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Can Personality Traits and Intelligence Compensate for Background Disadvantage? Predicting Status Attainment in Adulthood

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Abstract

This paper investigates the interplay of family background and individual differences, such as personality traits and intelligence (measured in a large US representative sample of high school students; N = 81,000) in predicting educational attainment, annual income, and occupational prestige eleven years later. Specifically, we tested whether individual differences followed one of three patterns in relation to parental SES when predicting attained status: (a) the independent effects hypothesis (i.e., individual differences predict attainments *independent* of parental SES level), (b) the resource substitution hypothesis (i.e., individual differences are stronger predictors of attainments at *lower* levels of parental SES), and (c) the Matthew effect hypothesis (i.e., "the rich get richer," individual differences are stronger predictors of attainments at *higher* levels of parental SES). We found that personality traits and intelligence in adolescence predicted later attained status above and beyond parental SES. A standard deviation increase in individual differences translated to up to 8 additional months of education, $4,233 annually, and more prestigious occupations. Furthermore, although we did find some evidence for both the resource substitution and the Matthew effect hypotheses, the most robust pattern across all models supported the independent effects hypothesis. Intelligence was the exception, where interaction models were more robust. Finally, we found that although personality traits may help compensate for background disadvantage to a small extent, they do not usually lead to a "full catch up" effect, unlike intelligence. This was the first longitudinal study of status attainment to test interactive models of individual differences and background factors.

Keywords

personality; education; occupational prestige; socioeconomic status; resource substitution; response surface analysis; polynomial regression

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A renaissance in personality psychology has emerged both within psychology, and in related social sciences, such as economics and educational research, because of hard evidence that "soft" skills (i.e., personality traits) predict important status attainment outcomes, such as educational and occupational success (Heckman & Kautz, 2012). Traditionally, social sciences have focused on the merits of using presumably "tougher" skills (i.e., cognitive abilities) and background factors (i.e., socioeconomic status) as predictors of status attainment. Recent research, however, has shown that, when predicting status attainment, personality characteristics provide added value beyond the more widely accepted predictors of cognitive ability and socioeconomic background (Heckman, 2006; Moffitt et al., 2011; Roberts et al., 2007). And, with great regularity, personality traits such as conscientiousness have shown incremental predictive power for outcomes such as educational achievement (Poropat, 2009).

Seldom considered, but always a possibility, is the fact that soft skills such as personality traits may have more complex relationships with the variables typically used to predict educational and occupational attainment. Specifically, rather than thinking simply in terms of whether a trait such as conscientiousness adds valuable information above and beyond family background, it is possible to consider more complex, multiplicative combinations of family background with personality. That is to say, individuals with certain characteristics may do disproportionately better or worse depending on whether they were born into a more challenging or privileged family context.

This paper investigates the interplay of family background and the effects of individual differences, such as personality traits and intelligence (measured in a large US representative sample of high school students) in predicting educational attainment, annual income, and occupational prestige eleven years later. Specifically, we test whether individual differences in personality traits and intelligence follow one of three patterns in relation to parental SES when predicting attained status: (a) the independent effects hypothesis (i.e., personality characteristics and intelligence predict attainments *independent* of parental SES level), (b) the resource substitution hypothesis (i.e., personality characteristics and intelligence are stronger predictors of attainments at *lower* levels of parental SES), and (c) the Matthew effect hypothesis (i.e., "the rich get richer," personality characteristics and intelligence are stronger predictors of attainments at *higher* levels of parental SES).[1]

The present paper is the first to test these three hypotheses and the possible moderating role of parental SES on the prospective effects of personality traits and intelligence on status attainment. Moreover, in doing so, we used a longitudinal design and one of the largest nationally representative samples in the world, that is, the Project Talent data.

[1]Other fields, such as sociology or educational research may have different definitions of the "Matthew effect." However, for the present paper we limit our definition of this effect to the one provided in text.

The Interplay of Parental SES with Personality Traits and Intelligence in Predicting Status Attainment

Investigations of educational and occupational status attainment, being driven by distinctly different intellectual guilds, have tended to avoid integrative work. The psychological literature on status attainment tends to focus on personality trait and cognitive ability predictors and correlates (e.g., Duckworth, Weir, Tsukayama, & Kwok, 2012; Roberts, Caspi, & Moffitt, 2003). In contrast, sociological literature on status attainment tends to focus on parental social class predictors and correlates (Child, 1969). Like personality traits and cognitive abilities, parental socio-economic status (SES) has been found to affect the children's later educational attainment, income, and occupational prestige (Duncan & Brooks-Gunn, 1997; Duncan, Featherman, & Duncan, 1972; Johnson, McGue, & Iacono, 2007). Although these two lines of research have developed in parallel, there is very little research to date, bridging the two traditions. Thus, studying the interactive effects of individual difference factors, such as personality traits and intelligence, with environmental factors, such as parental SES, is the next logical step in improving our models of status attainment.

The default model, which is implicitly reflected in the research siloed in the respective psychological or sociological literatures, is the independent effects model. The independent effects model presupposes no interaction between parental SES and either personality traits or intelligence. We refer to this as the default model because it has been the standard approach taken by researchers desiring to demonstrate the incremental validity of predictors such as conscientiousness on outcomes such as educational attainment. Ample research has shown that both personality traits and cognitive abilities have unique contributions (above and beyond each other) on attainment outcomes. For example, personality traits, such as conscientiousness, predict grade point average both in high school (Poropat, 2009) and college (Noftle & Robins, 2007). Moreover, conscientiousness predicts differences in income levels (Roberts et al., 2011), and in some cases net of parental SES and cognitive ability (Moffitt et al, 2011). Likewise, cognitive ability is also a strong predictor of educational attainment and academic outcomes (Cawley, Heckman, & Vytlacil, 2001; Gottfredson, 2002; Gustafsson & Undheim, 1996; Kuncel et al., 2004). Most of this prior research has not reported tests of interaction between parental SES and either personality traits or cognitive ability, but we take the univariate incremental effects of both, as evidence for the independent effects model. To the extent that this is the only pattern to be found, we would expect personality traits and intelligence to have the same effect on status attainment for all people across parental SES levels.

Of course, the relation between personality factors, parental SES, and attainment may not be so straightforward. For example, Johnson and colleagues (2006), showed that intelligence mitigated the negative effects of disadvantaged backgrounds on school achievement. Furthermore, according to Shanahan and colleagues (2014) personality traits and intelligence may be more strongly associated with attained status at lower levels of parent education. In other words, personality traits and intelligence (measured in high school) may compensate for background disadvantage with respect to educational attainment, income,

and occupational prestige eleven years later. If so, the returns to specific personality traits and intelligence would be greater for people overcoming limited socioeconomic resources of their parents. In line with this reasoning, Mirowsky and Ross (2003) proposed the "resource substitution hypothesis," which states that resources will have more beneficial effects among people with fewer alternative resources. For example, personal education influences health more so among people with less educated parents (Ross & Mirowsky, 2011). Resource substitution implies a moderating pattern such that one resource (personal education) becomes increasingly salient at lower levels of another critical resource (parental education). Such a pattern has been found with respect to the effect of a college degree on future earnings (Brand & Xie, 2010).

Although previously formulated with reference to education and health, resource substitution may well apply to personality traits, intelligence, and status attainment. Some of the compensatory effects of personal education are likely due to conscientious behaviors. Indeed, Mirowsky and Ross (2003) suggest that personal education is compensatory because —in addition to cognitive skills (such as analytic reasoning) and self-efficacy—attained education reflects the capacity to develop plans and implement them by way of conscientious behaviors such as planning, engagement in goal-directed behaviors, and perseverance. The interventions reviewed by Heckman and Kautz (2012) also suggested the importance of agreeableness and emotional stability in school settings. That is, some of the substitution effect of child's education that was observed by Mirowsky and Ross (2003) is likely attributable to personality characteristics that promote both education and health (see also, Hauser and Palloni, 2011). Moreover, children from lower-class households may be lacking diverse forms of cultural capital (linguistic and behavioral patterns indicative of middle-class up-bringing; Bourdieu & Passeron, 1977), but such children may compensate for these missing resources by being conscientiousness, agreeable, emotionally stable, and open.

Another possibility besides resource substitution is the so called "Matthew effect" or "the rich get richer" effect. According to this hypothesis, those children stemming from *higher* SES households will benefit more from certain personality traits and intelligence, presumably because their environment facilitates and enhances the positive effects of specific traits (e.g., a child with a high verbal ability who finds herself in a higher SES household will have access to more books, which will further increase her chances for high status attainment). Indeed, a previous cross-sectional study (Walberg & Tsai, 1983) found that young adults who were higher in parental SES benefited more from a better educational background and from more school motivation. Similar evidence for the Matthew effect can be found across many areas of inquiry. For example, Merton (1968) showed that highly ranked scientists received disproportionately higher praise from subsequent achievements, compared to lower ranked scientists. Another area with extensive evidence for the Matthew effect is memory research, where the effects of memory training appear to be enhanced for those who are younger and begin training with more cognitive resources (Bissig & Lustig, 2007; Verhaeghen & Marcoen, 1996; Verhaeghen, Marcoen, & Goossens, 1992).

Despite the theoretical and practical importance of testing these hypotheses in the context of status attainment, we know of only one paper to date that has attempted to do so.

