

Family Instability and Children's Genetic Influences on Educational Achievement

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Introduction: Nature vs Nurture in Family Research

- Much of family research centers on environmental factors
 - How do families influence children's life course outcomes?
 - Which social factors influence family behavior?
- **Most social outcomes are influenced by genetic factors**
 - Shift from mono- to polygenetic understanding of genetic influences
 - Usually quantified as heritability
 - Variance proportion attributable to genetic and not environmental factors
 - Educational attainment: 15% (Okbay et al. 2022)
 - Transition to Divorce: 9% (Van Winkle & Conely 2021)

Introduction: Nature and Nurture in Family Research

- Contemporary family research seeks to be integrative
 - Approaches that stress the role of the environment are incomplete without taken potential genetic influences into account
 - Genetic influences are not deterministic, but can be conceptualized as probabilistic for many social outcomes
- Research should assess how social and genetic factors interact
 - Regardless of whether our interest is family behavior or the role of the family for life course outcomes

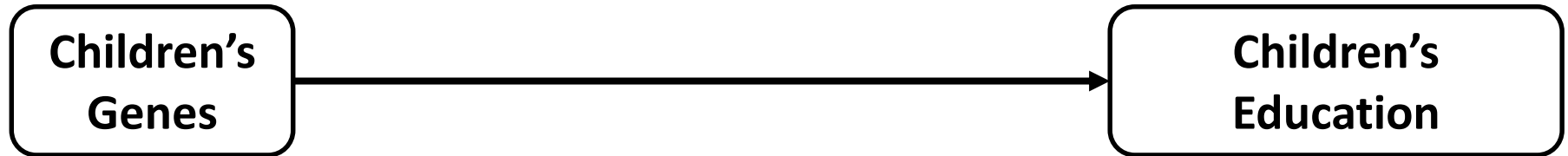
Gene-Environment Interplay: A Simple Metaphor



