**Supplementary Materials**

*Conceptual Model*

The educational moderation of interest manifests statistically as interactions between the effects of children’s social origins (parent attainment) and their education on their long-term attainment. Figure S1 uses the OED (origin-education-destination) triangle (see Goldthorpe 2014) to illustrate potential sources of these interactions. The solid black arrows decompose the total intergenerational effect into a direct effect and an indirect effect mediated by education. *U* represents confounders of schooling effects—things that affect schooling and child attainment, captured by solid gray arrows from *U* to *E* and *D*. When ignored, *U* will bias estimates of education effects and the corresponding indirect intergenerational effects; it will also bias direct effects by inducing a spurious association between *O* and *U* when conditioning on education, known as endogenous selection or collider variable bias (Elwert and Winship 2014; Zhou 2019).

My modification of the OED triangle is the addition of arrows to clarify sources of origin-by-education interaction. The black dotted arrows represent two causal reasons why direct intergenerational associations may vary with education: socioeconomic background may alter schooling’s effects on attainment (path 1a), or schooling may alter direct background effects on attainment (path 1b). The gray dotted arrows represent spurious reasons for intergenerational associations to vary with education, all related to education’s role as a selector; that is, individuals select or are selected into education systematically with respect to qualities that represent confounders here. One possibility is differential selection, which occurs when confounders’ effects on schooling depend on one’s social background (path 2a), or when background effects on schooling depend on confounders (path 2b). Another is that these confounders’ long-term effects on socioeconomic attainment depend on social background (path 3a), or that the confounders alter direct background effects on attainment (path 3b). Theory and evidence regarding these various paths are discussed in the main text.

*Gender-Specific Results and Control Variables*

 Tables S1 and S2 summarize the PSID and NLSY gender-specific elasticity estimates that are presented in Figure 4 of the main text. Table S3 summarizes estimates for selected control variables, based on the NLS-W model with controls and the gender-pooled NLSY and PSID models with controls and family FEs. These results are discussed in the main text.

*Parent Income Estimates*

Figure S2 plots each individual’s adjusted parent log-income estimate (posterior mean of true parent income predicted from the first stage of the Bayesian analysis) against the mean of available observations, with a solid diagonal line showing a perfect linear relationship and a dashed line showing a linear fit to the data. The size of the points is proportional to the uncertainty (posterior standard deviation) of the adjusted estimates. The correlations between these estimates are high (over 0.95 in all cases), but the linear relations are flatter than the diagonals, indicating shrinkage toward the means in the adjusted estimates. This shrinkage is driven by imprecise estimates, especially by individuals with high or low averages based on only a few measures; the more uncertainty in the estimate, the more shrinkage. Not surprisingly, there is more uncertainty and more shrinkage in the NLS-W and NLSY than in the PSID.

*Influence of Measurement Error*

Figure S3 summarizes results from intergenerational family income analyses intended to replicate the findings in Figure 4 but without adjusting for measurement error in parent family income, which is measured using the average of available observations. The baseline and control specifications are fit as random-effects models via maximum likelihood; the fixed-effects specification is fit via OLS; both use multiple imputation for missing covariates. Compared to findings from the preferred analyses (Figure 4), these estimates tend to reveal less variation in elasticities across education levels, slightly lower elasticities among high school dropouts, and more evidence of an uptick in elasticities between the bachelor’s and graduate degree-levels. This suggests differential attenuation bias due to measurement error may distort evidence of educational moderation; specifically, it may suppress the equalizing effects of high school completion and contribute to a spurious pattern of reduced mobility at post-baccalaureate levels.

*Parental Education and Occupational Status*

Additional analyses summarized in Figures S4 and S5 replicate the intergenerational models predicting total family log-income, but they replace parent income with parent education or occupational status. For parent education, I use the highest level completed by either parent and assign the same five categories listed for children, but I treat parent education as continuous for simplicity. For occupational status, I use the Duncan SEI score (rescaled in 20-point units) for the highest-status occupation of either parent during adolescence; this is unavailable in the PSID.