Specifically, the paper by Shanahan and colleagues (2014) investigated the role of personality traits on educational attainment and wages, as moderated by parental education. Regarding the educational outcome, the authors found evidence for resource substitution for three of the big five personality traits, namely emotional stability (the opposite end of neuroticism), agreeableness, and openness. Regarding wages, the authors replicated the finding that emotional stability shows evidence of resource substitution.

Although these findings further our understanding of individual difference and environmental factors interacting in the context of status attainment, it is important to note that this study did not include intelligence as a predictor or occupational prestige as an outcome, and did not include a moderator of parental SES (just parental education). Finally, perhaps the most important drawback of this study is that personality traits and the status outcomes were measured concurrently, not prospectively.

Present study overview

As mentioned earlier, this paper investigates the prospective effects of personality traits and intelligence in predicting educational attainment, annual income, and occupational prestige eleven years later, as well as the way parental socio-economic status moderates these links. Specifically, we test three hypotheses: (a) the independent effects hypothesis (i.e., personality characteristics and intelligence predict attainments *independent* of parental SES level), (b) the resource substitution hypothesis (i.e., personality characteristics and intelligence are stronger predictors of attainments at *lower* levels of parental SES), and (c) the Matthew effect hypothesis (i.e., “the rich get richer,” personality characteristics and intelligence are stronger predictors of attainments at *higher* levels of parental SES).

The present paper improves upon previous research in several significant ways: (a) it is the first paper to test the resource substitution hypothesis in a longitudinal setting (the previous paper by Shanahan and colleagues (2014), measured personality traits concurrent with the outcomes, whereas we measured teenage personality and adult outcomes eleven years later); (b) we added intelligence to the list of predictors, and we tested the robustness of our personality trait results by controlling for intelligence, and the robustness of our intelligence results by controlling for the personality traits; (c) we added occupational prestige as an outcome, in addition to education and annual income, (d) we used one of the largest nationally representative samples currently available, namely, the Project Talent data, and we used weighted regressions to ensure that our sample was still representative of the population upon attrition, (e) we used moderated polynomial regressions to test our hypotheses and Response Surface Methodology to visualize the results in a three dimensional space (Edwards, 2002; Shanock et al., 2010), and (f) we used meaningful raw metrics to interpret effect sizes.

Methods

Participants

The data come from Project Talent (see Flanagan et al., 1960; Wise, McLaughlin, & Steel, 1979), a national longitudinal study developed by the American Institutes for Research. The

original survey was conducted in 1960 on a 5% representative sample of U.S. high school students. Over 440,000 students in grades 9 through 12 participated, out of which about 377,000 cases are now available. After the original testing, the participants were re-contacted via mail three times, at 1st, 5th, and 11th years after their high school graduation. The response rates to the follow-up studies were 51.4 percent for the one-year follow-up, 35.3 percent for the 5-year follow-up, and 25.8 percent for the 11-year follow-up. In the present study, we were interested in the role of personality traits, cognitive abilities, and parental SES on later success, specifically, educational attainment, annual income, and occupational prestige. Thus, to ensure that the participants had as much time as possible to complete their education and get jobs, we used participants' responses from the original study and the third follow-up survey (i.e., 11^{th} year after their high school graduation).

Project Talent is the only nationally representative longitudinal study in the U.S. of such large scale. It is an ideal data set for studying how personality traits and cognitive abilities, along with parental SES, impact educational attainment later in life. The longitudinal design of Project Talent has clear advantages over cross-sectional studies, as it allows for studying the effects of individual differences at an early age on educational outcomes at later life stages (Tharenou, 1997).

For the first set of analyses, we will use the full available sample from the original survey (Time 1) to investigate the links between parental SES, personality traits, and cognitive ability. For the second set of analyses, we will use the reduced sample of approximately 81,000 participants who reported their educational attainment 11 years later, annual income, and job title from which we derived a measure of occupational prestige (Time 2). We will conduct an attrition analysis to see whether the people who dropped out from the study differed from those who stayed in the study in terms of parental SES, personality traits, and cognitive ability.

Measures

The original survey (Time 1) recorded the students' personality traits, cognitive abilities, parental socio-economic status, and demographics (gender, race, and high school cohort). The 11 year follow-up (Time 2) recorded the students' educational attainment, annual income, and occupational prestige. Below we describe each of the measures used in the present study, the original coding procedures, as well as transformations we performed.

Personality Traits—The Project Talent Personality Inventory (PTPI) included 150 items from which ten different scale composites were scored and recorded. The Vigor scale measures the physical activity level of a person. The Calmness scale measures the ability to react to emotional situations in an appropriate manner without extreme emotions. The Mature Personality scale measures the ability to get work done efficiently and to accept assigned responsibility. The Impulsiveness scale measures the tendency to make quick decisions without full consideration of the outcomes. The Self-Confidence scale measures one's feelings of social acceptability and the willingness to act and think independently. The Culture scale measures the tendency to recognize the value of aesthetic things, and to display refinement and good taste. The Sociability scale measures the tendency to enjoy

being with people. The Leadership scale measures activities such as taking charge and seeking out responsibilities. The Social Sensitivity scale measures the propensity to put oneself in another's place. Finally, the Tidiness scale measures the desire for order and neatness in one's environment. For each item, participants rated how well the item described them on a 5-point scale ("extremely well" to "not very well"). Item-level data are unfortunately not available to researchers today for the entire sample (only for 4% of the sample), which is why we relied on the scale scores computed by the Project Talent staff.

In previous work on independent participant samples of a similar age (Pozzebon et al., 2013), we established the validity and reliability of the 10 PTPI scales, and we identified how the 10 PTPI scales relate to modern Big Five inventories (e.g., John, Donahue, & Kentle, 1991). Thus, Emotional Stability was best captured in the PTPI by the Self-Confidence (α = .78) and Calmness (α = .87) scales; Extraversion was best captured by the Sociability (α = .83), Vigor (α = .86), and Leadership (α = .79) scales; Openness was best captured by the Culture (α = .81) scale; Agreeableness was best captured by the Social Sensitivity (α = .85) scale; and Conscientiousness was best captured by the Mature Personality (α = .93), Impulsiveness (α = .72; reverse scored), and Tidiness (α = .86) scales (for reliabilities and construct validation see Pozzebon et al., 2013).

To make the present research more comparable to previous research on personality traits and status attainment, we computed Big Five personality trait composites from the PTPI scales, as described above. We first standardized all 10 personality traits, then we computed Big Five composites by averaging the relevant scales (e.g., Extraversion was computed from the standardized Sociability, Vigor, and Leadership scales), and then we re-standardized the resulting Big Five scales prior to the analyses (note that the last two steps were not necessary for Openness and Agreeableness, because these scales had only one respective counterpart among the PTPI scales). Inter-correlations among the resulting Big Five personality scales ranged from .39 between Extraversion and Conscientiousness to .61 between Agreeableness and Openness (see Table 1).

Although we report here only the findings using the Big Five personality composites, we also conducted all the analyses on the individual PTPI scales. The detailed results can be found in our online supplemental materials at this address: https://osf.io/bsz8g/. Importantly, the findings and conclusions were similar when comparing the PTPI scales with the Big Five composites.

Cognitive Abilities—The Project Talent original survey contains a set of scales that represent different content domains of cognitive abilities, including verbal, quantitative, and visualization and spatial abilities. Following past research (e.g., Wai et al., 2009; Su, 2012) and the radex model of cognitive ability, which organizes ability in three subdomains—verbal, mathematical, and spatial, we developed composite measures for these three abilities. We used unit weighting in constructing the composites, so no ability scale was over-weighted.

The verbal ability composite (α = .88) consists of three scales: Vocabulary, English Composite, and Reading Comprehension. The math ability composite (α = .93) consists of

four scales: Mathematics Information, Arithmetic Reasoning, Introductory Mathematics, and Advanced Mathematics. The spatial ability composite (α = .80) consists of four scales: Two-Dimensional Spatial Visualization, Three-Dimensional Spatial Visualization, Mechanical Reasoning, and Abstract Reasoning. In addition to the three indices (verbal, math, and spatial), we also computed an overall intelligence index which was obtained by averaging the standardized scores of the three cognitive ability indices. The resulting intelligence index was also standardized prior to all the analyses.

Although we report here only the findings using the intelligence composite, we also conducted all the analyses on the individual cognitive ability scales. The detailed results can be found in our online supplemental materials at this address: https://osf.io/bsz8g/. Importantly, the findings and conclusions were similar when comparing the three cognitive ability scales with the intelligence composite.

Parental Socioeconomic Status (SES)—Project Talent provides excellent data on socioeconomic status (SES; Wise et al., 1979). The original SES composite included answers to nine questions regarding home value, family income, number of books in the house, number of appliances, number of electronics, availability of a private room for the child, father's job status, father's education, and mother's education (α = .69). These are all frequently used indicators of SES in the family of origin (Galobardes et al., 2006). The index scores ranged from 59 to 131, and were standardized prior to the analyses.