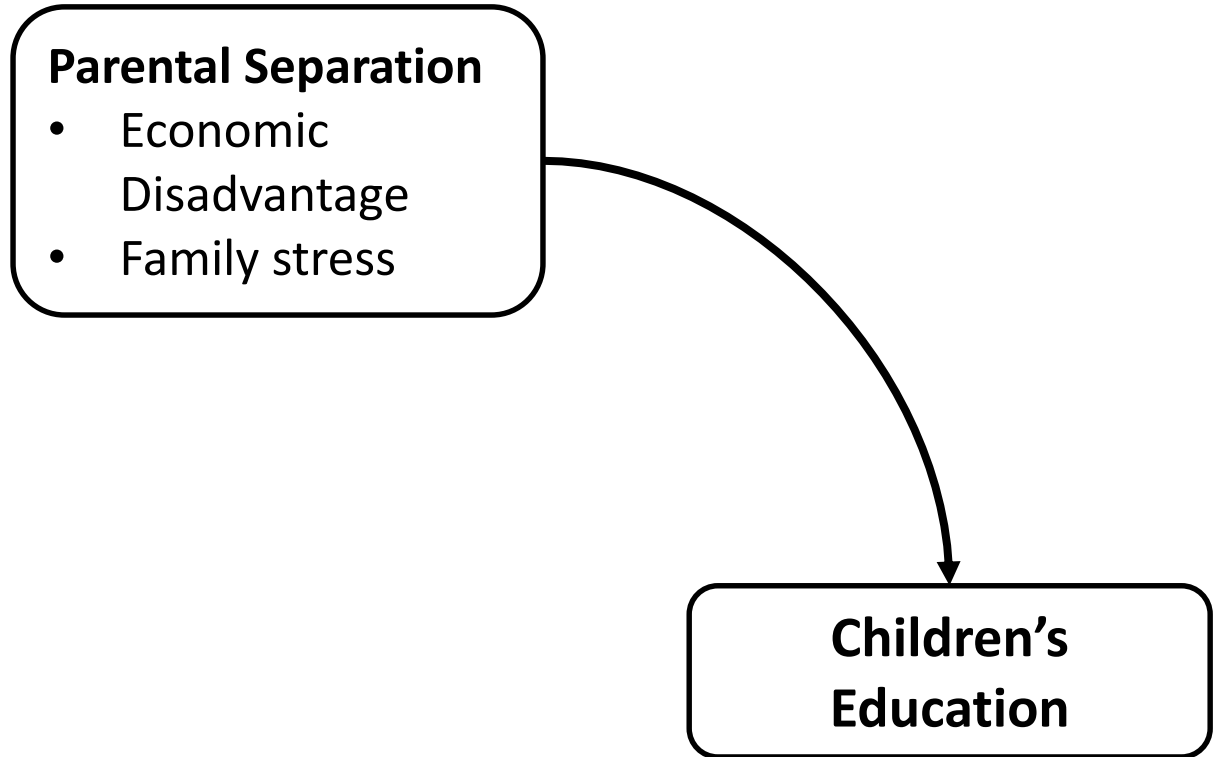
“Good” Environment

“Bad” Environment

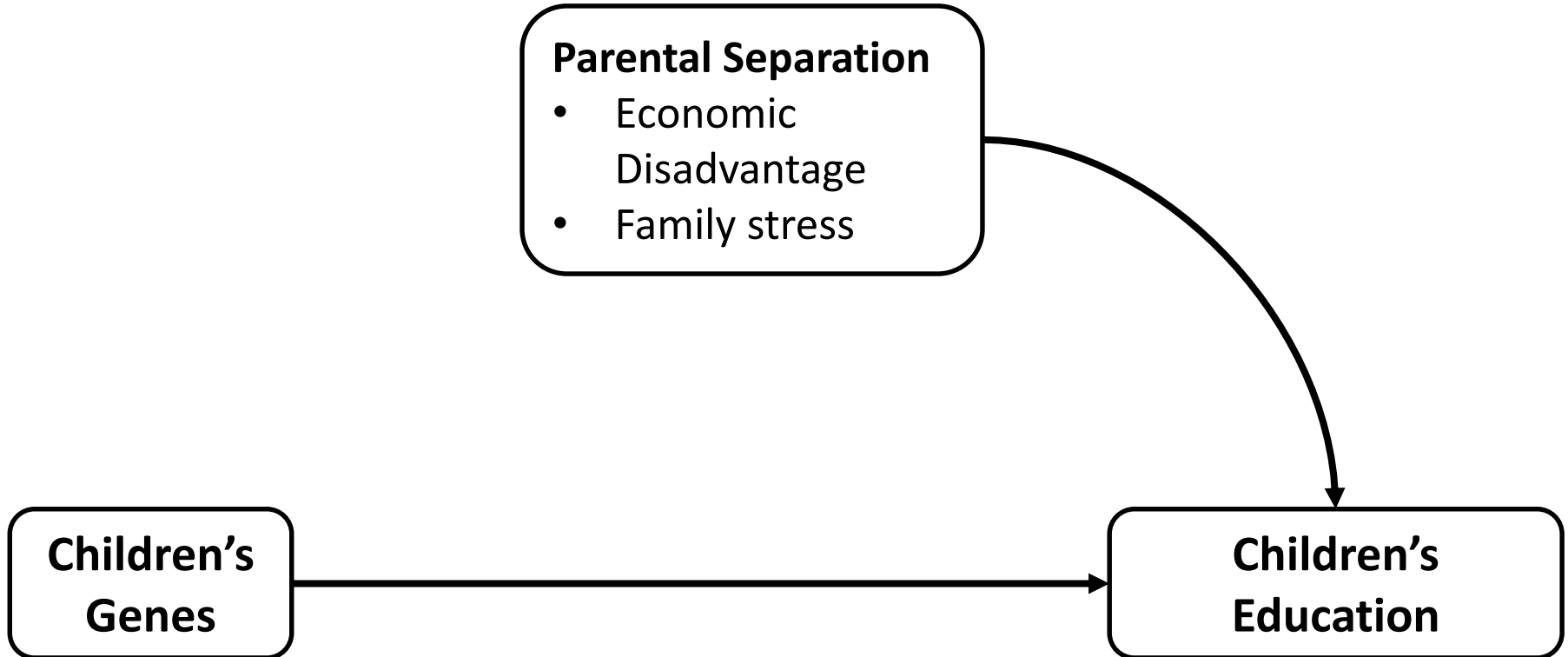
Family Instability as a Moderator of Genetic Influences



