

Supplementary Table 1

Parameter Estimates from Path Models Examining Social Genetic Effects on Educational Attainment in a Subsample of Individuals Aged 25 or older

| Paths  | Father Model |      |         |        | Mother Model |     |         |        |
|--|--------------|------|---------|--------|--------------|-----|---------|--------|
|  | B            | SE   | $\beta$ | p      | B            | SE  | $\beta$ | p      |
| <b>Social Genetic Effects Models (n = 2,738, Figure 1)</b>   |              |      |         |        |              |     |         |        |
| P Edu-GPS → O Educational Attainment   | .31          | .06  | .14     | < .001 | .14          | .06 | .07     | .03    |
| O Edu-GPS → O Educational Attainment   | .57          | .06  | .26     | < .001 | .68          | .05 | .31     | < .001 |
| P Edu-GPS → O Edu-GPS  | .55          | .02  | .55     | < .001 | .57          | .02 | .58     | < .001 |
| <b>Social Genetic Effects via Parental Education and Income Models (n = 2,738, Figure 2)</b>           |              |      |         |        |              |     |         |        |
| P Edu-GPS → O Educational Attainment   | .08          | .06  | .04     | .17    | .05          | .06 | .02     | .42    |
| O Edu-GPS → O Educational Attainment   | .48          | .05  | .22     | < .001 | .53          | .05 | .25     | < .001 |
| P Edu-GPS → O Edu-GPS  | .55          | .02  | .55     | < .001 | .57          | .02 | .58     | < .001 |
| P Edu-GPS → P Educational Attainment   | .99          | .12  | .35     | < .001 | .62          | .08 | .27     | < .001 |
| P Edu-GPS → P Income   | .46          | .07  | .22     | < .001 | .22          | .07 | .11     | .002   |
| P Educational Attainment → O Educational Attainment  | .21          | .02  | .27     | < .001 | .23          | .03 | .26     | < .001 |
| P Income → O Educational Attainment  | .19          | .03  | .18     | < .001 | .19          | .03 | .18     | < .001 |
| <b>Social Genetic Effects via Parental Education, Income, and Parenting Models (n = 202, Figure 3)</b> |              |      |         |        |              |     |         |        |
| P Edu-GPS → O Educational Attainment   | .27          | .16  | .16     | .10    | .13          | .13 | .07     | .34    |
| O Edu-GPS → O Educational Attainment   | .16          | .15  | .09     | .30    | .25          | .12 | .15     | .03    |
| P Edu-GPS → O Edu-GPS  | .65          | .07  | .64     | < .001 | .58          | .07 | .54     | < .001 |
| P Edu-GPS → P Educational Attainment   | .82          | .21  | .38     | < .001 | .58          | .21 | .26     | .01    |
| P Edu-GPS → P Income   | .31          | .18  | .15     | .09    | .04          | .15 | .02     | .79    |
| P Educational Attainment → O Educational Attainment  | .14          | .07  | .18     | .03    | .15          | .06 | .19     | .01    |
| P Income → O Educational Attainment  | .28          | .07  | .33     | < .001 | .17          | .06 | .19     | .004   |
| P Edu-GPS → P Bonding  | 1.32         | .78  | .17     | .09    | -.92         | .78 | -.12    | .24    |
| O Edu-GPS → P Bonding  | -.57         | 1.00 | -.07    | .57    | .85          | .93 | .11     | .36    |
| P Educational Attainment → P Bonding   | .10          | .34  | .03     | .77    | .95          | .40 | .27     | .02    |
| P Income → P Bonding   | .07          | .36  | .02     | .86    | .36          | .33 | .09     | .27    |

|                                      |     |     |     |     |     |     |     |      |
|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|------|
| P Bonding → O Educational Attainment | .02 | .02 | .07 | .42 | .05 | .02 | .24 | .003 |
|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|------|

*Note.* P = parent; O = offspring; Edu-GPS = educational attainment genome-wide polygenic scores. All models controlled for offspring sex, age at last interview, and cohort and accounted for family clustering.

