

The Influence of Early-life Shocks and Genetic Diversity on Long-term Economic Outcomes: Evidence from the Great Depression

Valentina Duque, University of Sydney (valentina.duque@Sydney.edu.au) | Lauren Schmitz, University of Michigan (lschmitz@umich.edu)

Research Question

Does the impact of early-life shocks on long-term socioeconomic attainment vary by genetic predisposition?

Motivation

- The prenatal environment has been shown to affect socioeconomic success (i.e., fetal origins hypothesis) (Barker, 1990; Almond et al., 2017)
- Not much is known about 1) the effects of early-life conditions on later life well-being; and 2) whether genetic diversity moderates adverse early-life conditions.

Project Overview

- Investigate long-term impact of early-life exposure to employment shocks from the **Great Depression**
- Exploit the state- and year-level variation in economic conditions during the 1930s
- Link state-level data on employment to 1) genotype data, and 2) longitudinal panel data on late-life economic outcomes for birth cohorts born between 1929 and 1940

Data, Sample, & Outcome Measure

Data

- Health and Retirement Study (HRS):** economic & genotype data
- Wallis (1989):** Data on manufacturing and nonmanufacturing employment at the state level → link to HRS by year and state of birth
- Polygenic score:** Educational attainment (Okbay et al., 2017)

Sample

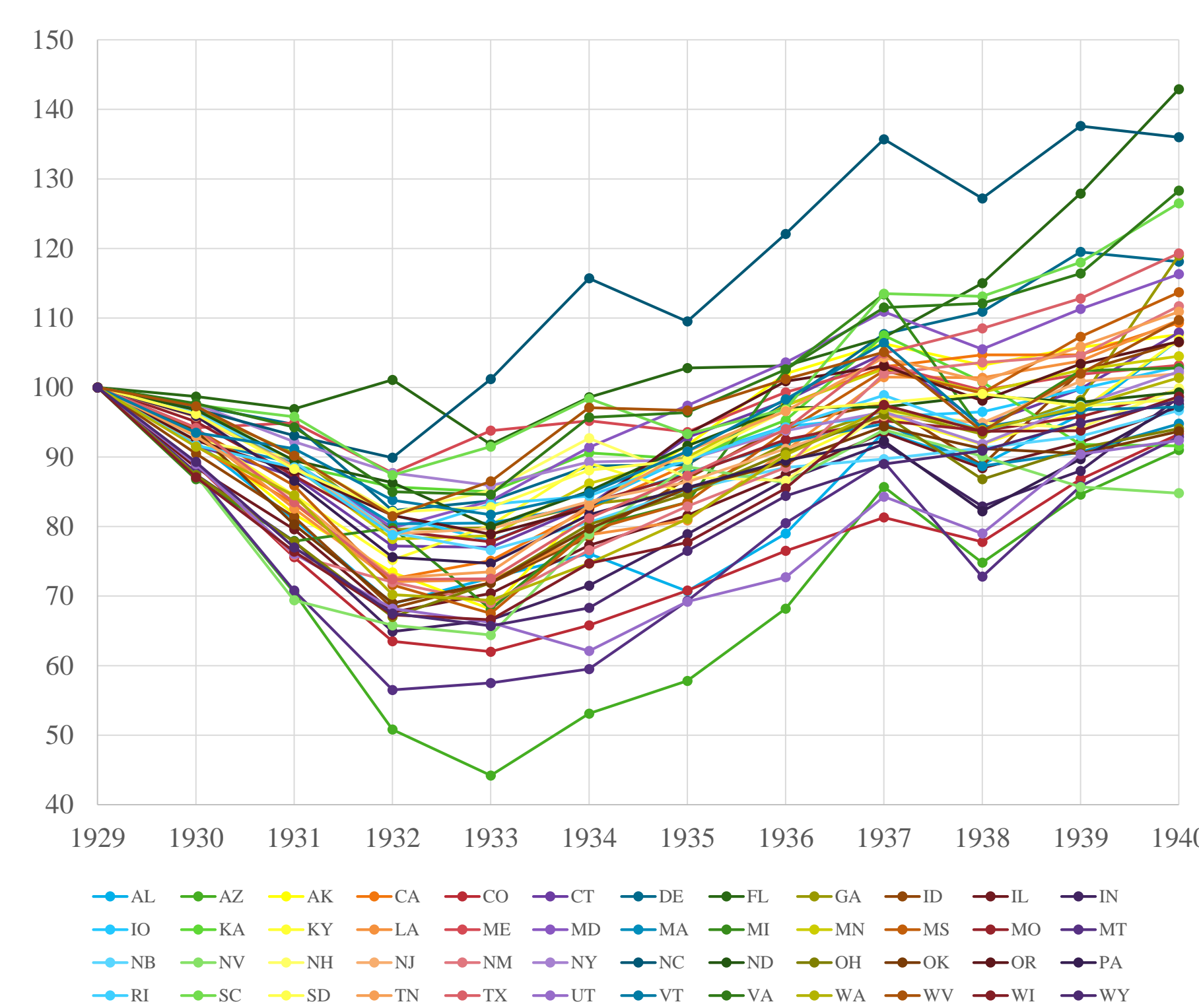
- European ancestry individuals born between 1930 and 1940 who are between the ages of 50 and 65 in the HRS
- Total person-year observations: **Men: N=7,150; Women: N=8,707**

