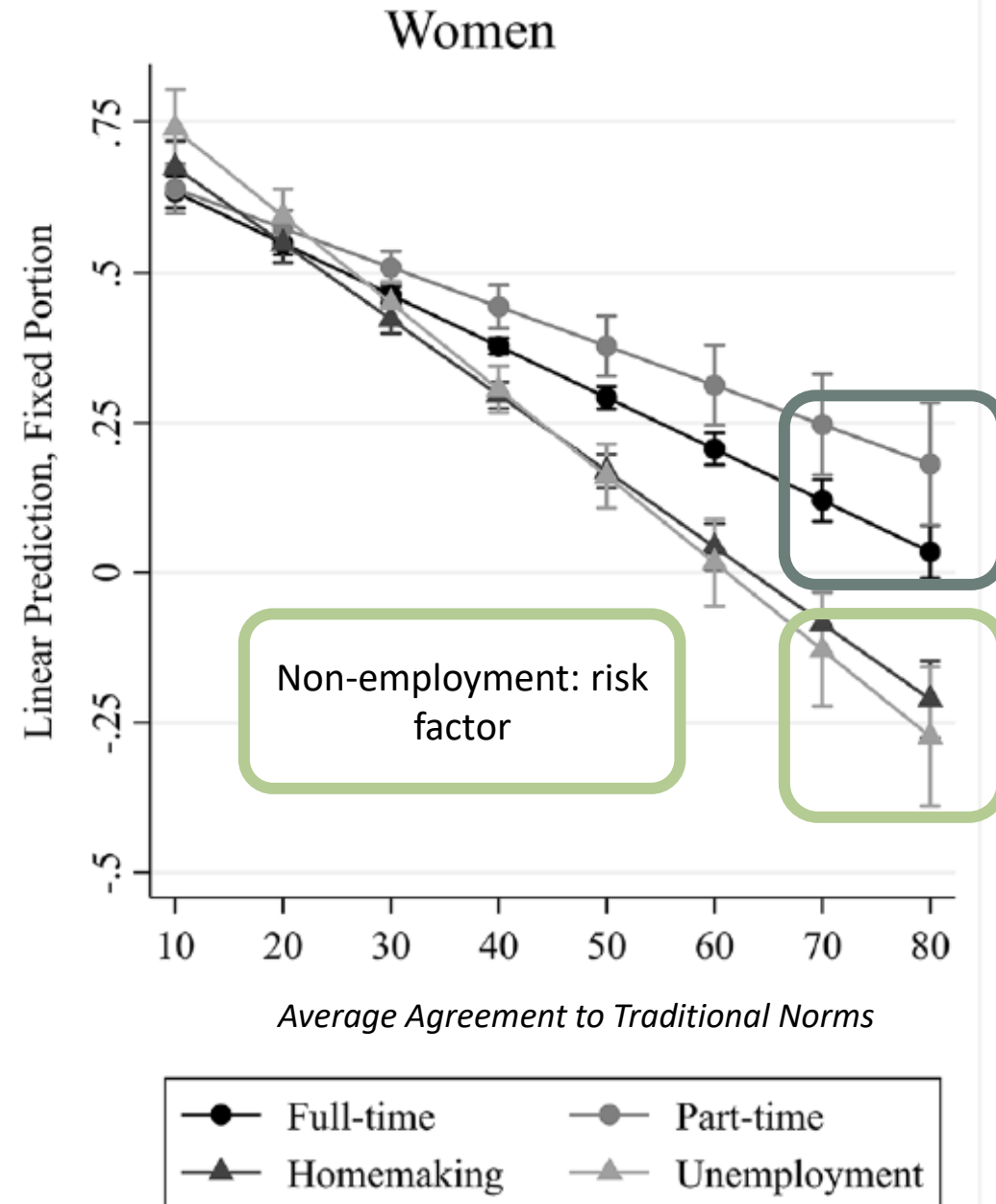
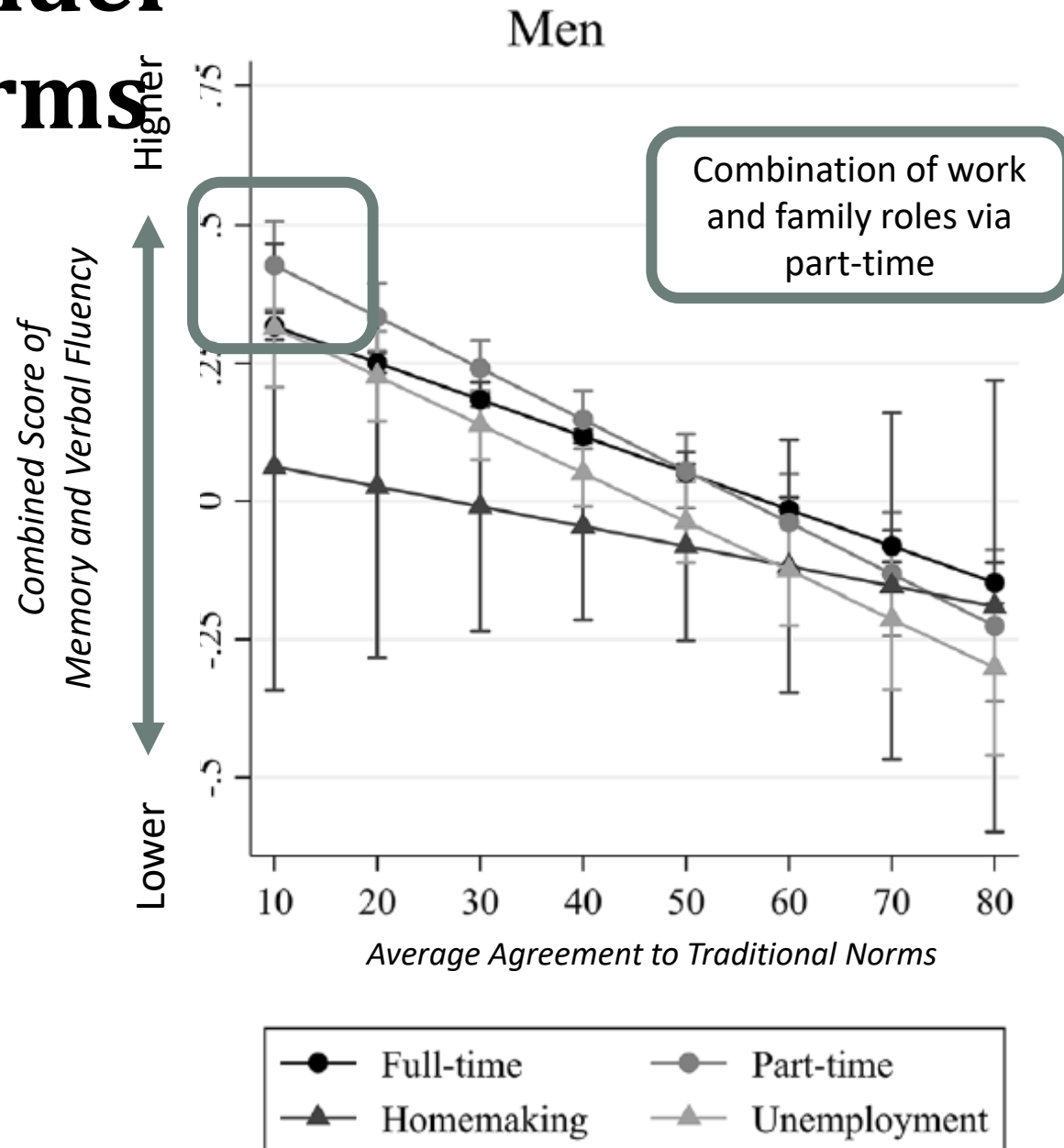
East advantage most pronounced when reunified in 40ies