Supplementary Table 2

Parameter Estimates from Path Models Examining Social Genetic Effects on Educational Attainment: Father and Mother Combined Model

|   | B    | SE  | $\beta$ | p     |
|---|------|-----|---------|-------|
| <b>Social Genetic Effects Model (n = 4,089)</b>   |      |     |         |       |
| F Edu-GPS → O Educational Attainment  | .38  | .05 | .18     | <.001 |
| M Edu-GPS → O Educational Attainment  | .22  | .05 | .10     | <.001 |
| O Edu-GPS → O Educational Attainment  | .34  | .05 | .16     | <.001 |
| F Edu-GPS → O Edu-GPS   | .47  | .01 | .48     | <.001 |
| M Edu-GPS → O Edu-GPS   | .49  | .01 | .50     | <.001 |
| <b>Social Genetic Effects via Parental Education and Income Model (n = 4,089)</b>           |      |     |         |       |
| F Edu-GPS → O Educational Attainment  | .12  | .05 | .06     | .01   |
| M Edu-GPS → O Educational Attainment  | .10  | .05 | .05     | .04   |
| O Edu-GPS → O Educational Attainment  | .29  | .05 | .14     | <.001 |
| F Edu-GPS → O Edu-GPS   | .47  | .01 | .48     | <.001 |
| M Edu-GPS → O Edu-GPS   | .49  | .01 | .50     | <.001 |
| F Edu-GPS → F Educational Attainment  | .77  | .08 | .29     | <.001 |
| F Edu-GPS → F Income  | .31  | .06 | .15     | <.001 |
| M Edu-GPS → M Educational Attainment  | .54  | .07 | .24     | <.001 |
| M Edu-GPS → M Income  | .18  | .05 | .09     | <.001 |
| F Educational Attainment → O Educational Attainment   | .15  | .02 | .19     | <.001 |
| F Income → O Educational Attainment   | .13  | .03 | .13     | <.001 |
| M Educational Attainment → O Educational Attainment   | .15  | .02 | .17     | <.001 |
| M Income → O Educational Attainment   | .08  | .03 | .08     | .003  |
| <b>Social Genetic Effects via Parental Education, Income, and Parenting Model (n = 642)</b> |      |     |         |       |
| P Edu-GPS → O Educational Attainment  | .18  | .09 | .09     | .06   |
| O Edu-GPS → O Educational Attainment  | .19  | .08 | .10     | .02   |
| P Edu-GPS → O Edu-GPS   | .67  | .04 | .65     | <.001 |
| P Edu-GPS → P Educational Attainment  | .66  | .12 | .32     | <.001 |
| P Edu-GPS → P Income  | .33  | .11 | .17     | .002  |
| P Educational Attainment → O Educational Attainment   | .15  | .04 | .15     | <.001 |
| P Income → O Educational Attainment   | .19  | .04 | .18     | <.001 |
| P Edu-GPS → P Bonding   | -.40 | .30 | -.07    | .18   |
| O Edu-GPS → P Bonding   | .56  | .31 | .10     | .07   |
| P Educational Attainment → P Bonding  | .32  | .15 | .11     | .04   |
| P Income → P Bonding  | .17  | .15 | .05     | .26   |
| P Bonding → O Educational Attainment  | .04  | .01 | .13     | <.001 |

*Note.* P = parent; F = father; M = mother; O = offspring; Edu-GPS = educational attainment genome-wide polygenic scores. All models controlled for offspring sex, age at last interview, and cohort and accounted for family clustering. For Figures 1-2 models, Edu-GPS, parental educational attainment, and income from both fathers and mothers were simultaneously included in the same model. For Figure 3 models, due to the small sample and reduced power, the combined model was conducted using the mean scores of parental Edu-GPS, parental educational attainment, parental income, and parental bonding.

Supplemental Table 3

*Path Models Examining Paternal Social Genetic Effects on Educational Attainment: Testing Sex Differences*