Demographic Measures—Three demographic measures were included in all the analyses, because there are well documented effects of these variables on educational attainment and career success outcomes: gender, race/ethnicity, and age cohort. Gender was coded as male = 0, female = 1. Race/ethnicity was coded using a 1 to 9 scale (the labels at the time were 1 = White/Caucasian, 2 = Black/African-American, 3 = Asian American, 4 = Native American, 5= Mexican-American, 6 = Puerto Rican-American, 7 = Eskimo, 8 = Cuban, 9 = Unknown). Because the numbers in each of the non-Caucasian racial categories were very small, we recoded race into a dummy variable where 0 was "Other" and 1 was "White/Caucasian." For the regression analyses gender and race were effects coded (men = −1, women=1; other =−1, White/Caucasian=1). Cohort represents the grade (9th, 10th, 11th, or 12th) which participants were in at the original survey. It was coded as a numeric variable ranging from 9 to 12, with a larger number standing for an older cohort. Cohort was an important variable to take into account for two reasons: (a) all participants took the same tests at Time 1 even though they belonged to different age groups; thus, cognitive ability test scores for instance vary quite a bit, with the older students scoring better; and (b) all participants were tested 11 years later (Time 2), which means they were at different career stages, and thus, the younger participants were at a different developmental stage and had less time to attain their maximum success (e.g., education level or their best job). Finally, all our analyses consist of weighted least squares regressions, where each case available at Time 2 was weighted appropriately in order to produce parameter estimates closer to the representative sample collected at Time 1 (for details on how the respondent case weights were computed by the Project Talent staff, see Wise et al., 1979).

Educational Attainment—At the 11th year follow-up (Time 2), participants answered several questions regarding their educational pursuits and outcomes, based on which the Project Talent staff coded an "amount-of-education" variable, using a 12-point scale. Thus, in the original coding, scores 0 through 4 referred to high school dropouts (each happening in a different grade from 8 to 12, respectively); scores 5 and 6 referred to high school graduates who had no post-high school education or some post-high school education, but no college; score 7 referred to high-school graduates who had some college experience, but no college degree; scores 8 and 9 referred to college graduates who had no further grad-school experience, or some grad school experience, but no graduate degree; scores 10 and 11 referred to Masters graduate who had no further graduate education or some graduate education, but no further degree beyond the Masters; and finally, score 12 referred to holders of doctoral or law degrees. As can be seen from this original coding, the amount of education scale was not well balanced, and it was biased towards high school dropouts. In an attempt to address this issue, we recoded the amount of education variable as follows. Scores 0–4 became "1" (high-school dropout), scores 5–6 became "2" (high school graduate, no college), score 7 became "3" (high school graduate, some college), scores 8–9 became "4" (college degree), scores 10–11 became "5" (Master degree), and score 12 became "6" (PhD). Using this new coding scale, the mean of amount of education in the sample (N = 81,075) was 3.07, with a standard deviation of 1.17, which means that the average person in the sample, at Time 2 (i.e., 11 years after being first surveyed in high school), had graduated high-school and had some college experience, but no college degree. This new scale also implies that, on average, the distance between each scale unit translates into about 2 years of education.

Annual Income—At the 11th year follow-up (Time 2), participants reported their rate of pay per month, per week, or per hour. Their responses were coded by the Project Talent staff to estimated annual income (see Wise et al., 1979). We converted these scores into the natural logarithm of annual income, which is a strategy often used to normalize the highly skewed distribution of income. Using the natural logarithm of income also facilitates the interpretation of results, because the value of the unstandardized beta (when $b < .10$) is equivalent to percentage increases in income (upon a unit increase in the predictor). Logarithmic annual income of the participants ranged from 2.48 to 12.25, and the dollar amounts were not adjusted for inflation prior to computing the logarithm, so they represent 1971 values.

Occupational Prestige—Occupational prestige refers to the social status of a specific occupation, as regarded by members of a society (Hauser & Warren, 1997). A widely used measure of occupational prestige is Stevens and Featherman's (1981) TSEI2, which was derived from the Duncan Socioeconomic Index (SEI; Duncan, 1961), by updating it to encompass the 1970 census job titles (U.S. Bureau of Census, 1971). The 11th year follow-up of Project Talent (Time 2) included self-reported job titles. These job titles were coded by the Project Talent staff into the 1970 census occupation codes, based on which the second author assigned TSEI2 scores (Su, 2012) following the coding system provided by Stevens and Featherman (1981). Each job title from the 1970 census has a specific prestige score assigned, based on expert ratings. In our sample, prestige scores ranged from 16.46

(professional driver) to 89.57 (dentist), with a mean of 47.3 (sales representative). To facilitate the interpretation of our results, we use this raw metric and its matching job titles throughout the paper.

Data Cleaning

Participants were excluded prior to all analyses based on two factors: response credibility and missing data. Regarding response credibility, we only analyzed cases that were coded as "credible" on the original Response Credibility Index (see Wise et al., 1979). This credibility index was computed based on a Screening Scale which included questions such as "how many days are in a week?" that should have been answered easily by anyone who did not suffer from a reading problem, a clerical problem in recording answers, general slowness, or a lack of cooperation. Missing data was handled throughout the analyses using listwise deletion. Out of about 377,000 cases available at Time 1, about 346,000 were credible and not missing according to the response credibility index. Furthermore, in most analyses, the sample was reduced by the fact that at Time 2, we have about 81,000 participants. We present an attrition analysis in the results section.

Data Analysis

The main analyses consist of moderated polynomial regression analyses (see Edwards, 2002), where each of the three attainment variables at Time 2 (educational attainment, annual income, and occupational prestige) was an outcome. The predictors were the following: each individual difference variable (Big Five personality dimension or intelligence; simple and squared), parental SES (simple and squared), the interaction between the respective individual difference variable and parental SES, gender, race, and age cohort. In addition, all the regressions were weighted by the case weights available at Time 2, to ensure our sample stayed representative of the US population upon attrition. Note that due to multicollinearity among the personality variables (see Table 1), we examined the effect of each individual difference on status attainment in a separate regression. We chose the polynomial regression approach because it both tests the proposed models and it allows for a more informed interpretation of the simple, non-linear, and multiplicative relationships among the focal variables (Edwards, 2002). One of the primary interpretive advantages of polynomial regression analysis is the ability to translate the findings into response surface analysis and three-dimensional graphs (see Edwards, 2002; Shanock et al., 2010).

Although this method has been mainly been used in the past to examine self-observer rating discrepancies, it may be used to describe any interaction effects, as long as the predictor variables are measured on the same scale or are standardized (as it was the case with our variables) (Shanock et al., 2010). To test our hypotheses (independent effects, resource substitution, and Matthew effect), we first established whether the interaction effects were statistically significant, and when that was the case, we constructed response surface graphs to help us better understand the meaning and the magnitude of the effects. In addition to the three-dimensional graphs, we also obtained four surface parameters, which may be used to further explore the results and answer a variety of interesting questions. The first two parameters (a1 and a2) refer to the slope and curvature of the line of perfect agreement, as relating to the outcome (i.e., in our case, the line of perfect agreement represents the line on

the graph where individual differences and parental SES are equal in magnitude, and the surface tests tell us how that agreement relates to the outcomes). For example, a positive (a1) slope on the line of perfect agreement would indicate that status attainment increases as both SES and personality increase. A positive (a2) curvature on this line of perfect agreement would indicate a convex (upward curving) surface, whereas a negative (a2) curvature would indicate a concave (downward curving) surface (i.e., outcomes could increase or decrease more sharply as both personality and SES become lower or higher form some point). The second two parameters (a3 and a4) refer to the slope and curvature of the line of discrepancy as relating to the outcome (i.e., in our case, the line of discrepancy represents the line on the graph where personality and SES are opposite in magnitude, and the surface tests tell us how that discrepancy relates to the outcomes). For example, a negative (a3) slope on the line of perfect discrepancy, where personality equals negative parental SES, would indicate that status attainment increases as the discrepancy between SES and personality increases such that SES is higher than personality. A positive/negative (a4) curvature on this line of discrepancy would indicate a convex/concave surface (i.e., outcomes could increase or decrease more sharply as the discrepancy between personality and SES becomes lower or higher form some point).

In addition to the above analyses, and to test the robustness of our findings, we re-estimated all the models (i.e., one independent model for each personality trait variable, on each of the three outcomes) including intelligence (simple and squared) and the interaction between intelligence and parental SES as predictors in the regression models. To establish optimal status attainment models, we also provided regression model comparisons (between models with and without controls). These robustness tests were necessary especially in light of new findings by Major, Johnson, and Deary (2014), who showed that intelligence and personality traits are related in the Project Talent sample, and that it is important to consider them together in predictive models.

Finally, given our large participant sample and the sensitivity of null hypothesis significance testing (NHST) to participant sample size, almost all our analyses resulted in significant results at $p < .001$. Furthermore, confidence intervals were often so close to the respective parameters that they provide little valuable information. That is to say, the confidence intervals were so small that if the parameters themselves were numerically different, they were also outside of the respective confidence intervals of each estimate. Thus, the typical approaches to evaluating findings (e.g., statistical significance, or parameter estimates with confidence intervals) were not that useful. As an alternative, we took advantage of the fact that our outcomes were on naturally meaningful metrics (e.g., years of schooling, income). Wherever possible, we have translated the main and interaction effects into the natural metric of the outcome variable, which allows readers to decide for themselves whether our effects are sizable enough to be of interest (for an extensive discussion and recommendations to shift from NHST to effect size interpretation see Cumming, 2013).