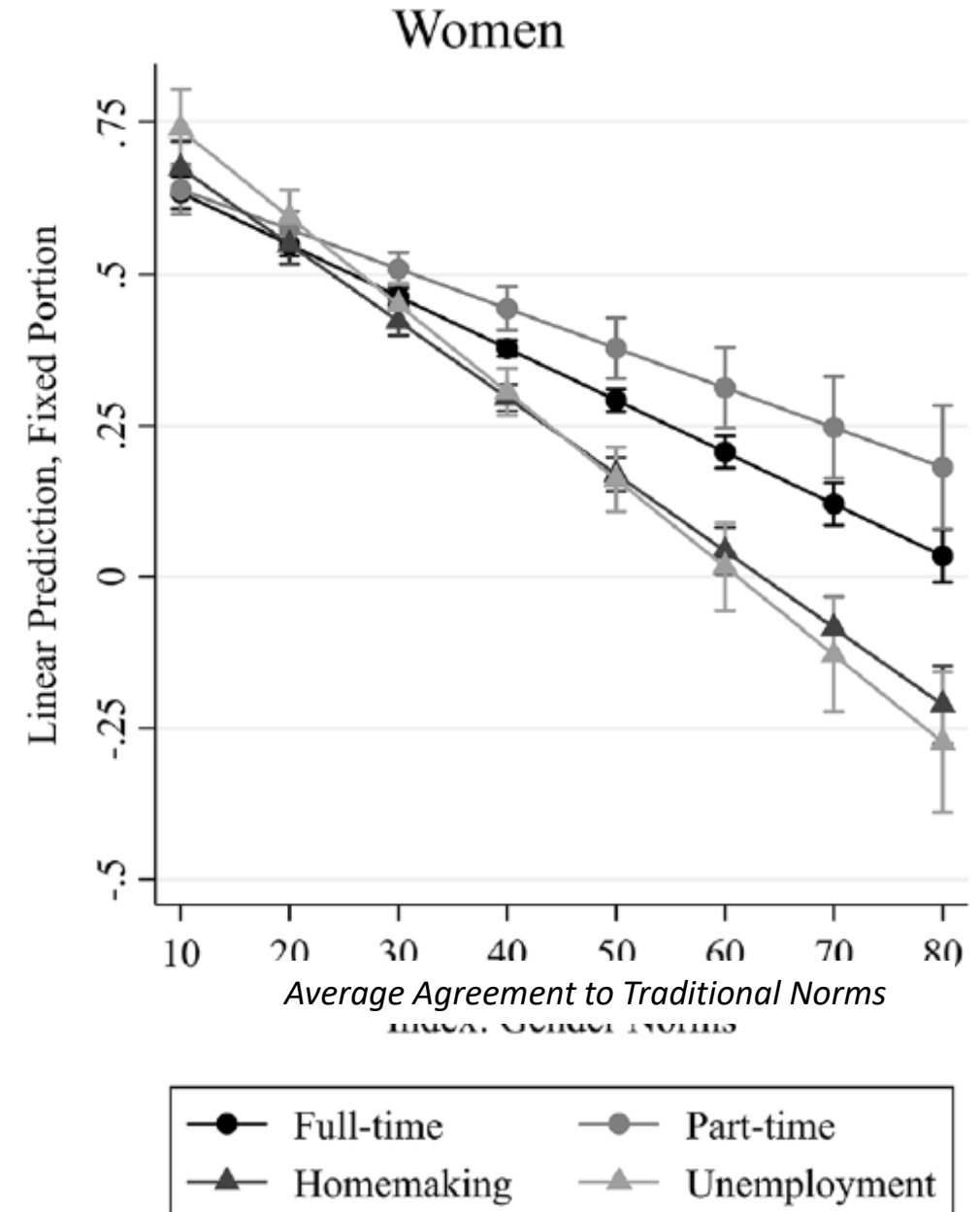
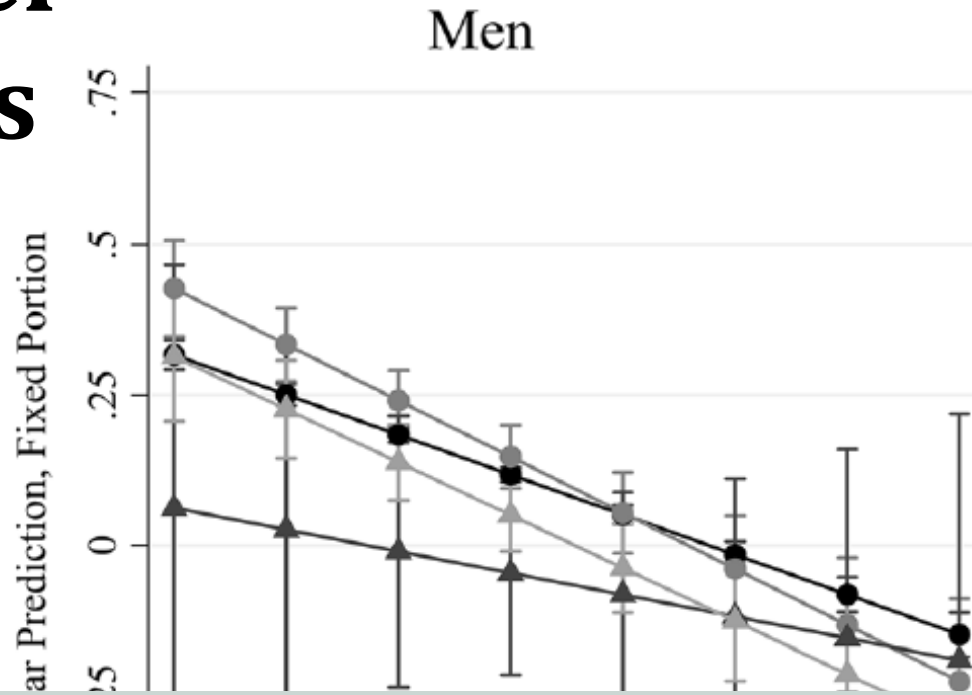
1 SD: 3.5 words / 7.5 animals