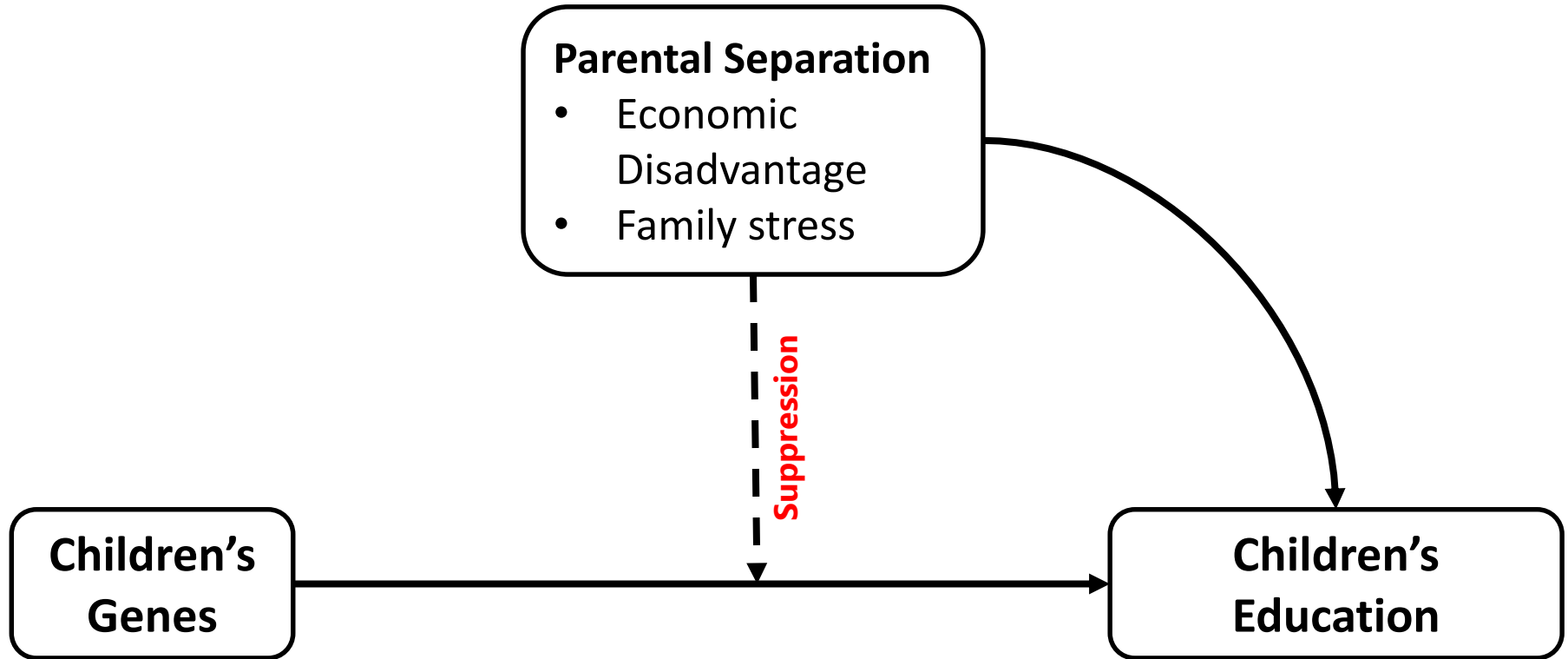
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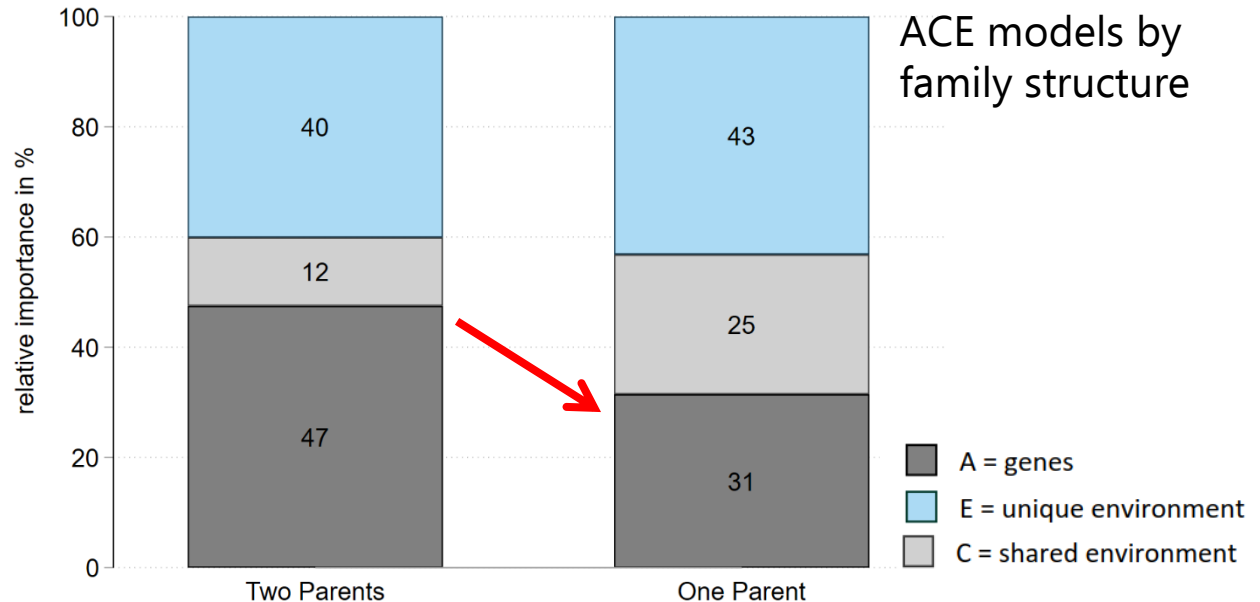