Results

Table 1 presents inter-correlations among all the variables of interest. Table 2 presents results from an attrition analysis. Of the approximately 346,000 participants available at

Time 1, about 81,000 responded at Time 2. The attrition analysis showed that the participants who stayed in the study, as opposed to those who dropped from the study, were more intelligent (r = .23) and had slightly higher parental SES (r = .11), but were not very different in their Big Five levels (average effect was .04). Furthermore, the gender and race distributions were very similar across time points: Time 1 had 51.6% females and 95.5% White/Caucasians, whereas Time 2 had 52.3% females and 96.2% White/Caucasians. Given these results, the Project Talent sample available at Time 2 cannot be considered a representative sample of the US population, unlike the Project Talent sample available at Time 1. However, by using weighted least squares regressions using the case weights available at Time 2, the estimates from our models can still be considered to be close to those drawn from a nationally representative sample, and it remains one of the largest in the world, where prospective effects of personality traits and cognitive abilities on education, income, and job prestige can be evaluated.

Prospective effects of personality traits on status attainment

Educational attainment—We first tested the predictive relation between the personality traits and educational attainment without factoring in intelligence, which was closer to the approach taken by Shanahan and colleagues (2014). Table 3 (Model 1) presents the moderated polynomial regression results for each of the Big Five (i.e., one independent regression model for each personality trait). All the main effects of the Big Five personality traits and parental SES were statistically significant at $p < .001$. Of the five interactions (between the Big Five and Parental SES), three were statistically significant, namely, extraversion, agreeableness, and conscientiousness. Because inferential statistics fail to provide us with a meaningful interpretation of these results, we provide effect size estimates translated into natural metrics (see Table 7). For example, moving up on standard deviation on extraversion is associated with gaining an extra 1.8 months of education, whereas going from −1 below the mean to 1 standard deviation above the mean would result in 3.6 months of education gained by year 11. Parental SES, which has a larger main effect on educational attainment, would result in 16.6 months (about 2 academic years) of education gained by year 11 when moving 2 standard deviations.

To further investigate the interaction effects between the Big Five and parental SES in predicting educational attainment 11 years later, we used response surface methodology and we constructed three-dimensional graphs of the three interactions that were statistically significant. Because the pattern we found was very similar across extraversion, agreeableness, and conscientiousness, we only present the results for agreeableness (see Figure 1). To address our hypotheses (independent effects, resource substitution, or Matthew effect), we need to compare the effects that agreeableness had on educational attainment at different levels of parental SES. Examining the graph, we can see that agreeableness had a slightly stronger effect on educational attainment at low (as opposed to high) levels of parental SES. Thus, when parental SES was the highest (+2SD), going from −2SD to +2SD in agreeableness gained people a .20 unit increase in education, whereas when parental SES was the lowest (−2SD), going from −2SD to +2SD in agreeableness gained them .68 units increase in education. This translates to a net advantage of agreeableness of .48, or the

equivalent of 8.6 additional months of education (about 1 academic year) at low (versus high) levels of SES. Therefore, agreeableness showed evidence for resource substitution.

This pattern replicated for extraversion and conscientiousness. They all showed evidence for resource substitution, where an increase in extraversion and conscientiousness benefited people more at low (vs. high) levels of parental SES.

Annual income—Table 4 (Model 1) presents the moderated polynomial regression results (separate regressions for each personality trait). All the main effects of the Big Five personality traits and parental SES were statistically significant at $p < .001$. Of the interaction effects, extraversion and conscientiousness showed statistically significant interactions with parental SES. The largest main effect of the Big Five was for extraversion ($b = .04$), which means that there was a 17% difference in income between people who were two standard deviations below (vs. above) the mean on extraversion. As Table 7 shows, at the average income, this percentage difference in annual income translates to $9,674 (adjusted for inflation to 2014 purchasing power). Parental SES had an average main effect on annual income of $b = .07$, which translates to a 32% difference in income (going from −2SD to 2SD in parental SES), which at the average income is the equivalent of $16,987.

Regarding the interaction effects, both extraversion and conscientiousness showed evidence for resource substitution, whereby higher personality trait levels benefited people's annual income more at lower (as opposed to higher) levels of parental SES. Figure 2 shows the effect for conscientiousness. Examining the graph, we can see that when parental SES was the highest (+2SD), going from −2SD to +2SD in conscientiousness gained people a 4% increase in annual income, whereas when parental SES was the lowest (−2SD), going from −2SD to +2SD in conscientiousness gained them a 22% increase in income. This translates to a net advantage of conscientiousness of about 18% in annual income at low (versus high) levels of parental SES. Therefore, conscientiousness showed evidence for resource substitution and this effect replicated for extraversion.

Occupational prestige—Table 5 (Model 1) presents the moderated polynomial regression results (separate regressions for each personality trait). All the main effects of the Big Five personality traits and parental SES were statistically significant at $p < .001$. Of the five interaction effects with parental SES, only Extraversion was statistically significant. To better understand the meaning of the effects, we provide effect size estimates translated in natural metrics (see Table 7; additionally, for a TSEI2 prestige scale sample with matching job titles, see Table 8).

To further investigate the interaction effect with parental SES, we constructed a response surface graph for extraversion (see Figure 3). Examining the graph, we can see that extraversion had a slightly stronger effect on occupational prestige at low (as opposed to high) levels of parental SES. Thus, when parental SES was the highest (+2SD), going from −2SD to +2SD in extraversion gained people only 3.5 prestige points, whereas when parental SES was the lowest (−2SD), going from −2SD to +2SD in extraversion gained them 12.8 prestige points. This translates to a net advantage of extraversion of 9.26 prestige points

(i.e., the equivalent of going from a “mail handler” to a “retail salesman”) at low (versus high) levels of SES. Therefore, extraversion showed evidence for resource substitution.

Prospective effects of intelligence on status attainment

Table 6 shows the prospective effects of intelligence on each of the three status attainment outcomes. Intelligence had significant main effects on all 3 outcomes. Thus, people who were two standard deviations above (as opposed to below) average in IQ gained 35.3 months (i.e., 4 academic years) of education, $12,094, and 33.96 occupational prestige points, going from an “electric power lineman” to a “health administrator.” Parental SES also had significant main effects on all the outcomes, but the effect was diminished compared to the effect of parental SES in the personality regressions, where IQ was not controlled for. Furthermore, intelligence showed a significant interaction effect with parental SES when predicting all three outcomes. Specifically, intelligence showed evidence for a Matthew effect when predicting educational attainment and occupational prestige, and a resource substitution effect when predicting income. Figure 4 shows three-dimensional graphs of the two interaction patterns found between intelligence and SES.

Examining the educational attainment graph in Figure 4, we can see that intelligence had a stronger effect on educational attainment at high (as opposed to low) levels of parental SES. Thus, when parental SES was the highest (+2SD), going from −2SD to +2SD in intelligence gained people a 2.28 units increase in education, whereas when parental SES was the lowest (−2SD), going from −2SD to +2SD in intelligence gained them 1.64 units increase in education. That translates to a net advantage of intelligence .64, or the equivalent of 11.5 months of additional education (i.e., more than a year) at high versus low levels of SES, which is indicative of a Matthew effect. This pattern replicated for occupational prestige, intelligence showing a larger prestige advantage at higher (versus lower) levels of parental SES.

Examining the annual income graph of Figure 4, we can see that intelligence had a stronger effect on annual income at low (as opposed to high) levels of parental SES. Thus, when parental SES was the highest (+2SD), going from −2SD to +2SD in intelligence gained people a 4% increase in annual income, whereas when parental SES was the lowest (−2SD), going from −2SD to +2SD in intelligence gained them a 43% increase in annual income. This translates to a net advantage of intelligence of 39% in annual income at low (as opposed to high) parental SES, which is evidence for resource substitution.

Furthermore, as can be seen from Tables 3, 4, and 5 (Models 2), the main effects of intelligence, as well as the interaction effects between intelligence and parental SES, on educational attainment, annual income, and occupational prestige were highly robust. These effects remained virtually unchanged when individual personality trait controls were included in the regression models. The effects of intelligence also remained unchanged when controlling for all personality traits and their interactions with SES simultaneously.

Because intelligence revealed such large main effects on all three outcomes, and because it showed statistically significant and robust interaction effects with parental SES when predicting all three outcomes, we considered it necessary to include it as a control (along

with its square and its interaction term with SES) in the personality regressions predicting status attainment. A second reason why we considered these analyses necessary is that previous research (Major et al., 2014) found that intelligence and personality were related in the Project Talent data set, and recommended that status attainment models should include both predictors. Finally, previous research on status attainment that investigated the interactive effects between personality traits and background factors did not include intelligence as a statistical control (see Shanahan et al., 2014). The goal of our paper was to extend the previous cross-sectional findings by Shanahan and colleagues (2014) to a longitudinal data set, and to test the robustness of these findings by including intelligence controls. Thus, we conducted several additional analyses, which we discuss below (the results can be found in Models 2 of Tables 3, 4, and 5).