Gender Norms



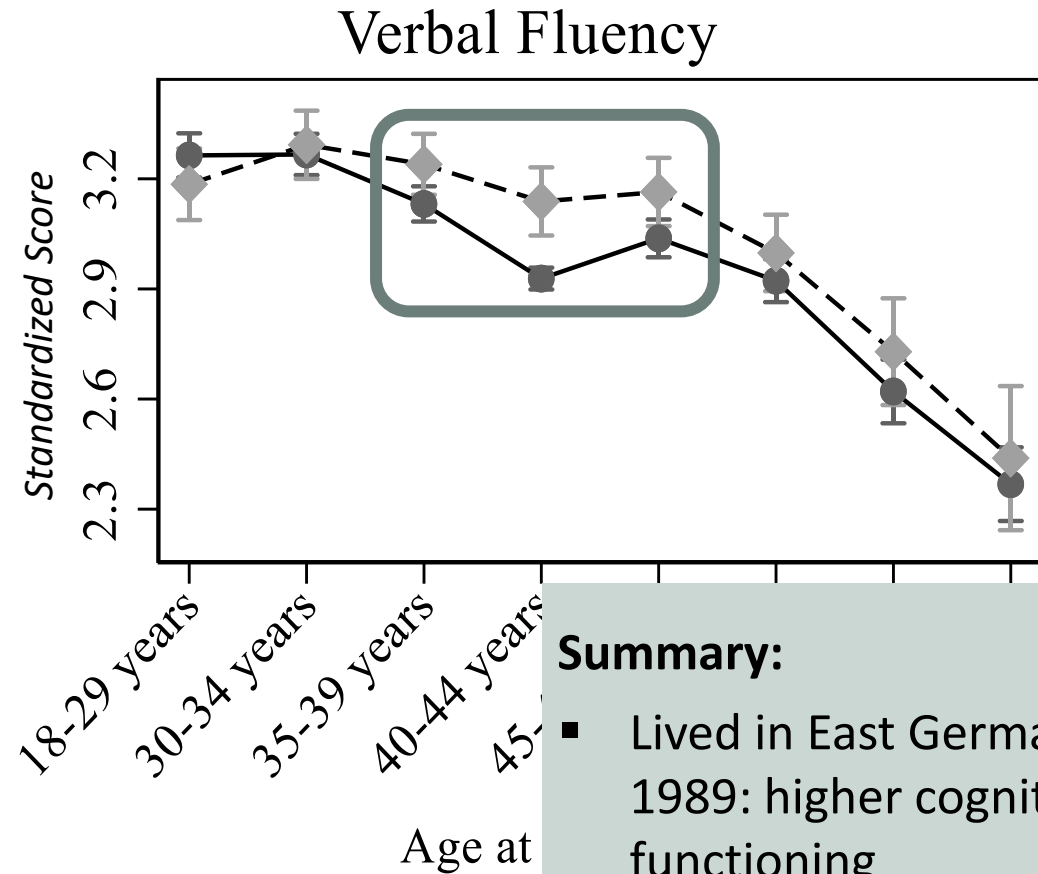
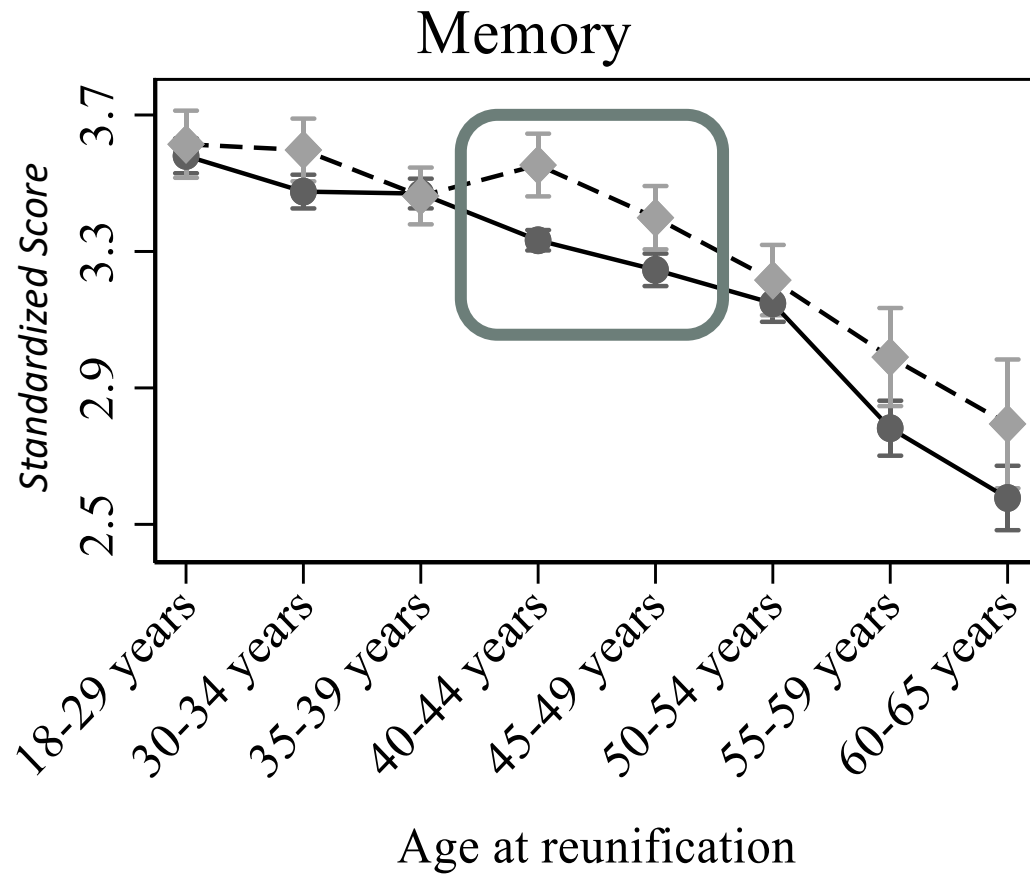
Gender Norms