Family Instability as a Moderator of Genetic Influences



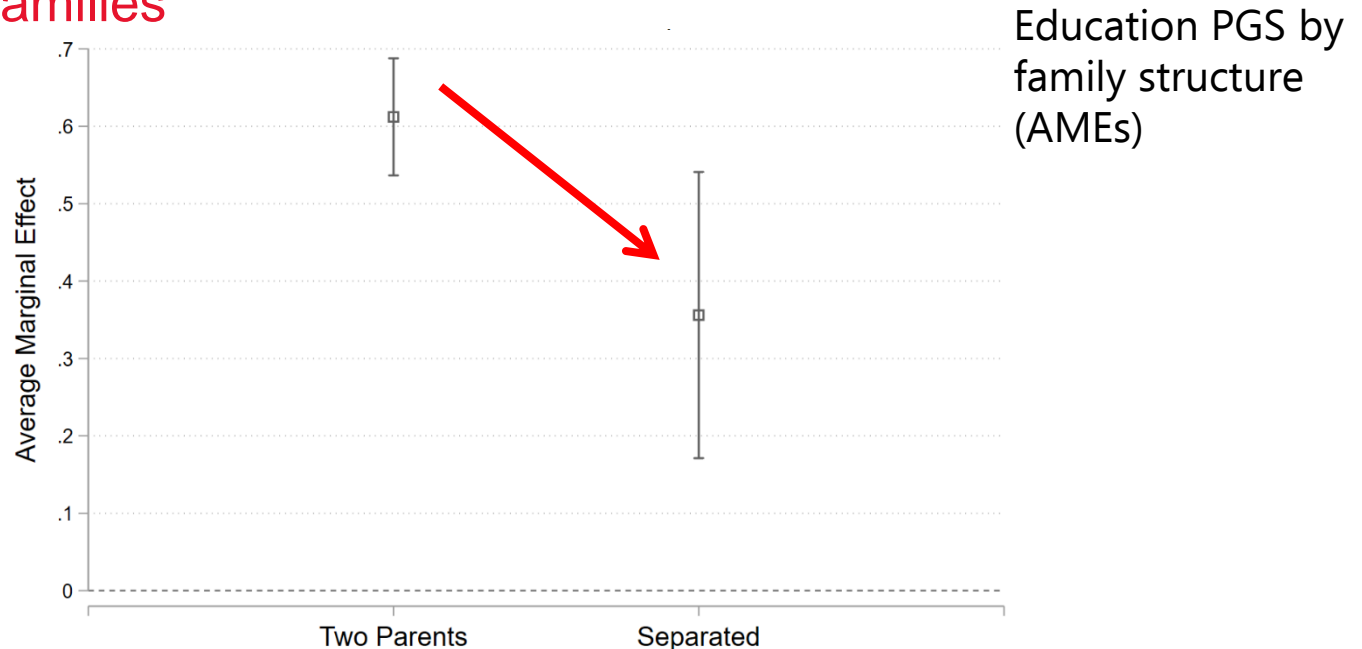
Previous Findings – Germany

- Genetic influences on IQ matter less in one parent families



Previous Findings – United States

- Genetic influences on educational attainment matter less in one parent families



Note: HRS data. N = 3,754.

Baier & Van Winkle 2025

Gaps in the Literature

- Family instability
 - Narrow focus on parental separation and divorce
- Evidence based on US or Germany
 - Heterogenous effects (see Ghiradi & Bernardi 2025)
- Indirect genetic effects have not been accounted for
 - Non-transmitted genetic influences may affect both separation and children's (home) environment (Kong et al. 2018; Nivard et al. 2024)

Research Questions

1. How do genetic influences on educational achievement differ across children from stable, separated, and re-partnered families in Norway?
2. Does this moderation vary by mother's education?
3. To what extent do indirect genetic effects explain these patterns?