These intergenerational effects are weaker than the parent income effects. This is not surprising given that these parent attainment measures do not account for the combined effects of both parents’ status or for income differences within education and occupation groups. The most rigorous efforts to address selection suggest very minor differences in intergenerational effects across schooling levels, with no evidence of equalization. The most notable difference from the family income elasticity analyses is the absence of relatively strong parent education or occupational status effects among high school dropouts. This suggests direct transmissions among the least educated individuals may depend on familial income-based resources not captured by cruder socioeconomic measures.

*Age Restrictions*

Figure S6 compares findings from the NLS-W and gender-pooled NLSY samples to a replication when limited to individuals surveyed at ages 14 to 17. This ensures the controls are not endogenous to educational attainment. There are insufficient observations to replicate the family fixed-effects analysis. The findings are very similar regardless of age restrictions, indicating that the findings reported in the main text are robust to concerns about the endogeneity of controls.

*Comparisons to Torche (2011)*

Here I revisit the differences between my findings and those of Torche (2011) in the NLSY and PSID. My preferred analytic samples use more recent data than Torche’s, and thus they incorporate more adult income data in both sources and add several additional cohorts in the PSID. Unlike Torche, I exclude the PSID’s SEO oversample of low-income families (see note 3 in the main text), and I include parent income data throughout childhood, whereas Torche only included adolescent measures. Torche also dropped PSID cases with fewer than three parent income measures; I incorporate them but adjust for measurement error. Finally, Torche measured parent and child income by averaging available measures during adolescence (14 to 22) and adulthood (38 to 42), respectively, whereas I include all time-specific parent (ages 1 to 18) and child (30+) measures in a multilevel model.

The advantages of my sample construction are that I include updated data, more child income observations during adulthood, and more parent income measures throughout childhood in the PSID, and I exclude fewer cases due to insufficient parent income measures (I only drop cases with no observations). This allows my analysis to yield more precise parent income estimates, to adjust for error in those estimates, and to adjust for educational selection, with less risk of sample selection bias. Nonetheless, to the extent that findings differ, it is useful to explore why. I first attempted to reconstruct Torche’s sample and replicate her variable construction. I was unable to reconstruct the sample exactly. Torche no longer has the data or code from her study, but she graciously offered guidance that helped me come close. Table S4 shows the educational distributions in her original sample and my attempted replication.

Next I attempted to replicate Torche’s family income elasticity patterns. Using my pseudo-replication sample, and treating the data as Torche did, I started with baseline models comparable to hers that do not address selection or measurement error (random-effects models fit via MLE). The findings are illustrated in Figure S7 alongside Torche’s estimates (obtained from Table 5 in Torche 2011). My baseline model closely replicates Torche’s trends in elasticities among NLSY women and PSID men; there are modest discrepancies for the other samples. The main discrepancy in the NLSY male sample is Torche’s higher elasticity among high school dropouts; the main discrepancy in the PSID female sample is Torche’s lower elasticity among high school dropouts. Less importantly, but perhaps also of interest, I supplemented this analysis with controls for observed confounders and family fixed effects; this adjusts for selection but not for measurement error. The adjustments for observed controls make little difference here, leaving patterns similar to the baseline analyses. Torche did not report gender-pooled analyses, but I incorporated family FEs into a pooled analysis. These analyses reveal a steady increase in elasticities across education levels in the PSID and M-shaped fluctuation in the NLSY.

I then took the sample of observations (persons and years) from the attempted Torche replication and treated the data and analyses exactly as I did in the manuscript—a person-year dataset of all income measures, with a two-stage analysis using hierarchical Bayesian models to adjust for measurement error and educational selection. Figure S8 illustrates the results, again alongside Torche’s. In both surveys, I obtain findings fairly similar to those reported in the main text (Figure 4). The main differences are slightly lower (but still high) elasticities among high school dropouts and slightly higher elasticities among bachelor’s degree recipients. Relative to the baseline model—which in this case adjusts for measurement error—controls tend to mitigate any patterns of equalization beyond high school completion. The pooled FE analyses, which do the most to adjust for selection, reveal no evidence of a general trend of equalization, no evidence that elasticities are especially weak among bachelor’s degree-holders, and no evidence that elasticities are especially strong among graduate degree-holders. Moreover, compared to the aforementioned analyses that did not adjust for measurement error, these FE models reveal relatively strong elasticities among high school dropouts, just as they did in the analyses with my preferred samples.