Summary

- The more traditional the gender norms, the lower the cognitive functioning
- Both genders affected → separation of spheres
- Stronger for women with long-term non-work
- Part-time work beneficial where culturally supported

Age at Reunification and Later Life Cognitive Functioning



Summary:

- Lived in East German before 1989: higher cognitive functioning
- Age at reunification: mid-life as sensitive period

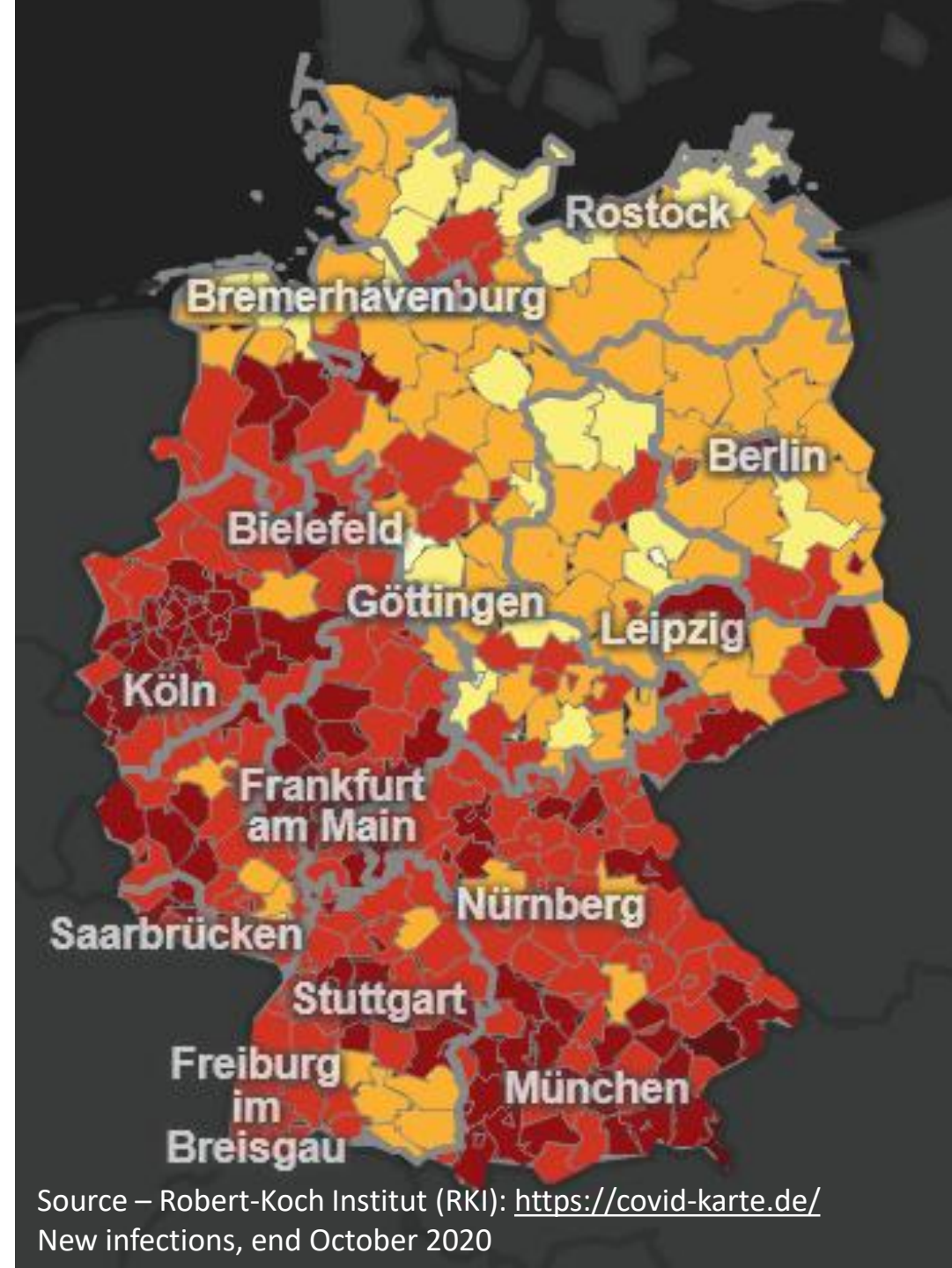
COVID-19

- **Biological mechanism:** SARS-CoV2 infection (physical), long Covid (direct brain health impact). Worries and anxieties (stress)
- **Social mechanism:** Physical distancing → isolation, loneliness, lack of support and cognitive stimulation

