

The Consequences of Academic Match between Students and Colleges

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Online Appendix

**Online Appendix Table A1: Starting Student Characteristics, NLSY-79**

|                                    | College Quality Quartile |           |     |     |            |
|------------------------------------|--------------------------|-----------|-----|-----|------------|
|                                    | Attendees                | 1, lowest | 2   | 3   | 4, highest |
| N                                  | 2,497                    | 813       | 608 | 618 | 458        |
| ASVAB 1 percentile                 | 49                       | 39        | 46  | 55  | 61         |
| <i>Additional ability measures</i> |                          |           |     |     |            |
| ASVAB 2 percentile                 | 49                       | 53        | 50  | 48  | 46         |
| High school GPA, percentile        | 47                       | 42        | 46  | 49  | 53         |
| SAT or ACT percentile              | 48                       | 35        | 47  | 52  | 64         |
| Any bad behaviors                  | 36%                      | 36%       | 35% | 36% | 39%        |
| Interviewer rated uncooperative    | 4%                       | 5%        | 4%  | 3%  | 4%         |
| Had sex before age 15              | 15%                      | 20%       | 13% | 13% | 12%        |
| <i>Demographics and family</i>     |                          |           |     |     |            |
| Male                               | 49%                      | 47%       | 52% | 48% | 51%        |
| White                              | 84%                      | 78%       | 87% | 89% | 86%        |
| Black                              | 12%                      | 18%       | 10% | 8%  | 9%         |
| Hispanic                           | 4%                       | 5%        | 3%  | 3%  | 5%         |
| Other non-white                    | 0%                       | 0%        | 0%  | 0%  | 0%         |
| Family income quartile 1           | 18%                      | 24%       | 18% | 15% | 12%        |
| Family income quartile 2           | 19%                      | 25%       | 17% | 15% | 17%        |
| Family income quartile 3           | 26%                      | 26%       | 28% | 25% | 24%        |
| Family income quartile 4           | 37%                      | 25%       | 36% | 45% | 47%        |
| Siblings                           | 2.8                      | 3.1       | 2.9 | 2.7 | 2.5        |
| No parent completed high school    | 8%                       | 13%       | 7%  | 6%  | 6%         |
| Parent grad. high sch.             | 33%                      | 38%       | 37% | 30% | 23%        |
| Parent some college                | 17%                      | 20%       | 17% | 19% | 13%        |
| Parent completed college           | 23%                      | 18%       | 23% | 24% | 28%        |
| Parent has grad. Degree            | 19%                      | 11%       | 14% | 22% | 30%        |
| <i>Neighborhood</i>                |                          |           |     |     |            |
| Northeast region                   | 23%                      | 8%        | 18% | 27% | 45%        |
| South region                       | 32%                      | 32%       | 40% | 34% | 15%        |
| Midwest region                     | 31%                      | 47%       | 25% | 24% | 26%        |
| West region                        | 14%                      | 12%       | 17% | 15% | 13%        |
| Rural                              | 19%                      | 25%       | 21% | 15% | 13%        |
| % Adults w/college deg. in county  | 11%                      | 10%       | 11% | 12% | 13%        |
| <i>Additional covariates</i>       |                          |           |     |     |            |
| Overweight                         | 11%                      | 15%       | 10% | 11% | 8%         |
| Obese                              | 3%                       | 3%        | 3%  | 1%  | 2%         |
| Religious observance per year      | 31                       | 36        | 31  | 30  | 26         |
| Count of enriching resources       | 2.6                      | 2.4       | 2.6 | 2.6 | 2.7        |
| Had contact with biological mother | 98%                      | 98%       | 98% | 98% | 97%        |
| Had contact with biological father | 96%                      | 96%       | 96% | 96% | 94%        |

Notes: This table describes the characteristics of students attending each college quality quartile. All statistics are weighted as described in text. Ability percentiles are among 4-year college starters, with the ASVAB measures adjusted by age when taking the test. Family, neighborhood, and additional characteristics are measured in the first 1979 survey. Parents' education is the maximum over resident parents. % of adults over the age of 25 in home county with a four-year college degree is taken from 1970 census.