To summarize, I was unable to exactly replicate Torche’s sample or elasticity estimates, but I came reasonably close. When subjecting the pseudo-replication sample to my full analysis, I find no evidence to support the equalization hypothesis, and I find patterns broadly consistent with those reported for my main analytic samples. Consequently, I am confident that the main differences in my findings and Torche’s (2011) are due to the treatment of data rather than differences in case selection. In general terms, Torche found a U-shaped pattern, with the lowest elasticities in the middle of the educational distribution. Accounting for measurement error and educational selection accentuates the higher elasticities she found among the least educated, but it weakens the differences in elasticities beyond high school completion.

**References**

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Torche, Florencia. 2011. “Is a College Degree Still the Great Equalizer? Intergenerational Mobility across Levels of Schooling in the United States.” *American Journal of Sociology* 117(3):763–807.

Zhou, Xiang. 2019. “Equalization or Selection? Reassessing the ‘Meritocratic Power’ of a College Degree in Intergenerational Income Mobility.” *American Sociological Review* 84(3):459–485.

**Table S1. Intergenerational Income Elasticity Estimates: PSID, by Gender**

|  |  |  |  |
| --- | --- | --- | --- |
|   | Males |   | Females |
|  | Baseline |  | + Controls |  | Baseline |  | + Controls |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Elasticities | Mean (𝛽) | SD (𝛽) |  | Mean (𝛽) | SD (𝛽) |  | Mean (𝛽) | SD (𝛽) |  | Mean (𝛽) | SD (𝛽) |
| < HS | 0.472 | 0.069 |  | 0.459 | 0.109 |  | 0.493 | 0.065 |  | 0.739 | 0.076 |
| HS | 0.293 | 0.103 |  | 0.240 | 0.139 |  | 0.220 | 0.094 |  | 0.333 | 0.130 |
| College | 0.257 | 0.062 |  | 0.255 | 0.120 |  | 0.257 | 0.051 |  | 0.479 | 0.071 |
| Bachelor’s | 0.321 | 0.069 |  | 0.372 | 0.130 |  | 0.273 | 0.069 |  | 0.431 | 0.090 |
| Graduate | 0.416 | 0.102 |  | 0.488 | 0.147 |  | 0.271 | 0.080 |  | 0.365 | 0.115 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Differences | Mean (∆𝛽) | P(∆𝛽<0) |  | Mean (∆𝛽) | P(∆𝛽<0) |  | Mean (∆𝛽) | P(∆𝛽<0) |  | Mean (∆𝛽) | P(∆𝛽<0) |
| HS – <HS | -0.179 | 0.943 |  | -0.219 | 0.975\* |  | -0.273 | 0.995\* |  | -0.406 | 1.000\* |
| College – <HS | -0.216 | 0.995\* |  | -0.204 | 0.990\* |  | -0.236 | 1.000\* |  | -0.260 | 0.999\* |
| Bachelor’s – <HS | -0.151 | 0.948 |  | -0.087 | 0.787 |  | -0.220 | 0.993\* |  | -0.308 | 1.000\* |
| Graduate – <HS | -0.056 | 0.673 |  | 0.030 | 0.443 |  | -0.222 | 0.988\* |  | -0.374 | 1.000\* |
| College – HS | -0.036 | 0.622 |  | 0.015 | 0.444 |  | 0.037 | 0.356 |  | 0.146 | 0.095 |
| Bachelor’s – HS | 0.028 | 0.411 |  | 0.133 | 0.150 |  | 0.053 | 0.325 |  | 0.098 | 0.203 |
| Graduate – HS | 0.123 | 0.194 |  | 0.249 | 0.041\* |  | 0.051 | 0.338 |  | 0.032 | 0.376 |
| Bachelor’s – College | 0.064 | 0.233 |  | 0.117 | 0.109 |  | 0.016 | 0.425 |  | -0.048 | 0.755 |
| Graduate – College | 0.159 | 0.086 |  | 0.233 | 0.026\* |  | 0.014 | 0.440 |  | -0.114 | 0.863 |
| Graduate – Bachelor’s | 0.095 | 0.211 |   | 0.116 | 0.184 |   | -0.002 | 0.504 |   | -0.066 | 0.763 |
| *Note:* Estimates correspond to posterior distributions of elasticity parameters. \*For educational differences, posterior probabilities above 0.95 are taken as evidence of declining elasticities; posterior probabilities below 0.05 are taken as evidence of increasing elasticities.  |