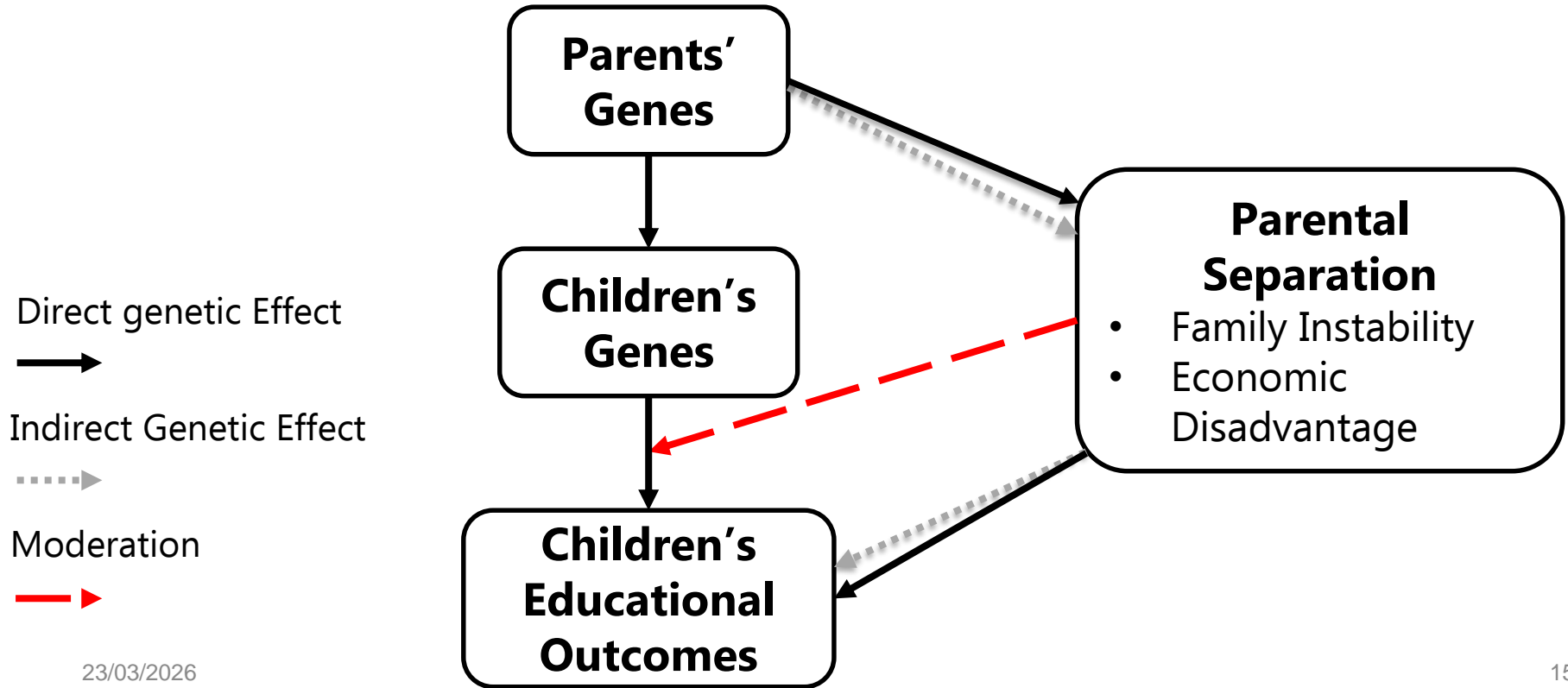
Theoretical Background: Family Instability & Genetic Influences

- **Parental separation**
 - Family instability/stress and resource loss
 - Stress seems driving negative associations
(Baier & Van Winkle, 2020; Van Winkle & Baier, 2025)
- **Parental re-partnering**
 - Both: resource recovery and new instability
- **H1-Overall**
 - Genetic effects on education will be weakest among children whose parents' re-partner, followed by children of separated parents who remain single, compared to those from stable families

Theoretical Background: Heterogenous Effects

- Cumulative disadvantage perspective:
 - High-educated mothers can buffer stress
 - H2a: Family instability suppresses children's genetic influences stronger among low-educated families
- “Least-expected” perspective:
 - Instability may be more disruptive among highly educated families
 - H2b: Family instability suppresses children's genetic influences stronger among highly-educated families

Theoretical Background: Indirect Genetic Effects



Theoretical Background: Indirect Genetic Effects

- H3: If indirect genetic effects drive the family instability suppression, it will weaken once adjusted for parental PGSs.