**Online Appendix Table A2: Starting Student Characteristics, NLSY-97**

|                                    | College Quality Quartile |           |     |     |            |
|------------------------------------|--------------------------|-----------|-----|-----|------------|
|                                    | Attendees                | 1, lowest | 2   | 3   | 4, highest |
| N                                  | 2,071                    | 596       | 571 | 467 | 437        |
| ASVAB 1 percentile                 | 49                       | 35        | 46  | 54  | 66         |
| <i>Additional ability measures</i> |                          |           |     |     |            |
| ASVAB 2 percentile                 | 49                       | 49        | 50  | 48  | 52         |
| High school GPA, percentile        | 49                       | 39        | 47  | 52  | 61         |
| SAT or ACT percentile              | 48                       | 31        | 43  | 53  | 67         |
| Any bad behaviors                  | 42%                      | 48%       | 41% | 41% | 36%        |
| Interviewer rated uncooperative    | 37%                      | 42%       | 36% | 37% | 34%        |
| Had sex before age 15              | 9%                       | 14%       | 8%  | 8%  | 4%         |
| <i>Demographics and family</i>     |                          |           |     |     |            |
| Male                               | 45%                      | 46%       | 42% | 43% | 48%        |
| White                              | 78%                      | 79%       | 77% | 80% | 78%        |
| Black                              | 12%                      | 15%       | 15% | 11% | 7%         |
| Hispanic                           | 3%                       | 4%        | 3%  | 3%  | 3%         |
| Other non-white                    | 6%                       | 2%        | 5%  | 6%  | 12%        |
| Family income quartile 1           | 12%                      | 18%       | 11% | 7%  | 9%         |
| Family income quartile 2           | 21%                      | 27%       | 20% | 19% | 15%        |
| Family income quartile 3           | 29%                      | 29%       | 30% | 29% | 27%        |
| Family income quartile 4           | 39%                      | 25%       | 39% | 45% | 49%        |
| Siblings                           | 2.2                      | 2.3       | 2.2 | 2.1 | 2.2        |
| No parent completed high school    | 3%                       | 6%        | 3%  | 2%  | 2%         |
| Parent grad. high sch.             | 19%                      | 26%       | 22% | 15% | 10%        |
| Parent some college                | 26%                      | 30%       | 26% | 25% | 25%        |
| Parent completed college           | 26%                      | 20%       | 24% | 29% | 29%        |
| Parent has grad. Degree            | 26%                      | 18%       | 25% | 29% | 35%        |
| <i>Neighborhood</i>                |                          |           |     |     |            |
| Northeast region                   | 20%                      | 14%       | 16% | 21% | 32%        |
| South region                       | 31%                      | 33%       | 36% | 31% | 22%        |
| Midwest region                     | 32%                      | 36%       | 29% | 32% | 30%        |
| West region                        | 17%                      | 17%       | 19% | 16% | 16%        |
| Rural                              | 19%                      | 30%       | 15% | 20% | 10%        |
| % Adults w/college deg. in county  | 21%                      | 18%       | 20% | 22% | 23%        |
| <i>Additional covariates</i>       |                          |           |     |     |            |
| Overweight                         | 11%                      | 13%       | 11% | 10% | 8%         |
| Obese                              | 7%                       | 10%       | 7%  | 7%  | 4%         |
| Religious observance per year      | 15                       | 18        | 17  | 13  | 12         |
| Count of enriching resources       | 2.1                      | 1.9       | 2.1 | 2.2 | 2.3        |
| Had contact with biological mother | 99%                      | 100%      | 99% | 98% | 99%        |
| Had contact with biological father | 97%                      | 96%       | 97% | 98% | 97%        |

Notes: This table describes the characteristics of students attending each college quality quartile. All statistics are weighted as described in text. Ability percentiles are among 4-year college starters, with the ASVAB measures adjusted by age when taking the test. Family, neighborhood, and additional characteristics are measured in the first 1997 survey. Parents' education is the maximum over resident parents. % of adults over the age of 25 in home census district with a four-year college degree is taken from 1990 census.