Prospective effects of personality on status attainment (controlling for intelligence)

Educational attainment—As can be seen from Table 3, in Model 2, we re-estimated the five personality trait regression models, controlling for intelligence (simple and squared) and the interaction between intelligence and SES. Model 2 had a significantly better fit than Model 1, across the Big Five (the average *R-change* = .14, $p < .001$). The main effects of the Big Five remained significant, and the effect sizes did not change dramatically. The main effects of SES also remained significant, but the average effect size was reduced by about 50% in Model 2, compared to Model 1. However, the interaction effects between extraversion, agreeableness, conscientiousness and parental SES were no longer statistically significant. Thus, none of the Big Five personality traits showed evidence for resource substitution in predicting educational attainment, when controlling for intelligence.

Annual income—As can be seen from Table 4, Model 2 (where we controlled for Intelligence, its square, and its interaction with SES, in each of the five personality trait regressions) did not fit much better than Model 1, across the Big Five (although the average *R-change* = .01 was statistically significant). The main effects of the Big Five remained significant, and the effect sizes did not change by much. The main effects of SES also remained significant, and the average effect did not change much. Of the two interaction effects that were previously statistically significant, Conscientiousness continued to show evidence for resource substitution when interacting with parental SES and the effect did not change when controlling for intelligence. Thus, being higher in Conscientiousness benefited more the annual income of people at lower versus higher levels of parental SES.

Occupational prestige—As can be seen from Table 5, in Model 2, we re-estimated the five personality trait regression models, controlling for intelligence (simple and squared) and the interaction between intelligence and SES. Model 2 had a significantly better fit than Model 1, across the Big Five (the average *R-change* = .11, $p < .001$). The main effects of the Big Five and SES remained significant, although the effects changed somewhat. However, the interaction effect between extraversion and parental SES was no longer statistically significant. Thus, none of the Big Five personality traits showed evidence for interactive effects with parental SES, when predicting occupational prestige in the presence of intelligence controls.

Discussion

Previous research has investigated either the role of individual differences in personality traits and cognitive ability, the role of socio-economic status (SES), or the added value of one predictor over the others on status attainment. In this paper we tested the possibility that background factors, such as parental SES, moderated the role of individual differences on status outcomes, and that personality traits and intelligence may compensate for background disadvantage. Specifically, we tested whether individual differences in personality traits and intelligence followed one of three patterns in relation to parental SES when predicting attained status: (a) the independent effects hypothesis (i.e., personality characteristics and intelligence predict attainments *independent* of parental SES level), (b) the resource substitution hypothesis (i.e., personality characteristics and intelligence are stronger predictors of attainments at *lower* levels of parental SES), and (c) the Matthew effect hypothesis (i.e., "the rich get richer," personality characteristics and intelligence are stronger predictors of attainments at *higher* levels of parental SES).

Although we did find some evidence for both the resource substitution and the Matthew effect hypotheses, especially for intelligence, the most robust pattern across all models supported the independent effects hypothesis. Our findings showed that personality traits had meaningful main effects on educational attainment, income, and occupational prestige, even after controlling for SES and intelligence (e.g., Poropat, 2009; Noftle & Robins, 2007; Sutin, Costa, Miech, & Eaton, 2009). Table 7 presents all the main effect sizes in natural metrics. Similarly, we replicated previous findings that intelligence positively predicts status attainment (educational attainment, annual income, and occupational prestige), even when controlling for SES and personality traits (e.g., Batty et al., 2009; Cawley, Heckman, & Vytlacil, 2001). Not surprisingly, parental SES was also found to be a relatively strong predictor of status attainment, across all three outcome variables, which is also in line with previous research (Duncan & Brooks-Gunn, 1997; Duncan, Featherman, & Duncan, 1972).

Without controlling for intelligence, we did find evidence of resource substitution for Extraversion, Agreeableness, and Conscientiousness when predicting educational attainment, for Extraversion and Conscientiousness when predicting annual income, and for Extraversion when predicting occupational prestige. However, of these effects, only the interaction between Conscientiousness and parental SES when predicting annual income survived our robustness test, which included intelligence controls.

We found more robust interactions between intelligence and parental SES on all three outcomes. Specifically, intelligence showed evidence for a Matthew effect ("the rich get richer") when predicting educational attainment and occupational prestige, where intelligence benefited people at higher SES levels more, and it showed evidence for resource substitution when predicting annual income, where intelligence benefited people at lower SES levels more. These effects did not change when including personality controls in the regressions.

The initial resource substitution effects of personality traits replicated and extended previous findings by Shanahan and colleagues (2014), who found evidence of resource substitution

on educational attainment for Agreeableness, Openness, and Emotional Stability in a cross-sectional study. Although some of our findings overlapped with the cross-sectional study by Shanahan and colleagues, some did not; for instance, we did not find evidence of resource substitution for Openness and Emotional Stability, but we did for Extraversion and Conscientiousness. Nevertheless, there are many differences between the present study and the study by Shanahan and colleagues that may explain these discrepancies: (a) we used parental SES as a moderator, whereas they used parental education as a moderator; (b) we used Big Five composites derived from the Project Talent personality scales, whereas they used the Mini-IPIP, which is a 20-item short-form version of the International Personality Item Pool designed to measure the Big Five factors of personality (Donnellan et al. 2006); (c) we used a prospective longitudinal design, whereas they used a cross-sectional design, and (d) we used moderated polynomial regressions and response surface analysis, whereas they used moderated linear regressions.

In sum, the present study replicated, in a longitudinal setting, some of the cross-sectional resource substitution effects previously found by Shanahan and colleagues (2014), and extended this research by further testing the robustness of these effects, when including intelligence controls. When subjected to these tests, most interactive effects between personality and parental SES ceased to be statistically significant, thus indicating that an independent effects model is more appropriate. This conclusion, however, did not apply to intelligence, where Matthew effects and resource substitution effects were larger and more robust. One open question, however, is why intelligence showed different interaction patterns with parental SES when predicting different outcomes. One possibility is that intelligence showed a Matthew effect when predicting educational attainment and occupational prestige because the two outcomes are highly correlated (see Table 1) and heavily dependent access to higher education; the latter has a high entry cost in the US due to college tuition and fees, which wealthier families are better able to pay. This might explain why being intelligent benefits more the educational attainment and occupational prestige of people from higher (versus lower) SES backgrounds. When predicting annual income, intelligence showed a resource substitution pattern, whereby it helped people from lower SES backgrounds more. This could be due to the fact that there are more paths to a higher income, which might not require entry level costs as high as the cost of a college education. Future research should test these hypotheses to disentangle the reasons behind the distinct interaction patterns between intelligence and parental SES.

One advantage of the present paper is that we used response surface analysis to interpret and visualize the interactions in a three-dimensional space. Thus, the graphs, along with the surface tests, provide additional information, which can help answer interesting theoretical and practical questions. One such question is: *Given the evidence for resource substitution, does that mean the "American Dream" is alive and well?* In other words, do certain personality traits, such as being nice to others, or working hard, compensate for background disadvantage? In terms of the American Dream the question really becomes can people who are born into poverty "catch up" to their peers born into affluence through their personality traits or intelligence? Compensation in this case is not necessarily reflective solely of an interaction pattern as much as the combination of main effects and interaction effects on

outcomes. For example, if a personality trait like conscientiousness had a main effect as large as, if not larger than parental SES, then it could be said to "compensate" for parental SES such that people brought up in poverty who were highly conscientious could do just as well as those low in conscientiousness who were brought up in wealth. Of course, if the interaction effects between personality and parental SES were large, they too could contribute to the possibility that individual differences could make up for background disadvantage. One benefit of the response surface figures is that one can see, in practical terms, whether individual differences can make up for a disadvantaged background.

In the case of personality traits, neither the main effects nor the interactive effects were large enough to compensate for low parental SES and this can be seen on the response surface figures. For example, even in the ideal case of the interaction between agreeableness and parental SES when cognitive ability was not controlled for, being highly agreeable did not make up for low parental SES. For example, Figure 1, which shows the relation of both agreeableness and parental SES on educational attainment, supports this conclusion. The slope of the line of perfect disagreement (a3, running from the left to the right side of the graph, where personality equals negative parental SES) is the most appropriate test for this question, and its negative value indicates that educational attainment increases as the discrepancy between SES and agreeableness increases such that SES is higher than agreeableness. Examining the left and right corners of the figures we see that the most agreeable (but poorest) people did not earn (on average) more than a high school degree, whereas the least agreeable (but wealthiest) people earned college degrees. In the case of the one personality interaction that survived our robustness test, the most conscientious (but poorest) people did not attain (on average) an annual income higher than 8.97 on the natural logarithm scale (i.e., $46,256 adjusted for inflation to 2014), whereas the least conscientious (but wealthiest) people attained annual incomes of 9.13 on the natural logarithm scale (i.e., $54,286 adjusted for inflation to 2014). Therefore, personality traits, while important in the prediction of attainment outcomes, did not suffice to make up for low parental socioeconomic status.

However, the story was different for intelligence. There, the slope of the line of perfect disagreement was positive for educational attainment and occupational prestige (and flat for income), indicating that as the discrepancy increased (such that IQ was higher), educational attainment and occupational prestige increased. In other words the smartest but least wealthy people were close to getting a college degree, whereas their least smart but wealthiest counterparts were close to getting an associate's degree. In sum, even though we have evidence that certain personality traits may compensate for background disadvantage (in the absence of intelligence controls), the effects were not large enough to overcome the main effect of SES. The only individual difference that seemed to be able to do that was intelligence. Thus, we would conclude that the American Dream, as manifest through personality, is more myth than fact. On the other hand, the American Dream manifest through intelligence is still alive and well. Although, it should be noted that the descriptions of the American Dream seldom mention cognitive ability as the compensatory factor that would make up for starting out life in difficult straits.