Main Outcome: Economic Well-being Index

Take average across three components:

- Education (1=GED/HS degree; 0=no degree)
- Standardized household income (\$2010s)
- Standardized household wealth (\$2010s)

Employment index by state: 1929-1940 (1929 = 100)



Considerable variation in employment across states during the Great Depression and New Deal.

Source: Wallis (1989)

Empirical G x E Model

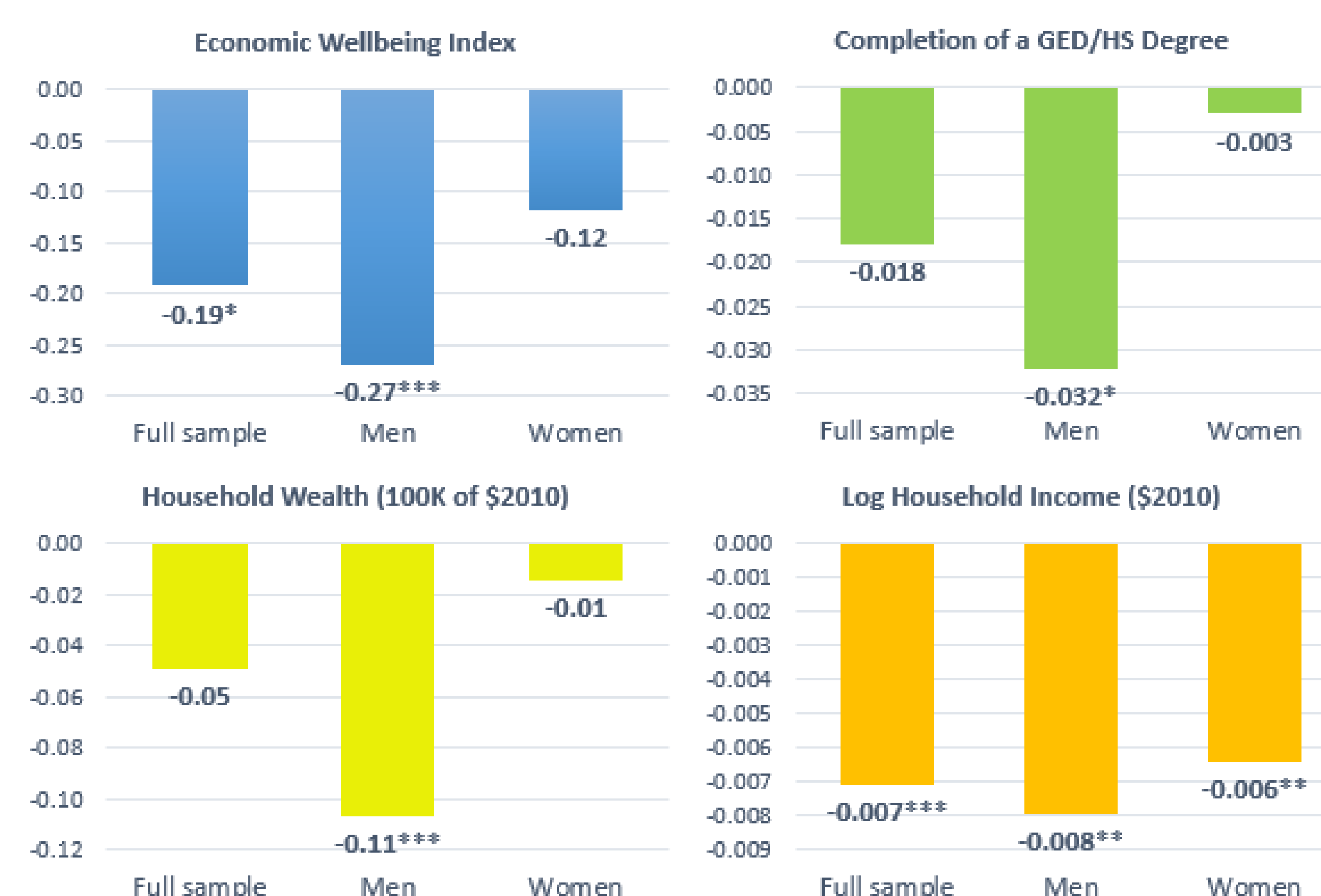
Differences-in-differences G x E specification

