

Classmate Moderation of Genetic Effects on Educational Outcomes¹

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Extended Abstract

Introduction

This paper explores genetic and environmental sources of educational attainments. I build on work by Fletcher (2018) that showed interactions between (state-level) contextual measures of educational mobility and genetic penetrance of polygenic scores for education as well as work by Trejo et al. (2018) that explored school-level moderators of genetic penetrance of educational outcomes. The question of interest is whether contextual measures of social mobility may decouple genetic endowments from eventual outcomes (lowering genetic penetrance). A second questions revolve around whether we can pinpoint mechanisms of the decoupling using the richness of the Add Health data.

Data and Analysis

¹ This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (<http://www.cpc.unc.edu/addhealth>). No direct support was received from grant P01-HD31921 for this analysis.

The paper uses Add Health data, especially leveraging the clustered nature of the respondents within schools, the availability of respondents in different grades in the same school, the longitudinal follow ups that measure completed schooling, and the genotyping of respondents. I construct school-cohort level measures of educational mobility by estimating rank-rank correlations in child-parent levels of education for all classmates (excluding the individual) for each school and cohort. The presence of multiple grades in each school allows a high-school fixed effect approach that controls for a large set of contextual confounders and also selection into school environments (reducing concerns of gene-environment correlation). I use polygenic scores (PGS) for education from Okbay et al. (2016) and Lee et al. (2018) to measure genetic endowments related to educational attainments. I measure educational attainment at Wave 4.

Results

Like Fletcher (2018), I find that environments of more fluid social mobility appear to decouple genetic endowments from eventual educational attainments. Table 2, Column 2 presents these preliminary results. I then further leverage the Add Health data to analyze some of the possible explanations for this decoupling by examining the extent to which these gene-environment interactions are linked with school performance, course taking patterns, and other educational outcomes. Table 2, Column 3 shows a preliminary analysis that shows the possibility of gene-environment interactions predicting test score outcomes during high school.

Tables

Table 1
Selected Summary Statistics
Add Health Sample, White Students

Variable	Obs	Mean	Std Dev	Min	Max
Education	9,941	14.3	2.1	8.0	21.0
Mobility	8,514	0.7	0.2	0.2	1.0
Grade (W1)	9,720	9.6	1.6	7.0	12.0
Male	9,941	0.5	0.5	0.0	1.0
Education-PGS	6,240	0.0	1.0	-4.1	3.4

Table 2
Effects of School-Grade Mobility and Education-PGS on Education Outcomes
Main Effects and Gene-Environment Interactions

Outcome	Education	Education	PVT Score
Sample	White	White	White
Fixed Effects	School	School	School
Mobility	0.088 (0.184)	0.093 (0.180)	1.385 (1.010)
PGS	0.475*** (0.024)	0.707*** (0.076)	3.203*** (0.520)
Interaction		-0.356*** (0.111)	-1.142 (0.799)
7th Grade	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
8th Grade	-0.007 (0.095)	-0.005 (0.095)	1.053* (0.614)
9th Grade	-0.083 (0.162)	-0.085 (0.163)	2.717*** (0.786)
10th Grade	0.061 (0.161)	0.057 (0.160)	3.327*** (0.824)
11th Grade	0.279* (0.164)	0.272 (0.164)	3.552*** (0.755)
12th Grade	0.324* (0.182)	0.320* (0.180)	4.119*** (0.809)
Male	-0.483*** (0.050)	-0.483*** (0.050)	1.586*** (0.310)
Constant	14.363*** (0.162)	14.360*** (0.163)	100.080*** (0.848)
Observations	5,333	5,333	5,119
R-squared	0.215	0.216	0.184
Robust standard errors in parentheses			

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