Data and Methods

- The Norwegian Mother and Child Cohort Study (MoBa)
 - Population-based pregnancy cohort study (1998-2008)
 - DNA sampling for mothers, children, and fathers
- Linked Administrative Registers
 - Children's national test-scores
 - Standard demographics, cohabitation patterns
- N= 37,390

Data and Methods

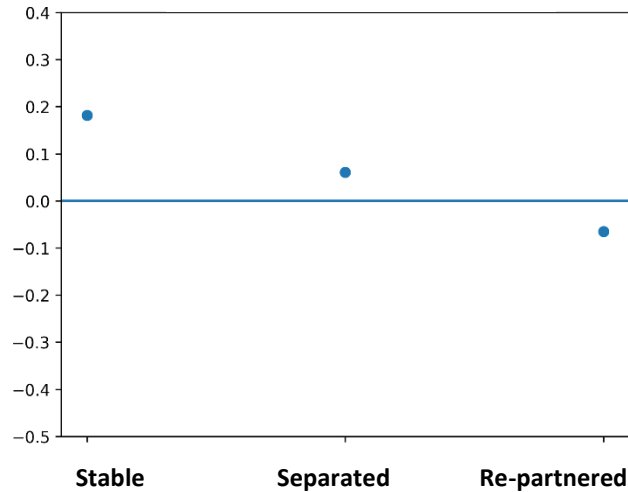
- **Outcome**
 - Children's national test score (Ø English, Reading, Math) (5th grade, age 10)
- **Key predictors**
 - Education Polygenic Index (EA PGI)
 - Family structure: Stable (two parent) | Separated | Re-partnered
- **Basic controls**
 - Child's gender, birth year, siblings, 10 PCs

Data and Methods

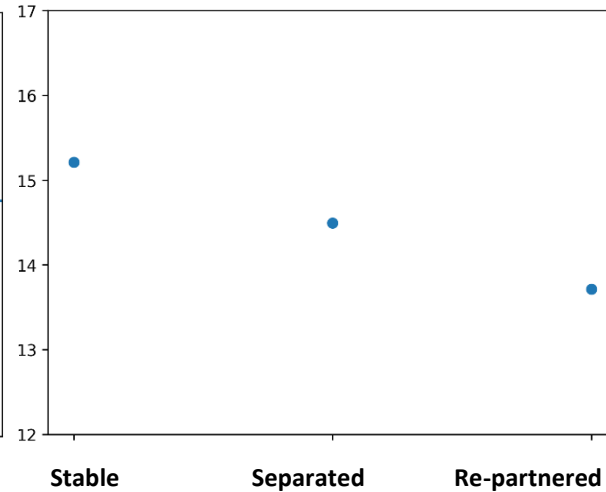
- 1. Gene–environment moderation
 - OLS interaction models
 - Family structure*child EA PGI + controls
- 2. Social stratification of moderation
 - OLS interaction models
 - Stratified by mother's education
- Sensitivity
 - Timing restriction: Separation by age 5 (comparable exposure window)
 - Indirect genetic effects: Maternal and paternal EA PGIs

Descriptive Findings

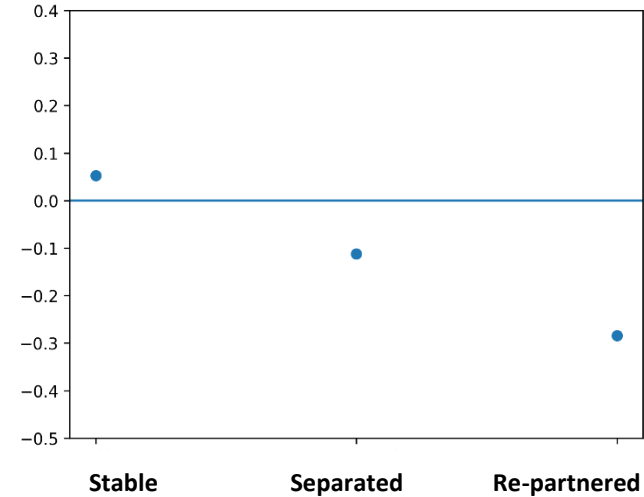
Test scores



Mothers' Education (yrs)