$$Y_{isrct} = \delta \text{EMPLOYMENT}_{st} + \gamma \text{EMPLOYMENT}_{st}^2 + \Omega \text{EMPLOYMENT}_{st} * \text{PGS}_i + \beta \text{PGS}_i + X_i' \beta + \theta_s + \eta_c + \lambda_t + u_{(r*c)} + \varepsilon_{isrct}$$

- Where Y is the outcome of individual i born in state s in region r in year c and observed in the HRS in year t
- EMPLOYMENT and EMPLOYMENT^2 : linear and quadratic terms of the aggregate employment index
- PGS_i : educational attainment polygenic score for individual i
- X_i : individual characteristics including sex, age, age², mother's and father's education, first 10 PCs of genetic data, and PCs interacted with the employment index
- θ_s and η_c : state and year of birth fixed effects; λ_t : year of HRS interview fixed effects; $u_{(r*c)}$: region of birth*year of birth fixed effects; ε_{isrct} : random error term clustered at the state of birth level
- All models are estimated using the HRS sample weights

Results: Main Effects

Percent change in economic outcomes after age 50 from a one unit decrease in the state employment index in early life

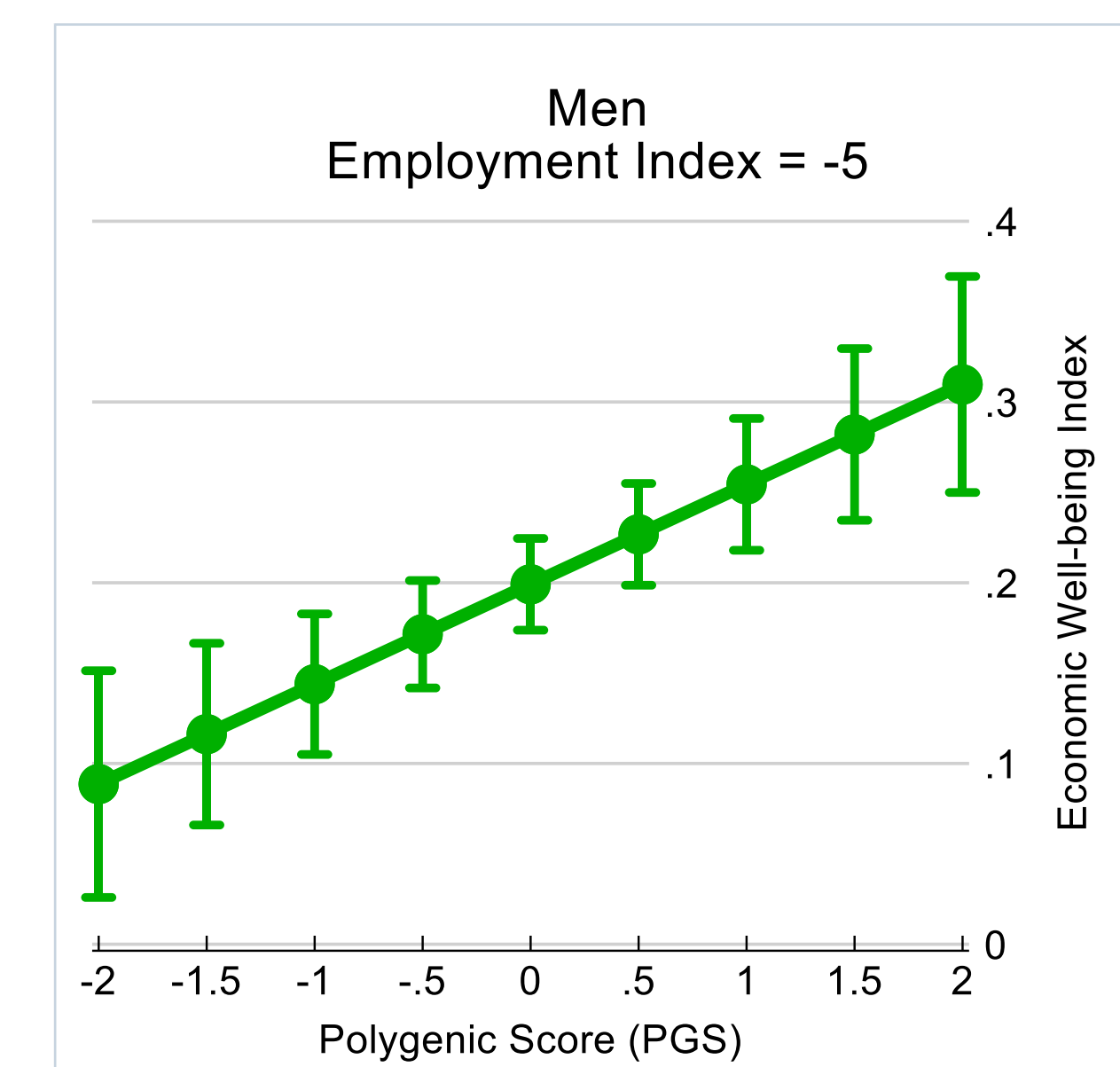


Source: Authors' calculations from the Health and Retirement Study using state employment data from Wallis (1989). ***p < .01; **p < .05; *p < .10

Results: G x E