H1: Older adults' cognitive functioning declined faster during the pandemic period than over a pre-pandemic period of similar length

Measures:

- Period dummies: “baseline change rate” vs. Covid.
- DV: standardized change scores of memory and verbal fluency.
- **Specification:** „longer follow-up“ (waves 4-5), adjusting for time between interviews.



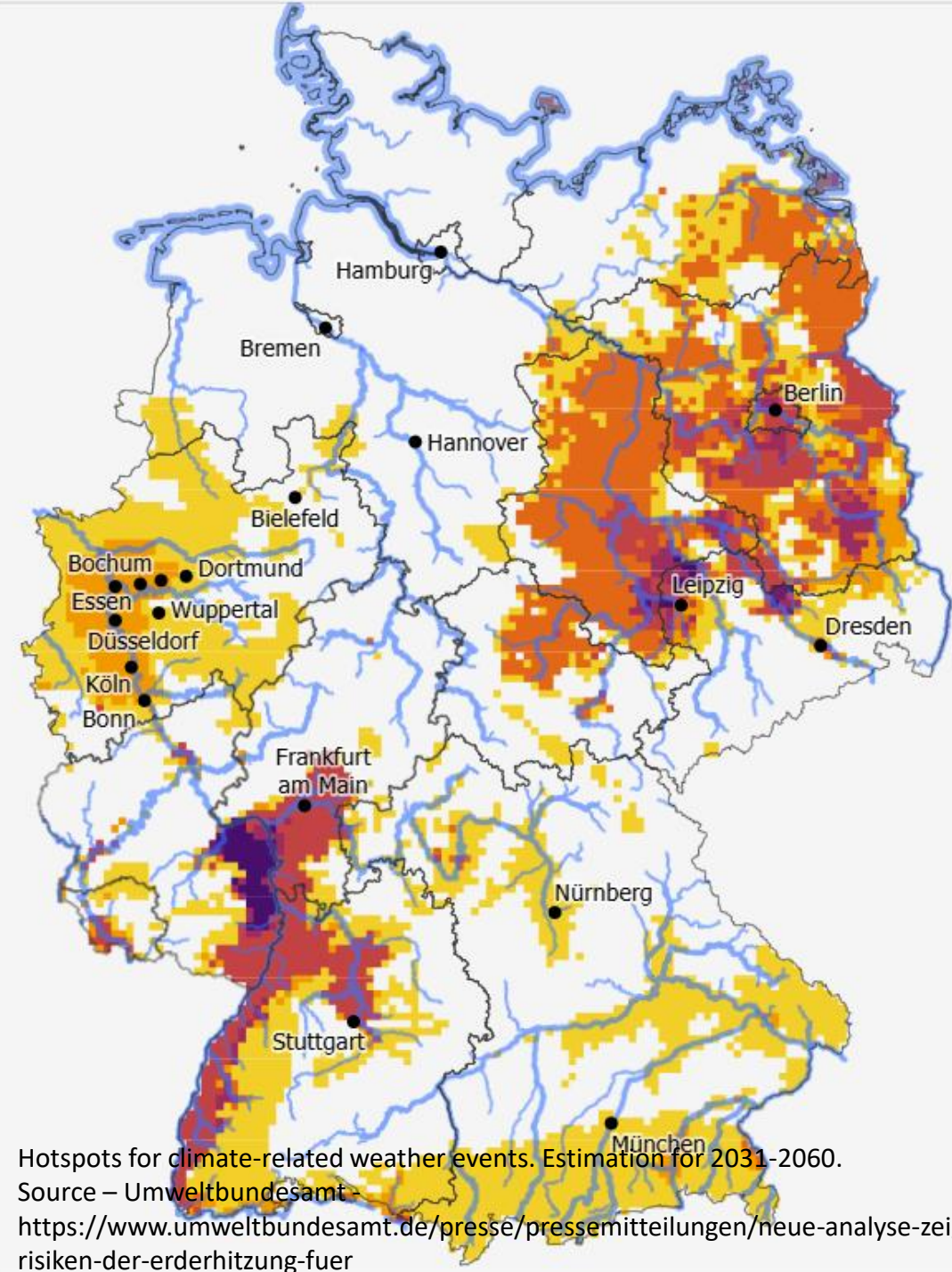
Source – Robert-Koch Institut (RKI): <https://covid-karte.de/>
New infections, end October 2020