**Table S2. Intergenerational Income Elasticity Estimates: NLSY, by Gender**

|  |  |  |  |
| --- | --- | --- | --- |
|   | Males |   | Females |
|  | Baseline |  | + Controls |  | Baseline |  | + Controls |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Elasticities | Mean (𝛽) | SD (𝛽) |  | Mean (𝛽) | SD (𝛽) |  | Mean (𝛽) | SD (𝛽) |  | Mean (𝛽) | SD (𝛽) |
| < HS | 0.160 | 0.068 |  | -0.363 | 0.204 |  | 0.362 | 0.072 |  | 0.252 | 0.188 |
| HS | 0.280 | 0.041 |  | -0.215 | 0.203 |  | 0.397 | 0.042 |  | 0.277 | 0.180 |
| College | 0.215 | 0.055 |  | -0.249 | 0.216 |  | 0.230 | 0.046 |  | 0.225 | 0.189 |
| Bachelor’s | 0.224 | 0.068 |  | -0.130 | 0.227 |  | 0.211 | 0.058 |  | 0.194 | 0.198 |
| Graduate | 0.233 | 0.098 |  | -0.108 | 0.246 |  | 0.091 | 0.086 |  | 0.127 | 0.205 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Differences | Mean (∆𝛽) | P(∆𝛽<0) |  | Mean (∆𝛽) | P(∆𝛽<0) |  | Mean (∆𝛽) | P(∆𝛽<0) |  | Mean (∆𝛽) | P(∆𝛽<0) |
| HS – <HS | 0.119 | 0.061 |  | 0.147 | 0.033\* |  | 0.035 | 0.332 |  | 0.026 | 0.393 |
| College – <HS | 0.054 | 0.268 |  | 0.114 | 0.117 |  | -0.132 | 0.944 |  | -0.027 | 0.610 |
| Bachelor’s – <HS | 0.063 | 0.253 |  | 0.233 | 0.023\* |  | -0.150 | 0.955\* |  | -0.057 | 0.694 |
| Graduate – <HS | 0.073 | 0.273 |  | 0.255 | 0.036\* |  | -0.270 | 0.993\* |  | -0.124 | 0.828 |
| College – HS | -0.065 | 0.845 |  | -0.033 | 0.675 |  | -0.167 | 0.997\* |  | -0.052 | 0.797 |
| Bachelor’s – HS | -0.056 | 0.764 |  | 0.086 | 0.194 |  | -0.186 | 0.998\* |  | -0.083 | 0.841 |
| Graduate – HS | -0.046 | 0.670 |  | 0.108 | 0.197 |  | -0.306 | 1.000\* |  | -0.150 | 0.925 |
| Bachelor’s – College | 0.009 | 0.458 |  | 0.119 | 0.106 |  | -0.018 | 0.607 |  | -0.031 | 0.645 |
| Graduate – College | 0.019 | 0.439 |  | 0.141 | 0.123 |  | -0.138 | 0.925 |  | -0.098 | 0.833 |
| Graduate – Bachelor’s | 0.010 | 0.468 |   | 0.022 | 0.419 |   | -0.120 | 0.885 |   | -0.067 | 0.732 |
| *Note:* Estimates correspond to posterior distributions of elasticity parameters. \*For educational differences, posterior probabilities above 0.95 are taken as evidence of declining elasticities; posterior probabilities below 0.05 are taken as evidence of increasing elasticities.  |