| Paths   | Male |     |         |       | Female |     |         |       | Wald test |     |
|---|------|-----|---------|-------|--------|-----|---------|-------|-----------|-----|
|   | B    | SE  | $\beta$ | p     | B      | SE  | $\beta$ | p     | $\chi^2$  | p   |
| <b>Social Genetic Effects Models (Figure 1)</b>   |      |     |         |       |        |     |         |       |           |     |
| F Edu-GPS $\rightarrow$ O Education   | .30  | .07 | .14     | <.001 | .37    | .07 | .17     | <.001 | .75       | .39 |
| O Edu-GPS $\rightarrow$ O Education   | .49  | .06 | .23     | <.001 | .49    | .06 | .23     | <.001 | .01       | .93 |
| F Edu-GPS $\rightarrow$ O Edu-GPS   | .55  | .02 | .56     | <.001 | .54    | .02 | .55     | <.001 | .22       | .64 |
| <b>Social Genetic Effects via Parental Education and Income Models (Figure 2)</b>             |      |     |         |       |        |     |         |       |           |     |
| F Edu-GPS $\rightarrow$ O Education   | .09  | .06 | .04     | .13   | .13    | .06 | .07     | .03   | .38       | .54 |
| O Edu-GPS $\rightarrow$ O Education   | .40  | .06 | .19     | <.001 | .41    | .06 | .19     | <.001 | .02       | .89 |
| F Edu-GPS $\rightarrow$ O Edu-GPS   | .55  | .02 | .56     | <.001 | .54    | .02 | .55     | <.001 | .13       | .72 |
| F Edu-GPS $\rightarrow$ F Education   | 1.01 | .11 | .37     | <.001 | .90    | .10 | .34     | <.001 | 1.67      | .20 |
| F Edu-GPS $\rightarrow$ F Income  | .42  | .07 | .20     | <.001 | .45    | .06 | .23     | <.001 | .18       | .67 |
| F Education $\rightarrow$ O Education   | .22  | .02 | .28     | <.001 | .20    | .02 | .25     | <.001 | .43       | .51 |
| F Income $\rightarrow$ O Education  | .16  | .03 | .16     | <.001 | .25    | .03 | .24     | <.001 | 5.23      | .02 |
| <b>Social Genetic Effects via Parental Education, Income, and Parenting Models (Figure 3)</b> |      |     |         |       |        |     |         |       |           |     |
| F Edu-GPS $\rightarrow$ O Education   | .40  | .14 | .20     | .005  | .08    | .15 | .04     | .62   | 2.50      | .11 |
| O Edu-GPS $\rightarrow$ O Education   | .14  | .11 | .08     | .20   | .27    | .13 | .13     | .04   | .53       | .47 |
| F Edu-GPS $\rightarrow$ O Edu-GPS   | .67  | .05 | .63     | <.001 | .57    | .06 | .57     | <.001 | 2.50      | .11 |
| F Edu-GPS $\rightarrow$ F Education   | .96  | .18 | .41     | <.001 | .54    | .17 | .26     | .001  | 3.75      | .05 |
| F Edu-GPS $\rightarrow$ F Income  | .34  | .13 | .18     | .01   | .22    | .13 | .14     | .09   | .55       | .46 |
| F Education $\rightarrow$ O Education   | .13  | .06 | .15     | .04   | .12    | .07 | .13     | .10   | .01       | .93 |
| F Income $\rightarrow$ O Education  | .22  | .05 | .21     | <.001 | .31    | .09 | .26     | .001  | .78       | .38 |
| F Edu-GPS $\rightarrow$ F Bonding   | -.24 | .68 | -.04    | .72   | .82    | .73 | .11     | .26   | 1.24      | .27 |
| O Edu-GPS $\rightarrow$ F Bonding   | .13  | .54 | .02     | .82   | -.19   | .74 | -.03    | .80   | .14       | .71 |
| F Education $\rightarrow$ F Bonding   | .43  | .22 | .15     | .049  | .16    | .32 | .05     | .61   | .56       | .45 |
| F Income $\rightarrow$ F Bonding  | -.05 | .27 | -.02    | .85   | -.14   | .38 | -.03    | .71   | .04       | .85 |
| F Bonding $\rightarrow$ O Education   | .02  | .01 | .07     | .12   | .04    | .02 | .13     | .02   | .50       | .48 |

*Note.* F = father; O = offspring; Edu-GPS = educational attainment genome-wide polygenic scores. All models controlled for age at last interview, and cohort and accounted for family clustering.