Climate Change

- **Biological mechanism:** Heat strokes (cardiovascular), dehydration, air pollution and sleep quality (direct brain health impact). Mental health (stress)
- **Social mechanism:** Staying inside: forgone daily activities, social encounters and participation → lack of social stimulation and support, unmet needs, less physical activity

H2: Older adults' cognitive functioning declined faster between two survey waves the hotter the summer in between was

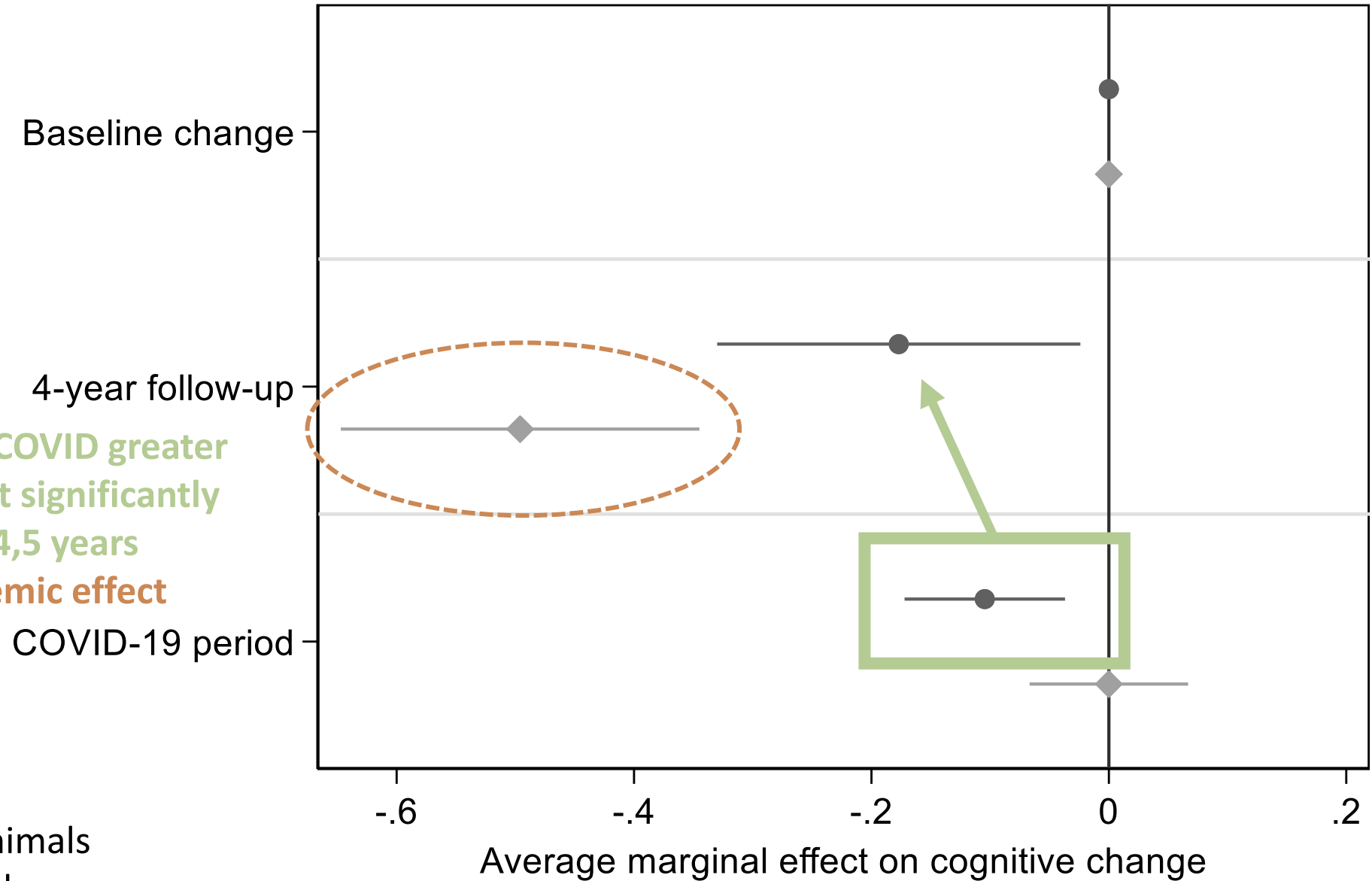
- Measures: Average and maximum summer temperatures in July & August. DV: standardized change scores (same)
- **Specification:** controlling for interview month, strokes & dementia diagnoses. Robust standard errors (regions).