**Online Appendix Table A3: Principal Components of the ASVAB**

|                          | NLSY-79          |                  | NLSY-97          |                  |
|--------------------------|------------------|------------------|------------------|------------------|
|                          | 1st<br>Component | 2nd<br>Component | 1st<br>Component | 2nd<br>Component |
| Eigenvalue               | 5.46             | 0.84             | 5.25             | 0.88             |
| Total variance explained | 0.68             | 0.10             | 0.66             | 0.11             |
| Eigenvectors:            |                  |                  |                  |                  |
| General Science          | 0.37             | -0.28            | 0.37             | -0.32            |
| Arithmetic Reasoning     | 0.37             | -0.17            | 0.38             | -0.05            |
| Word Knowledge           | 0.38             | -0.08            | 0.37             | -0.23            |
| Paragraph Comprehension  | 0.37             | 0.05             | 0.38             | -0.09            |
| Numerical Operations     | 0.33             | 0.51             | 0.31             | 0.55             |
| Coding Speed             | 0.30             | 0.63             | 0.28             | 0.62             |
| Mathematics Knowledge    | 0.37             | -0.10            | 0.38             | 0.09             |
| Mechanical Comprehension | 0.32             | -0.47            | 0.34             | -0.37            |

Notes: Following Altonji, Bharadwaj, and Lange (2011), we adjust scores on each test component the age of the respondent when they took the test by calculating age-specific percentiles and then assigning each student the score that corresponds to their percentile for 16 year olds.

**Online Appendix Table A4: Principal Components of the College Quality Proxies**

|                       | 1992 | 2008 |
|-----------------------|------|------|
| Eigenvalue            | 2.46 | 2.56 |
| Variance explained    | 61%  | 64%  |
| Eigenvectors:         |      |      |
| Mean SAT              | 0.56 | 0.55 |
| Rejection rate        | 0.47 | 0.46 |
| Faculty/Student ratio | 0.45 | 0.47 |
| Avg. faculty salaries | 0.51 | 0.52 |

Notes: Calculated from the set of four-year colleges in IPEDS in each year that report all four college quality proxies (1,157 institutions in 1992, 1,346 in 2008). In both years, quality measures that are missing in IPEDS are filled in where possible using data from U.S. News and World Report.

**Online Appendix Table A5: Effect of College Quality and Ability on College Outcomes, Quartile Dummies**

|                      | NLSY-79                    |                          | NLSY-97                    |                          |
|----------------------|----------------------------|--------------------------|----------------------------|--------------------------|
|                      | Graduate<br>within 6 years | Earnings,<br>10-11 years | Graduate<br>within 6 years | Earnings,<br>10-11 years |
| ASVAB q1, Quality q2 | 0.025<br>(0.049)           | 3,401<br>(2,243)         | 0.133*<br>(0.044)          | 5,862<br>(3,114)         |
| ASVAB q1, Quality q3 | 0.038<br>(0.056)           | 8,122*<br>(3,301)        | 0.162*<br>(0.054)          | -791<br>(2,929)          |
| ASVAB q1, Quality q4 | 0.178*<br>(0.069)          | -1,581<br>(3,233)        | 0.179*<br>(0.072)          | 10,566*<br>(5,112)       |
| ASVAB q2, Quality q1 | 0.119*<br>(0.050)          | 4,835<br>(2,517)         | 0.145*<br>(0.045)          | 8,278*<br>(2,547)        |
| ASVAB q2, Quality q2 | 0.199*<br>(0.052)          | 7,009*<br>(2,558)        | 0.220*<br>(0.044)          | 7,597*<br>(3,098)        |
| ASVAB q2, Quality q3 | 0.271*<br>(0.052)          | 8,708*<br>(2,674)        | 0.269*<br>(0.049)          | 7,884*<br>(3,343)        |
| ASVAB q2, Quality q4 | 0.271*<br>(0.061)          | 4,760<br>(3,398)         | 0.424*<br>(0.060)          | 10,966*<br>(3,642)       |
| ASVAB q3, Quality q1 | 0.173*<br>(0.055)          | 4,231<br>(2,381)         | 0.099<br>(0.053)           | 3,940<br>(3,720)         |
| ASVAB q3, Quality q2 | 0.200*<br>(0.056)          | 9,174*<br>(2,860)        | 0.283*<br>(0.046)          | 4,026<br>(2,774)         |
| ASVAB q3, Quality q3 | 0.309*<br>(0.051)          | 11,899*<br>(2,801)       | 0.325*<br>(0.046)          | 10,225*<br>(3,375)       |
| ASVAB q3, Quality q4 | 0.365*<br>(0.060)          | 11,054*<br>(3,346)       | 0.371*<br>(0.049)          | 17,048*<br>(3,909)       |
| ASVAB q4, Quality q1 | 0.367*<br>(0.066)          | 10,307*<br>(3,395)       | 0.278*<br>(0.061)          | 3,895<br>(3,152)         |
| ASVAB q4, Quality q2 | 0.398*<br>(0.060)          | 10,811*<br>(3,807)       | 0.328*<br>(0.051)          | 8,648*<br>(3,334)        |
| ASVAB q4, Quality q3 | 0.431*<br>(0.053)          | 10,893*<br>(3,030)       | 0.364*<br>(0.049)          | 15,162*<br>(3,851)       |
| ASVAB q4, Quality q4 | 0.442*<br>(0.054)          | 14,556*<br>(3,231)       | 0.487*<br>(0.044)          | 22,685*<br>(3,750)       |
| Observations         | 2,441                      | 2,228                    | 2,071                      | 1,732                    |
| R-squared            | 0.127                      | 0.145                    | 0.201                      | 0.138                    |
| Pr(constant slope)   | 0.782                      | 0.400                    | 0.702                      | 0.040                    |