Another interesting theoretical question that may be addressed using the response surface tests is: *Should we switch from an independent effects model to an interaction effects model when predicting status attainment?* Examining the a1 parameters across Figures 1–4, may answer that question. These parameters represent the slope of perfect agreement (i.e., the sum of the main effects of individual differences and SES), in other words, the independent effects model. This slope was consistently positive, indicating that increasing levels of both personality traits/intelligence and parental SES were beneficial for status attainment. The main effects were also quite robust when adding controls, and they were consistently larger than the interaction effects. Thus, we would conclude that although some interactive effects were present between personality traits and parental SES (when not taking into account intelligence), the magnitude of these effects and their lack of robustness do not always justify their inclusion, especially in smaller samples. The independent effects model seems to do a good job predicting status attainment in a robust fashion. Regarding intelligence on the other hand, models of status attainment that take into account interactions between intelligence and background factors seem warranted.

Finally, by investigating the prospective interactive effects of individual differences and background factors on status attainment in a large representative sample, and by providing effect size estimates translated into meaningful raw metrics, the present paper may have important practical implications on policy making. Knowing the effects of SES, intelligence, and personality in terms of dollars and in terms of months of schooling may allow other researchers to better compare effects of other variables or interventions to these basic predictors. Knowing, for example, that an intervention to prepare students for college may net a gain similar to specific predictors like intelligence or personality could inform whether policy should be focused on selection strategies or intervention strategies given their respective costs and societal implications.

Limitations and Future Directions

One limitation of the present data is the age of testing. Namely, at Time 2, our participants were only 11 years (or less) out of high-school, which means that for many of them the job they held at the follow-up was their first job, and thus, not necessarily the most representative in terms of their full annual income potential or peak occupational prestige. Indeed, previous studies (Deary et al., 2005) showed that individual differences, such as intelligence, and SES were stronger predictors of annual income at mid-life compared to young adulthood. To address this question, future studies should try to replicate the present findings on the latest follow-up on the Project Talent sample, which was conducted 52 years after the original survey.

Another caveat is that most of the resource substitution effects failed to hold once intelligence was controlled. One possible explanation is that there is a developmental process that gets washed out over time. It is possible that at earlier ages, personality attributes are more highly valued by decision makers, such as teachers, that then give students more opportunities in the classroom. These opportunities may then enhance their abilities, which are then used more often for decision making when it comes to selecting students into higher education, for example. Although this is an interesting hypothesis and

there is some evidence for it in previous studies (Becker et al., 2012), the more typical mechanism is that educational opportunities impact school achievement rather than cognitive abilities. Another, more likely, explanation is that intelligence simply accounted for most of the variance when included in the models, thus, diminishing the interactive effects between personality traits and parental SES.

A third limitation of these data is that they were collected more than 40 years ago, and the American education system and economy have changed in important ways since then, which means that some of our effects might not replicate in more recent cohorts.

Fourth, as can be seen from Table 1 and as past research has pointed out (Major et al., 2014; Pozzebon et al., 2013), another limitation is that the Project Talent Personality Inventory does not differentiate very well between the Big Five personality traits and thus, we cannot be confident that the results would replicate with modern personality measures.[2] Additionally, this study only used self-reports in order the assess personality traits. Future longitudinal studies should be designed with these factors in mind, thus including better personality measures, both self-reports and other-reports, to ensure measurement accuracy.

Fifth, our educational attainment scale might not be the true equivalent of an interval scale. In order to facilitate an interpretation focused on effect sizes in natural raw metrics, we estimated that, on average, each scale point represented 2 years of education (18 months). However, it is possible that there are qualitative differences between the different scale points (e.g., high school dropouts might be qualitatively different from the rest of the people), which our quantitative scale did not capture. Future studies that are interested in qualitative differences may investigate such questions.

Despite these limitations, it should be noted that the present study tested the interactive effects of individual differences and parental SES on status attainment, using a prospective longitudinal design, measuring personality traits, intelligence, and parental SES in adolescence, and their prospective associations with attained status eleven years later. We also improved upon previous research by using three different measures of status attainment: educational attainment, annual income, and occupational prestige, and by looking at the role of both personality traits and intelligence in the same sample. Furthermore, our study uses the largest nationally representative sample of U.S. high school students available, which leads to reliable estimates of effect sizes. Additionally, we tested the robustness of our findings by controlling for intelligence in the personality trait regressions. Finally, we provided meaningful interpretations of our results throughout the paper, using raw natural metrics and focusing on effect size estimates, in an attempt to depart from traditional inferential statistics (especially since most effects are significant at $p < .001$ in such a large sample) and adopt the new statistics, which many researchers have argued are the key to a better science (Cumming, 2013).

[2]Because the Project Talent Personality Scales are not ideal for capturing the Big Five, we factor analyzed the 10 scales using principal axis factoring with a varimax rotation and obtained two factors (Maturity and Extraversion). We re-analyzed the data using these two personality scales and we reached the same conclusions presented in this paper. The independent effects model seems to better represent the relations between personality and background factors when predicting stats attainment, whereas interactive models should be considered for intelligence. The detailed results of these analyses can be found here: https://osf.io/bsz8g/.

Conclusion

We showed, in a longitudinal setting, in a large nationally representative sample of approximately 81,000 people that personality traits and intelligence in adolescence, in addition to parental SES, matter in predicting status attainment in adulthood. A standard deviation increase in individual differences translated to up to 8 additional months (1 academic year) of education, $4,233 annually, and more prestigious occupations. Furthermore, we brought evidence for the resource substitution hypothesis, where certain personality characteristics (e.g., Agreeableness, Conscientiousness, and Extraversion) were stronger predictors of attainments at *lower* levels of parental SES. However, all these effects (with the exception of the interaction between conscientiousness and SES predicting income) were diminished and became statistically non-significant when controlling for intelligence, suggesting that the independent effects model is more appropriate when predicting status attainment from personality traits and background factors.

We also showed that intelligence interacted with parental SES, when predicting all three outcomes, following two patterns: the Matthew effect when predicting educational attainment and occupational prestige, and resource substitution when predicting annual income. These effects remained statistically significant when controlling for personality traits.

This is the first longitudinal study to suggest that status attainment might be best predicted with more complex models that take into account the interactions between intelligence and background factors. However, this study also suggests that the independent effects model might be best suited when predicting status attainment from personality and background factors. Finally, we found that although personality traits may help compensate for background disadvantage to a small extent, they do not usually lead to a full “catch up” effect. Intelligence was an exception, thus showing a full “catch up” effect. To put it more colorfully, we would adapt George Carlin’s cynically humorous words: “The reason they call it the American Dream is because you have to be asleep to believe it,” unless you happen to be extraordinarily intelligent.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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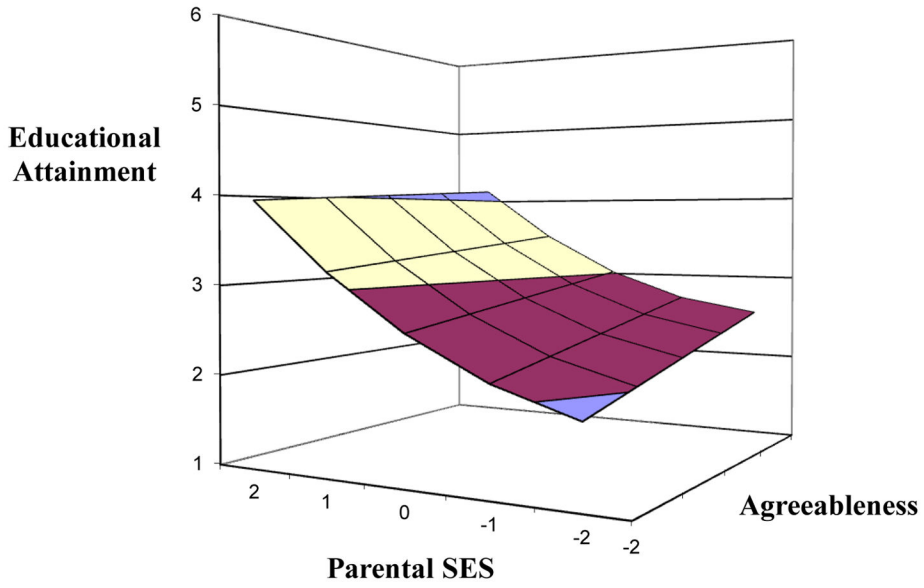

Surface tests

$a_1 = .57, p < .001$

$a_2 = .05, p < .001$

$a_3 = -.35, p < .001$

$a_4 = .11, p < .001$

Figure 1.