**Table S3. Selected Control Variable Coefficients**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | NLS-W |   | NLSY |   | PSID |
|  | + Controls |  | + Family FE |  | + Family FE |
|   | Mean (𝛽) | SD (𝛽) |   | Mean (𝛽) | SD (𝛽) |   | Mean (𝛽) | SD (𝛽) |
| Black | -0.090 | 0.140 |  | -- | -- |  | -- | -- |
| × HS | -0.300\* | 0.150 |  | -0.170 | 0.140 |  | -0.280\* | 0.130 |
| × College | -0.130 | 0.160 |  | -0.010 | 0.150 |  | -0.090 | 0.120 |
| × Bachelor's | -0.230 | 0.170 |  | 0.090 | 0.180 |  | 0.020 | 0.160 |
| × Graduate | 0.150 | 0.220 |  | 0.260 | 0.240 |  | 0.160 | 0.230 |
| × Parent Income | -0.190 | 0.120 |  | 0.110 | 0.190 |  | 0.110 | 0.190 |
| Other | 0.210 | 0.420 |  | -- | -- |  | -- | -- |
| × HS | -0.270 | 0.680 |  | -0.090 | 0.130 |  | -0.740\* | 0.320 |
| × College | -0.040 | 0.450 |  | 0.050 | 0.150 |  | -0.380 | 0.260 |
| × Bachelor's | -0.400 | 0.570 |  | -0.150 | 0.190 |  | -0.240 | 0.320 |
| × Graduate | 0.270 | 0.640 |  | 0.040 | 0.230 |  | 0.040 | 0.420 |
| × Parent Income | -0.020 | 0.510 |  | -0.080 | 0.200 |  | -0.010 | 0.580 |
| Parent educ.: HS | 0.020 | 0.060 |  | -- | -- |  | -- | -- |
| × Parent Income | 0.110 | 0.110 |  | -0.040 | 0.090 |  | -0.190 | 0.180 |
| Parent educ.: College | 0.080 | 0.080 |  | -- | -- |  | -- | -- |
| × Parent Income | 0.040 | 0.160 |  | 0.120 | 0.160 |  | -0.040 | 0.200 |
| Parent educ.: Bachelor's | -0.170 | 0.130 |  | -- | -- |  | -- | -- |
| × Parent Income | 0.270 | 0.200 |  | 0.230 | 0.210 |  | -0.020 | 0.250 |
| Parent educ.: Graduate | -0.290 | 0.220 |  | -- | -- |  | -- | -- |
| × Parent Income | 0.520† | 0.300 |  | 0.080 | 0.330 |  | -0.050 | 0.270 |
| Cognitive skills | 0.100\* | 0.040 |  | 0.170\* | 0.040 |  | -- | -- |
| × Parent Income | -0.220\* | 0.060 |  | -0.120\* | 0.050 |  | -- | -- |
| Delinquency | -- | -- |  | -0.040 | 0.030 |  | -- | -- |
| × Parent Income | -- | -- |  | 0.010 | 0.040 |  | -- | -- |
| Siblings | -0.010 | 0.010 |  | -- | -- |  | -- | -- |
| × Parent Income | -0.020 | 0.020 |  | -0.020\* | 0.010 |  | -- | -- |
| Educational aspirations | 0.080\* | 0.020 |  | 0.000 | 0.020 |  | -- | -- |
| × Parent Income | 0.050† | 0.030 |  | 0.000 | 0.020 |  | -- | -- |
| Educational expectations | -- | -- |  | 0.010 | 0.020 |  | -- | -- |
| × Parent Income | -- | -- |  | 0.010 | 0.020 |  | -- | -- |
| Parent educ. aspirations | 0.020\* | 0.010 |  | -- | -- |  | -- | -- |
| × Parent Income | -0.040\* | 0.020 |  | -- | -- |  | -- | -- |
| Occupational aspirations | -0.070\* | 0.030 |  | -- | -- |  | -- | -- |
| × Parent Income | 0.020 | 0.050 |   | -- | -- |   | -- | -- |
| *Note:* Estimates are from posterior distributions of regression coefficients. Controls involving gender, age, and year of birth are included but not shown. \*|t-ratio|>1.96, †|t-ratio|>1.65. |