Regression Results:
Economic Well-being Index

	Men	Women
Employment Index	0.048*** [0.012]	0.014 [0.018]
Employment Index ²	-0.00023*** [0.00006]	-0.00007 [0.00009]
PGS	0.044*** [0.014]	0.063*** [0.011]
Employment Index × PGS	-0.0027*** [0.0009]	-0.0002 [0.0008]
N	7,150	8,707
R-squared	0.24	0.24



- Significant negative G x E in men → Degree of substitutability between the environment and the PGS.

Next Steps

- Examine health outcomes linked to prenatal maternal stress and economic deprivation**
 - Cognition, depression, and anxiety
- Investigate potential mechanisms using historical data:**
 - Access to adequate nutrition for pregnant mothers
 - Data from Census of Agriculture (1924-1939) → Access to eggs (source of iodine and folate), vegetables, meat, grains
 - Increases in poor health behaviors or worsening health conditions
 - Data on infant/adult mortality & stillbirths from the CDC (1929-1940)
 - Childhood SES and maternal investment (self-reported HRS data)

Acknowledgements

Funding: Marshall Weinberg Endowment, University of Michigan (Duque & Schmitz); NIA pilot grant to the Michigan Center for the Demography of Aging [P30 AG012846] (Schmitz); NIA K99 award [K99 AG056599] (Schmitz). Analysis in the HRS is covered by University of Michigan IRB approval HUM00122253.