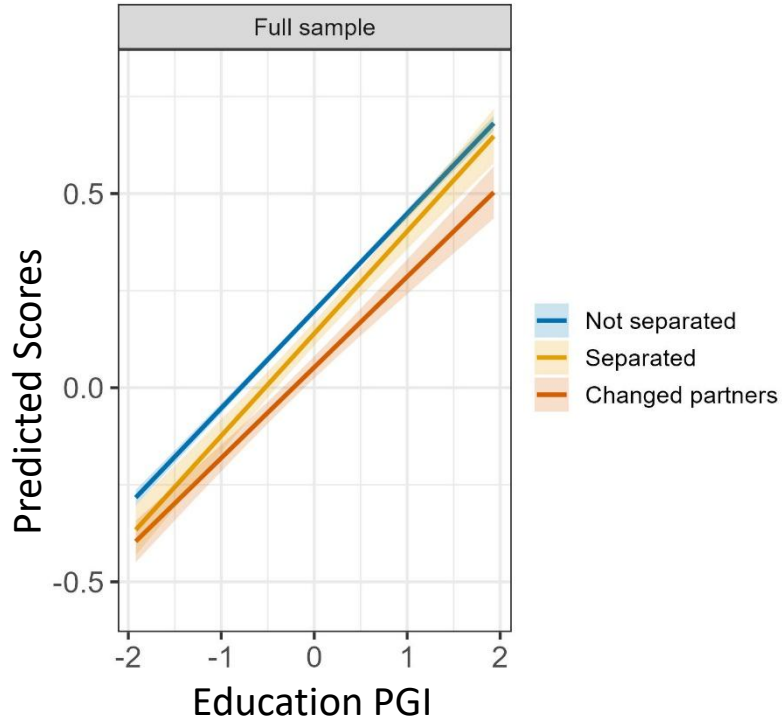
Education PGI



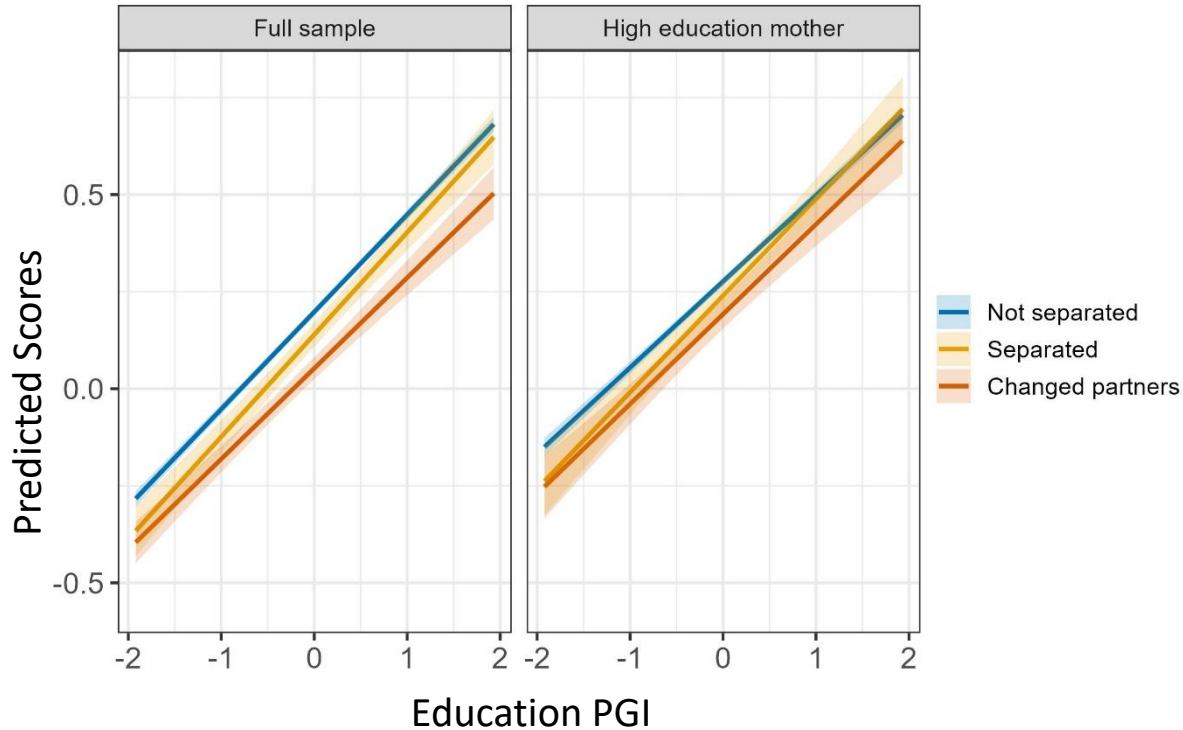
Consistent gradients

Stable > Separated > Re-partnered in test scores, mothers' education, and education PGI