Agreeableness and SES predicting educational attainment (without IQ controls, corresponding to Table 3, Model 1)

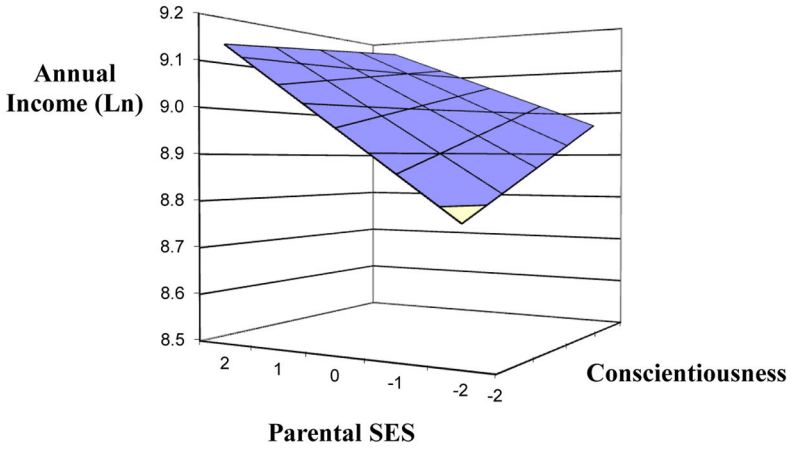

Figure 2.

Conscientiousness and SES predicting the natural logarithm of annual income (without IQ controls, corresponding to Table 4, Model 1)

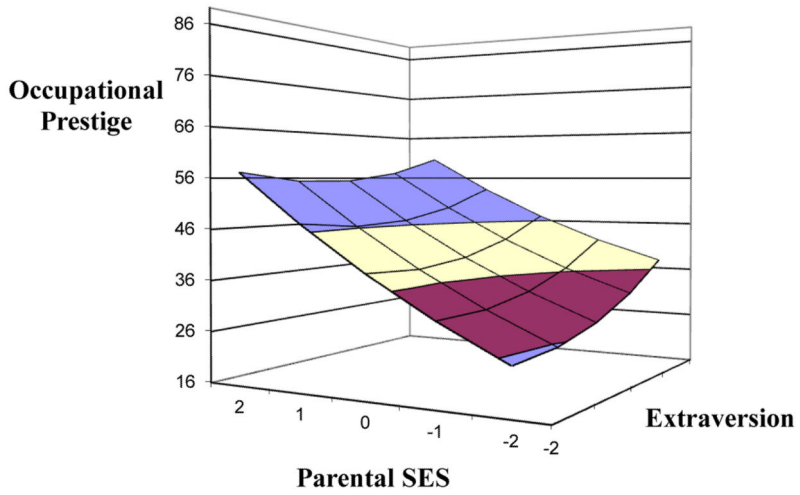

Figure 3.

Extraversion and SES predicting occupational prestige (without IQ controls, corresponding to Table 5, Model 1).

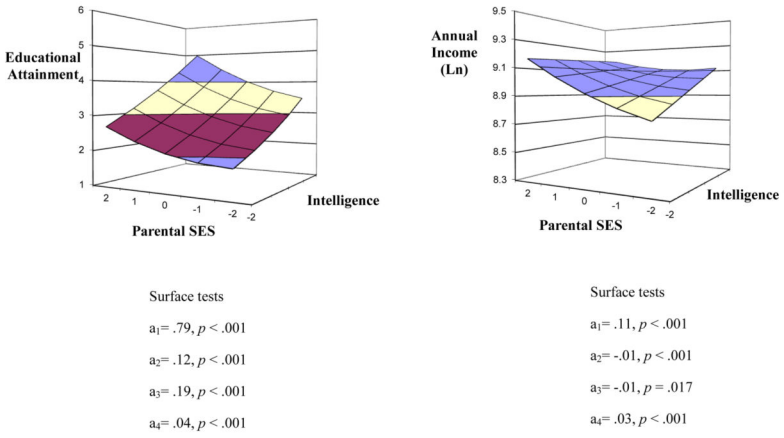

Figure 4.

IQ and SES predicting educational attainment and income (without personality controls, corresponding to Table 6).

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Table 1

Inter-correlations among all variables.

No.	Variable	*M*	*SD*	*N*	1	2	3	4	5	6	7	8	9	10	11	12
1	Gender	.52	.50	346,660	-											
2	Race	.05	.21	147,873	.04	-										
3	Cohort	10.43	1.10	346,660	.00	−.02	-									
4	Parental SES	98.07	10.09	331,961	−.02	−.18	.08	-								
5	Extraversion	.00	1.00	346,386	.07	−.01	.06	.19	-							
6	Agreeableness	.05	1.00	346,386	.24	−.01	.13	.17	.56	-						
7	Conscientiousness	.00	1.00	346,386	.13	−.01	.10	.11	.39	.46	-					
8	Emotional Stability	.00	1.00	346,386	.04	−.01	.14	.19	.55	.50	.47	-				
9	Openness	.04	1.00	346,386	.26	.01	.11	.18	.54	.61	.51	.48	-			
10	Intelligence	.00	1.00	339,114	−.15	−.23	.24	.44	.10	.12	.14	.21	.10	-		
11	Educational attainment (Y11)	3.07	1.17	81,075	−.22	−.04	−.02	.42	.13	.08	.13	.16	.12	.52	-	
12	Income Ln (Y11)	9.07	.65	58,474	−.49	−.04	−.08	.13	.04	−.07	−.00	.04	−.09	.18	.27	-
13	Prestige (Y11)	47.30	21.31	58,575	−.11	−.06	−.01	.35	.14	.11	.15	.16	.14	.45	.74	.30

Notes: Because most of the Big Five and Intelligence were composite measures, we used standardized scores here. We used raw scores for the other variables. Gender and race were dummy coded (men = 0, women=1; whites = 0, non-whites=1). All correlations higher than .00 were significant at $p < .001$

Table 2

Attrition analyses. Negative effects mean higher scores for the people who stayed in the study.

Variable	*Mean Difference*	*95% CI*	*r*
Parental SES	−.22	[−.23, −.22]	−.11
Extraversion	−.04	[−.05, −.03]	−.02
Agreeableness	−.05	[−.06, −.05]	−.03
Conscientiousness	−.13	[−.14, −.13]	−.07
Emotional Stability	−.11	[−.12, −.10]	−.06
Openness	−.06	[−.07, −.05]	−.03
Intelligence	−.46	[−.46, −.45]	−.23

Notes: All variables were standardized prior to the analyses.

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Table 3

Moderated polynomial regressions on the educational attainment outcome (one independent regression for each of the Big Five). Model 1 controls for gender, race, and age. Model 2 adds controls for IQ, IQ-square, and IQ X SES.

Model	Educational attainment predictors	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
1	Personality	**.10**	**.11**	**.15**	**.11**	**.14**
	Parental SES	**.46**	**.46**	**.46**	**.46**	**.45**
	Personality X Parental SES	**−.03**	**−.03**	**−.02**	−.01	−.00
	Personality^2	**.05**	.00	**.05**	**.02**	.01
	Parental SES^2	**.08**	**.08**	**.08**	**.08**	**.07**
	Gender	**−.22**	**−.24**	**−.23**	**−.22**	**−.24**
	Race	**−.10**	**−.10**	**−.10**	**−.10**	**−.09**
	Age Cohort	**.04**	**.03**	**.03**	**.03**	**.03**
	Constant	**2.76**	**2.8**	**2.75**	**2.78**	**2.79**
	R-square	.24	.24	.25	.25	.25
2	Personality	**.09**	**.08**	**.10**	**.06**	**.11**
	Parental SES	**.28**	**.29**	**.29**	**.29**	**.28**
	Personality X Parental SES	−.00	−01	−.00	−.00	.01
	Personality^2	**.02**	**−.01**	**.01**	.00	**−.01**
	Parental SES^2	**.05**	**.05**	**.05**	**.05**	**.05**
	Gender	**−.15**	**−.16**	**−.16**	**−.15**	**−.17**
	Race	**−.25**	**−.25**	**−.25**	**−.25**	**−.25**
	Age Cohort	**−.08**	**−.08**	**−.08**	**−.08**	**−.08**
	Intelligence	**.49**	**.48**	**.48**	**.48**	**.48**
	Intelligence^2	**.03**	**.03**	**.03**	**.03**	**.03**
	Intelligence X Parental SES	**.04**	**.04**	**.04**	**.04**	**.04**
	Constant	**2.89**	**2.92**	**2.90**	**2.92**	**2.92**
	R-square	.39	.38	.39	.38	.39
Comparison	*R-change*	**.14**	**.14**	**.13**	**.13**	**.14**
	N	74,644	74,644	74,644	74,644	74,644

Notes: Unstandardized regression coefficients. Gender and race are effects coded (men = −1, women=1; non-whites=−1, whites=1). Personality traits, intelligence, parental SES, and age cohort were standardized prior to the analyses. All regression analyses were weighted by the 11th year case weight assigned by the Project Talent staff to account for attrition. Bold font indicates $p < .001$ (alpha level was set based on a Bonferroni correction to account for the number of analyses conducted across this data set).

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Table 4

Moderated polynomial regressions on the annual income outcome (one independent regression for each of the Big Five). Model 1 controls for gender, race, and age. Model 2 adds controls for IQ, IQ-square, and IQ X SES.