Notes: Standard errors in parentheses. \* indicates that the estimated effect is statistically significant at 5%. The final row reports the p-statistic from a Wald test of whether the differences in the effects of adjacent quality quartiles are constant across ability quartiles (i.e.  $A2Q2-A2Q1 = A1Q2-A1Q1$ ).

**Online Appendix Table A6: Degree Attainment, Linear Probability Model**

|  |         | NLSY 79           |                   | NLSY 97           |                   |
|--|---------|-------------------|-------------------|-------------------|-------------------|
|  |         | Within 6<br>years | Within 4<br>years | Within 6<br>years | Within 4<br>years |
| $\partial\text{Outcome}/\partial A$            | Q = p25 | 0.503*<br>(0.059) | 0.276*<br>(0.054) | 0.312*<br>(0.060) | 0.155*<br>(0.056) |
|  | Q = p50 | 0.515*<br>(0.061) | 0.336*<br>(0.056) | 0.280*<br>(0.059) | 0.279*<br>(0.058) |
|  | Q = p75 | 0.481*<br>(0.062) | 0.388*<br>(0.054) | 0.312*<br>(0.062) | 0.365*<br>(0.065) |
| $\partial\text{Outcome}/\partial Q$            | A = p25 | 0.220*<br>(0.056) | 0.031<br>(0.046)  | 0.344*<br>(0.058) | 0.238*<br>(0.060) |
|  | A = p50 | 0.274*<br>(0.063) | 0.105<br>(0.056)  | 0.376*<br>(0.056) | 0.352*<br>(0.057) |
|  | A = p75 | 0.211*<br>(0.063) | 0.144*<br>(0.059) | 0.330*<br>(0.062) | 0.455*<br>(0.060) |
| Observations                                   |         | 2,441             | 2,441             | 2,071             | 2,071             |
| R-squared                                      |         | 0.166             | 0.102             | 0.245             | 0.209             |
| Pr(interaction=0)                              |         | 0.153             | 0.203             | 0.650             | 0.030             |
| Pr( $\partial\text{Outcome}/\partial A$ equal) |         | 0.751             | 0.211             | 0.630             | 0.015             |
| Pr( $\partial\text{Outcome}/\partial Q$ equal) |         | 0.202             | 0.102             | 0.477             | 0.017             |

Notes: Mean marginal effects are calculated from the coefficients of a polynomial of ability and college quality as described in the text. Standard errors in parentheses. \* indicates that the estimated effect is statistically significant at 5%. The final three rows present the p-statistics from Wald tests that the coefficients on the interaction terms of the ability-quality polynomial are jointly equal to zero, that the mean marginal effects of ability are equal across the three percentiles of college quality, and that the mean marginal effects of college quality are constant across the three percentiles of ability.