Supplemental Table 4

*Path Models Examining Maternal Social Genetic Effects on Educational Attainment: Testing Sex Differences*

| Paths   | Male |     |         |       | Female |     |         |       | Wald test |     |
|---|------|-----|---------|-------|--------|-----|---------|-------|-----------|-----|
|   | B    | SE  | $\beta$ | p     | B      | SE  | $\beta$ | p     | $\chi^2$  | p   |
| <b>Social Genetic Effects Models (Figure 1)</b>   |      |     |         |       |        |     |         |       |           |     |
| M Edu-GPS $\rightarrow$ O Education   | .10  | .07 | .05     | .11   | .17    | .07 | .08     | .01   | .79       | .37 |
| O Edu-GPS $\rightarrow$ O Education   | .65  | .06 | .30     | <.001 | .61    | .06 | .29     | <.001 | .30       | .58 |
| M Edu-GPS $\rightarrow$ O Edu-GPS   | .57  | .02 | .58     | <.001 | .56    | .02 | .56     | <.001 | .10       | .75 |
| <b>Social Genetic Effects via Parental Education and Income Models (Figure 2)</b>             |      |     |         |       |        |     |         |       |           |     |
| M Edu-GPS $\rightarrow$ O Education   | .01  | .06 | .00     | .91   | .07    | .06 | .03     | .26   | .61       | .43 |
| O Edu-GPS $\rightarrow$ O Education   | .49  | .06 | .23     | <.001 | .46    | .06 | .22     | <.001 | .26       | .61 |
| M Edu-GPS $\rightarrow$ O Edu-GPS   | .57  | .02 | .58     | <.001 | .57    | .02 | .56     | <.001 | .09       | .77 |
| M Edu-GPS $\rightarrow$ M Education   | .66  | .07 | .29     | <.001 | .62    | .08 | .26     | <.001 | .42       | .52 |
| M Edu-GPS $\rightarrow$ M Income  | .28  | .07 | .13     | <.001 | .27    | .07 | .13     | <.001 | .01       | .93 |
| M Education $\rightarrow$ O Edu   | .21  | .03 | .23     | <.001 | .24    | .03 | .26     | <.001 | .73       | .39 |
| M Income $\rightarrow$ O Education  | .20  | .03 | .20     | <.001 | .20    | .03 | .20     | <.001 | .04       | .83 |
| <b>Social Genetic Effects via Parental Education, Income, and Parenting Models (Figure 3)</b> |      |     |         |       |        |     |         |       |           |     |
| M Edu-GPS $\rightarrow$ O Education   | -.04 | .13 | -.02    | .74   | .08    | .13 | .04     | .52   | .46       | .50 |
| O Edu-GPS $\rightarrow$ O Education   | .37  | .11 | .20     | <.001 | .23    | .11 | .12     | .03   | .71       | .40 |
| M Edu-GPS $\rightarrow$ O Edu-GPS   | .63  | .04 | .59     | <.001 | .54    | .06 | .53     | <.001 | 1.54      | .21 |
| M Edu-GPS $\rightarrow$ M Education   | .63  | .17 | .28     | <.001 | .63    | .17 | .28     | <.001 | .00       | .99 |
| M Edu-GPS $\rightarrow$ M Income  | .21  | .14 | .10     | .13   | .40    | .15 | .20     | .007  | 1.64      | .20 |
| M Education $\rightarrow$ O Education   | .15  | .05 | .17     | .002  | .09    | .05 | .10     | .08   | .73       | .39 |
| M Income $\rightarrow$ O Education  | .20  | .05 | .20     | <.001 | .19    | .06 | .18     | .002  | .02       | .89 |
| M Edu-GPS $\rightarrow$ M Bonding   | -.80 | .41 | -.13    | .047  | -.39   | .54 | -.06    | .47   | .41       | .52 |
| O Edu-GPS $\rightarrow$ M Bonding   | .70  | .46 | .12     | .12   | .41    | .56 | .06     | .47   | .21       | .65 |
| M Education $\rightarrow$ M Bonding   | .53  | .21 | .19     | .01   | .54    | .25 | .17     | .03   | .00       | .98 |
| M Income $\rightarrow$ M Bonding  | .02  | .25 | .01     | .93   | .22    | .21 | .06     | .29   | .37       | .54 |
| M Bonding $\rightarrow$ O Education   | .04  | .01 | .13     | .001  | .05    | .02 | .17     | .001  | .16       | .69 |

*Note.* M = mother; O = offspring; Edu-GPS = educational attainment genome-wide polygenic scores. All models controlled for age at last interview, and cohort and accounted for family clustering.