Model	Income predictors	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
1	Personality	**.04**	**.02**	**.03**	**.03**	**.02**
	Parental SES	**.07**	**.07**	**.07**	**.07**	**.07**
	Personality X Parental SES	**−.01**	−.00	**−.01**	−.00	−.00
	Personality^2	.00	.01	.00	.00	.00
	Parental SES^2	.00	.00	.00	.00	.00
	Gender	**−.33**	**−.34**	**−.33**	**−.33**	**−.34**
	Race	**−.02**	**−.02**	**−.02**	**−.02**	**−.02**
	Age Cohort	**−.07**	**−.07**	**−.07**	**−.07**	**−.07**
	Constant	**9.01**	**9.00**	**9.01**	**9.01**	**9.01**
	R-square	.30	.30	.30	.30	.30
2	Personality	**.03**	**.02**	**.02**	**.03**	**.02**
	Parental SES	**.05**	**.06**	**.06**	**.06**	**.06**
	Personality X Parental SES	−.01	−.00	**−.01**	.00	−.00
	Personality^2	−.00	.01	−.00	−.00	−.00
	Parental SES^2	.01	.01	.01	.01	.01
	Gender	**−33**	**−.33**	**−.33**	**−.33**	**−.33**
	Race	**−.04**	**−.04**	**−.04**	**−.04**	**−.04**
	Age Cohort	**−.08**	**−.08**	**−.08**	**−.08**	**−.08**
	Intelligence	**.05**	**.05**	**.05**	**.05**	**.05**
	Intelligence^2	.00	.00	.00	.01	.00
	Intelligence X Parental SES	**−.01**	**−.01**	**−.01**	**−.01**	**−.02**
	Constant	**9.02**	**9.02**	**9.02**	**9.02**	**9.02**
	R-square	.31	.31	.31	.31	.31
Comparison	*R-change*	**.01**	**.01**	**.01**	**.00**	**.01**
	N	53515	53515	53515	53515	53515

Notes: Unstandardized regression coefficients. Gender and race are effects coded (men = −1, women=1; non-whites=−1, whites=1). Personality traits, intelligence, parental SES, and age cohort were standardized prior to the analyses. All regression analyses were weighted by the 11th year case weight. Bold font indicates $p < .001$.

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Table 5

Moderated polynomial regressions on the occupational prestige outcome (one independent regression for each of the Big Five). Model 1 controls for gender, race, and age. Model 2 adds controls for IQ, IQ-square, and IQ X SES.

Model	Prestige predictors	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
1	Personality	**2.03**	**2.10**	**3.01**	**2.21**	**2.29**
	Parental SES	**6.87**	**6.98**	**6.92**	**6.89**	**6.88**
	Personality X Parental SES	**−.58**	−.26	−16	−.20	−.18
	Personality^2	**.86**	**.33**	**.66**	**.61**	**.39**
	Parental SES^2	**.53**	**.99**	**1.01**	**.95**	**.84**
	Gender	**−2.17**	**−2.53**	**−2.41**	**−2.16**	**−2.06**
	Race	.13	.12	.18	.05	.28
	Age Cohort	**.40**	**.30**	.21	.20	**.34**
	Constant	**39.96**	**40.50**	**40.08**	**40.32**	**40.32**
	R-square	.15	.15	.16	.16	.15
2	Personality	**1.93**	**1.61**	**2.01**	**1.15**	**2.02**
	Parental SES	**3.88**	**4.01**	**4.11**	**4.09**	**3.90**
	Personality X Parental SES	−.20	.03	.06	−.01	.18
	Personality^2	**.33**	.03	−.05	.18	.01
	Parental SES^2	**.59**	**.54**	**.60**	**.56**	**.49**
	Gender	**−1.25**	**−1.50**	**−1.37**	**−1.20**	**−1.63**
	Race	**−2.64**	**−2.67**	**−2.52**	**−2.71**	**−2.54**
	Age Cohort	**−1.71**	**−1.76**	**−1.71**	**−1.71**	**−1.77**
	Intelligence	**8.38**	**8.36**	**8.19**	**8.27**	**8.39**
	Intelligence^2	**.63**	**.62**	**.60**	**.56**	**.62**
	Intelligence X Parental SES	**.37**	**.39**	**.38**	**.38**	.31
	Constant	**42.00**	**42.34**	**42.30**	**44.22**	**42.26**
	R-square	.28	.28	.28	.27	.28
Comparison	*R-change*	**.12**	**.12**	**.12**	**.12**	**.12**
	N	53,538	53,538	53,538	53,538	53,538

Notes: Unstandardized regression coefficients. Gender and race are effects coded (men = −1, women=1; non-whites=−1, whites=1). Personality traits, intelligence, parental SES, and age cohort were standardized prior to the analyses. All regression analyses were weighted by the 11th year case weight. Bold font indicates $p < .001$.

Table 6

Moderated polynomial regressions on each of the three status attainment outcomes. Model 1 controls for gender, race, and age.

Predictors	Educational attainment	Annual income	Occupational prestige
Intelligence	**.49**	**.05**	**8.49**
Parental SES	**.30**	**.06**	**4.21**
Intelligence X Parental SES	**.04**	**−.02**	**.36**
Intelligence^2	**.03**	.00	**.56**
Parental SES^2	**.05**	.01	**.60**
Gender	**−.14**	**−.32**	**−1.12**
Race	**−.26**	**−.04**	**−2.81**
Age Cohort	**−.07**	**−.08**	**−1.59**
Constant	**2.92**	**9.02**	**42.53**
R-square	.38	.31	.27
N	74,644	53,515	53,538

Notes: Unstandardized regression coefficients. Gender and race are effects coded (men = −1, women=1; non-whites=−1, whites=1). Intelligence, parental SES, and age cohort were standardized prior to the analyses. All regression analyses were weighted by the 11th year case weight. Bold font indicates $p < .001$.

Table 7

Main effect estimates in natural metrics (computed for 1SD, −1 to 1SD, −2 to 2SD of each predictor). The estimates were based on Tables 3, 4, and 5 (Models 1), where each personality trait predicted each status attainment outcome in a separate independent regression model (i.e., 15 regression models, without intelligence controls). The main effect of SES remained unchanged across the five personality regressions (within each outcome); thus, we present the average main effect of SES across the five regressions within each outcome.

	Education			**Income**			**Prestige**		
Predictor Variables	**1SD**	**−1 to 1 SD**	**−2 to 2SD**	**1SD**	**−1 to 1 SD**	**−2 to 2SD**	**1SD**	**−1 to 1 SD**	**−2 to 2SD**
Extraversion	1.8 months	3.6 months	7.2 months	$2,419	$4,837	$9,674	“mail handler” to “compositor/typesetter”	“mail handler” to “stenographer”	“mail handler” to “auctioneer”
Agreeableness	2 months	4 months	8 months	$1,209	$2,419	$4,838	“mail handler” to “electric power lineman”	“mail handler” to “stenographer”	“mail handler” to “auctioneer”
Conscientiousness	2.7 months	5.4 months	10.8 months	$1,814	$3,628	$7,256	“mail handler” to “receptionist”	“mail handler” to “decorator”	“mail handler” to “superintendent”
Emotional Stability	2 months	4 months	8 months	$1,814	$3,628	$7,256	“mail handler” to “electric power lineman”	“mail handler” to “locomotive fireman”	“mail handler” to “legal secretary”
Openness	2.5 months	5 months	10 months	$1,209	$2,419	$4,838	“mail handler” to “telegraph operator”	“mail handler” to “inspector”	“mail handler” to “salesman retail”
SES	8.3 months	16.6 months	33.1 months	$4,233	$8,466	$16,987	“mail handler” to “railroad conductor”	“mail handler” to “construction inspector”	“mail handler” to “insurance agent/broker”

Note: All effects on education are based on the assumptions that each scale point represented 2 academic years of education (i.e., 18 months). Regarding income, each unstandardized b represents percentage from the mean. We computed dollar amount differences at the mean by multiplying b with the mean annual income, which was $10,279 in 1971, that is, the equivalent of $60,468 in 2014 (adjusted for inflation). All effects are in 2014 dollars (when b > .10, we used exp(b) and exp (−b) to compute income differences accurately). Job titles are the equivalent of TSEI2 prestige points (a scale sample can be found in Table 8).

Table 8

Sample of TSEI2 occupational prestige scores matched with job titles, following the coding system provided by Stevens and Featherman (1981).

Prestige Score	Job Title
(lowest score in the sample) 16.5	Professional drivers
(−1SD) 26.0	Mail handlers, except post office
28.0	Compositors and typesetters
28.1	Electric power linemen and cablemen
28.5	Telegraph operators
29.0	Receptionists
30.0	Stenographers
30.5	Locomotive firemen
30.8	Inspectors
32.2	Decorators and window dressers
32.7	Railroad conductors
34.4	Auctioneers
34.7	Legal secretaries
35.3	Salesmen, retail trade
38.4	Managers and superintendents buildings
39.6	Construction inspectors
40.1	Managers and administrators
44.1	Clerical supervisors
44.9	Inspectors, except construction, public administration
(Mean) 47.3	Sales representatives
49.1	Data processing machine repairmen
49.6	Foresters and conservationists
50.1	Air traffic controllers
51.6	High school teachers
52.5	Officials of lodges, societies, and unions
53.4	Insurance agents, brokers, and underwriters
54.5	Purchasing agents and buyers

Prestige Score	Job Title
57.1	Officials and administrators
61.9	Health administrators
64.9	Real estate appraisers
(+1SD) 68.6	Airplane pilots
77.8	Chemists
(highest scores in the sample) 89.6	Dentists

Note: These prestige scores are representative of the 1970 census job titles (U.S. Bureau of Census, 1971), which is when our participants were assessed for the 11th year follow-up.