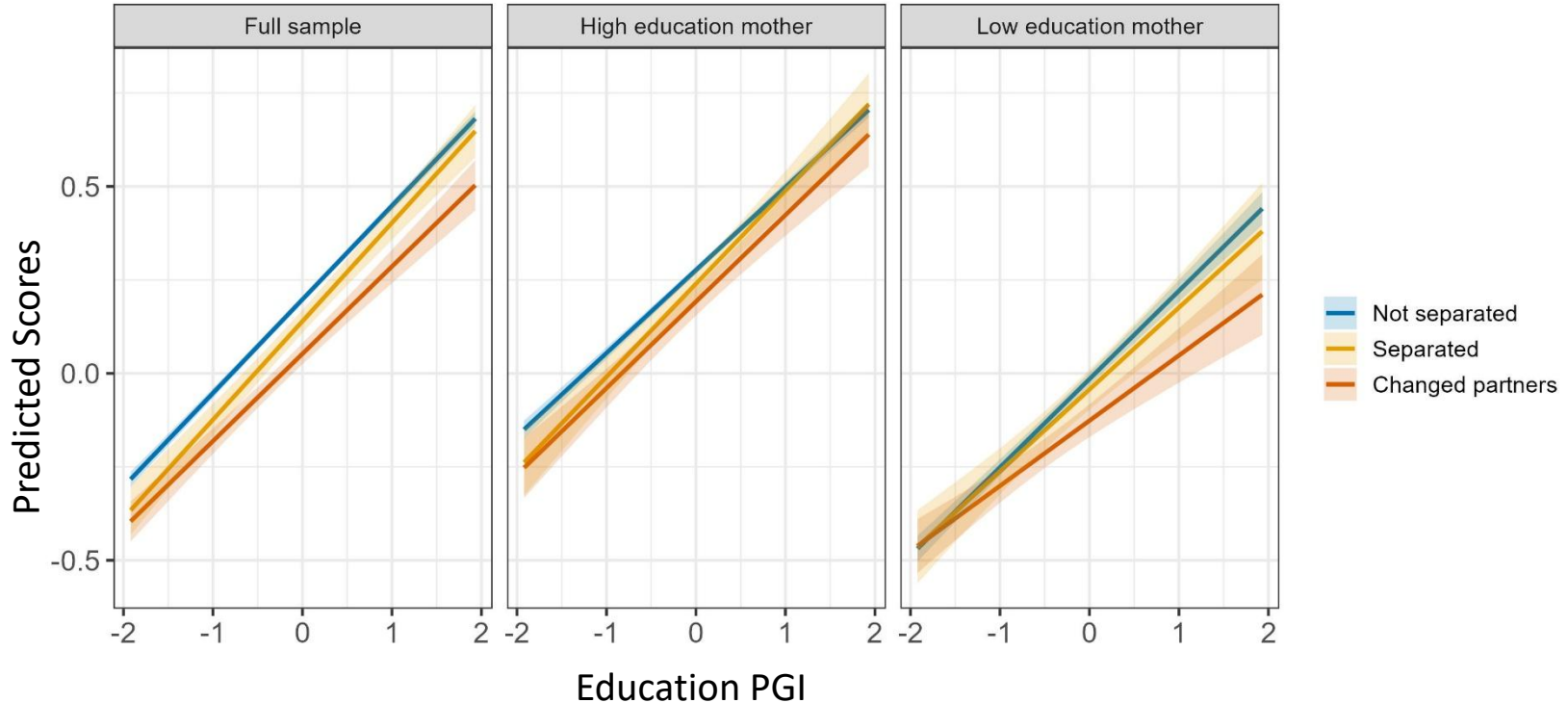
Overall Results: Level Rather Than Slope Differences



Stratification by Maternal Education



Stratification by Maternal Education



Key findings: Stable Gradients, Context-Specific Attenuation

- Full-sample: Genetic influences on educational achievement are similar across family structures
 - Possibly institutional buffering (Norway: generous WFS, shared custody norms)
- Stratified results
 - Weaker genetic influences in re-partnered families with lower parental education
 - Aligns with cumulative disadvantage
 - Points to the underlying mechanisms

Next Steps

- **Mechanisms**
 - “Genetic nurture effects”
 - Changes in resources and residential mobility
 - Points to stress-related mechanisms
 - Direct measures for stress and family conflict, child's perceptions
- **Buffering & Resilience**
 - (Step-)parent & sibling relationships

THANK YOU!



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