**Table S4. Educational Distributions in Torche (2011) and Attempted Replication**

|  |  |  |  |
| --- | --- | --- | --- |
|   | NLSY |   | PSID |
|   | Torche | Replication |   | Torche | Replication |
| Males |  |  |  |  |  |
| Total *N* | 2,171 | 2,075 |  | 1,065 | 1,192 |
| % < HS | 24.9 | 16.0 |  | 11.1 | 11.1 |
| % HS | 36.1 | 42.6 |  | 40.8 | 33.3 |
| % College | 19.9 | 22.5 |  | 26.9 | 31.2 |
| % Bachelor’s | 13.7 | 13.5 |  | 18.3 | 20.2 |
| % Graduate | 5.4 | 5.3 |  | 2.9 | 4.2 |
| Females |  |  |  |  |  |
| Total *N* | 2,093 | 1,994 |  | 1,476 | 1,418 |
| % < HS | 16.6 | 10.6 |  | 8.4 | 7.5 |
| % HS | 36.8 | 38.3 |  | 39.3 | 31.7 |
| % College | 26.6 | 30.4 |  | 33.1 | 38.4 |
| % Bachelor’s | 13.8 | 14.5 |  | 15.8 | 16.2 |
| % Graduate | 6.2 | 6.1 |   | 3.5 | 6.1 |

**Figure S1. Conceptual Model.** O refers to parent attainment (origins), D to socioeconomic outcomes (destinations), E to educational attainment, and U to confounders. Solid black arrows show direct and indirect intergenerational associations, and solid gray arrows show confounding of education effects. Dotted arrows show causal (black) and spurious (gray) sources of origin-by-education interactions.



**Figure S2. Comparison of Adjusted and Average Parent Income.** Points represent the means of the posterior distributions of adjusted parent log-income (*y*-axis) and the average of available parent log-income measures (*x*-axis); both are centered around their sample means. Point sizes are proportional to the uncertainty in the adjusted estimates (the standard deviations of their posterior distributions). The gray diagonal corresponds to perfect relationship; the dashed line corresponds to linear fit.



**Figure S3. Intergenerational Elasticity Estimates without Measurement Error Adjustments.** Results based on specifications analogous to those summarized in Figure 4, but using the average of available parent income measures without further adjustments for measurement error. The random-effects models are fit via MLE and the fixed-effects models are fit via OLS.



**Figure S4. Parent Education Effects with Controls for Selection.** Results based on three Bayesian hierarchical models: the baseline specification, one with additional controls for confounding, and one with family fixed effects (gender pooled analyses only). Elasticities are re-centered around the baseline estimates for high school completion to facilitate comparison. Parent education (five categories) treated as continuous.



**Figure S5. Parent Occupation Effects with Controls for Selection.** Results based on three Bayesian hierarchical models: the baseline specification, one with additional controls for confounding, and one with family fixed effects (gender pooled analyses only). Elasticities are re-centered around the baseline estimates for high school completion to facilitate comparison. Parent occupational status is rescaled to 20-point units (0 to 5).



**Figure S6. Sensitivity to Age at Survey.** Elasticities presented from the baseline and control models for the NLS-W and NLSY cases who were 14 to 17 at the time at which controls were measured, presented alongside estimates from the full samples (All). All estimates come from Bayesian models that adjust for measurement error in parent income.



**Figure S7. Intergenerational Elasticity Estimates, Torche Replication Sample, without Measurement Error Adjustments.** Torche estimates are from her original article (Torche 2011, Table 5). Based on specifications analogous to those summarized in Figure 4, but using the average of available parent income measures without further adjustments for measurement error. The baseline and control estimates are from random-effects models fit via MLE, and the fixed-effects estimates are from models fit via OLS.



**Figure S8. Intergenerational Elasticity Estimates, Torche Replication Sample, Adjusted for Measurement Error.** Torche estimates are from her original article (Torche 2011, Table 5). Other results are based on three Bayesian hierarchical models of a sample intended to approximate Torche’s: the baseline specification, one with controls for confounding, and one with controls and family fixed effects (gender pooled analyses only). Elasticities are re-centered around the baseline estimates for high school education to facilitate comparison.