COVID-19: Period dummies

Memory: decline during COVID greater than baseline change, not significantly smaller than „loss“ over 4,5 years

Verbal Fluency: no pandemic effect



Mean: 10.1 words / 22.3 animals

1 SD: 3.5 words / 7.3 animals

Baseline change rate:

-0.10 (memory) / -0.17 (verbal fluency)

● Total memory ◆ Verbal fluency

Climate Change: Summer Temperatures

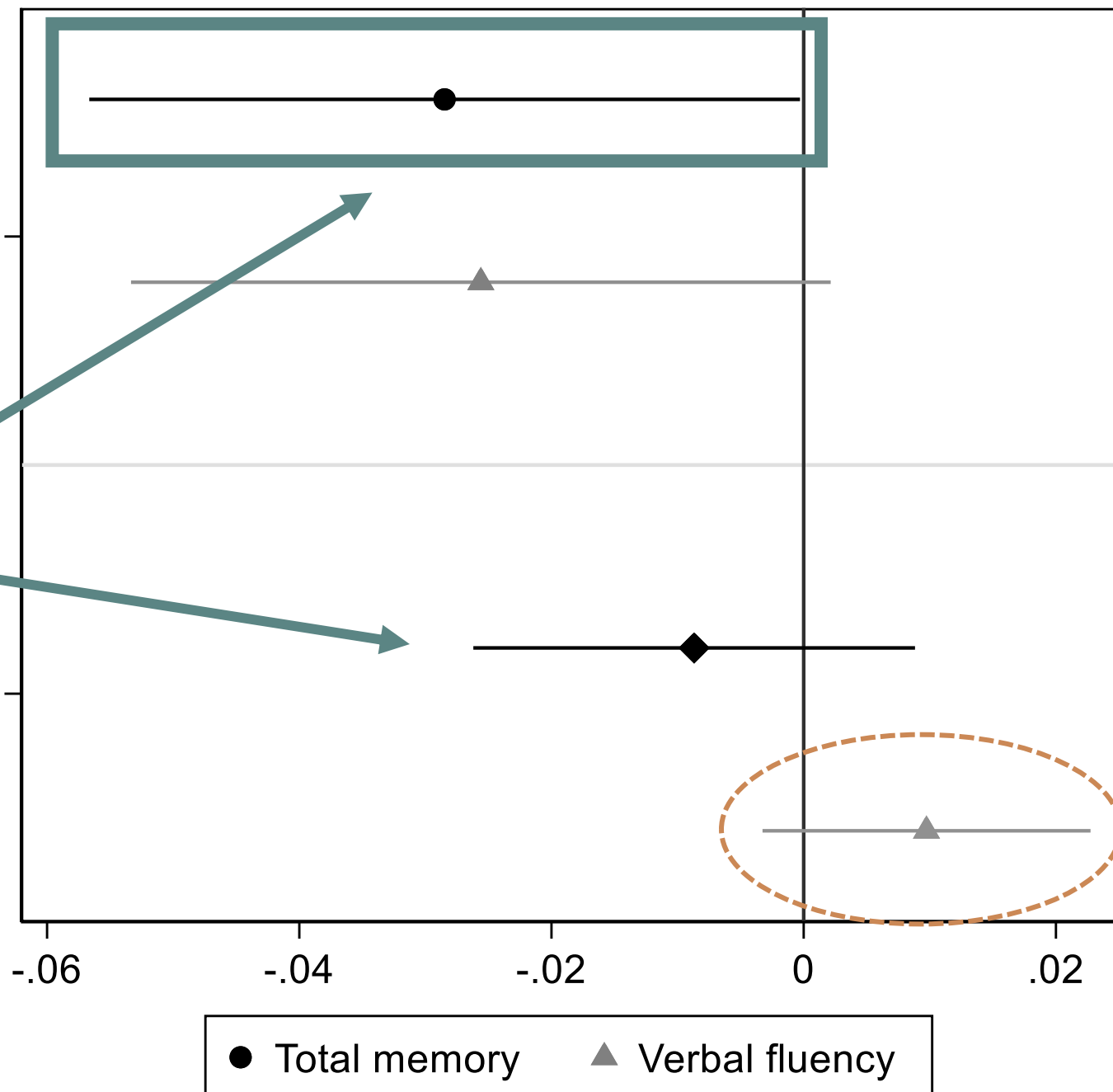
Memory: Duration of exposure
(average temp) rather than short-
term heat peaks (max temp)

Verbal fluency: No effect

Average temperature
Jul-Aug

Max. temperature
Jul-Aug

Mean: 10.1 words / 22.3 animals
1 SD: 3.5 words / 7.3 animals
Constant: 0.00 n.s. (both)



Covid Infections over Time

08. März 20

1167 Tage

19. Mai 23

