Adolescent Conscientiousness Predicts Lower Lifetime Unemployment

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Abstract

Existing research on Big Five personality and unemployment has relied on personality measures elicited after the respondents had already spent years in the labor market, an experience which could change personality. We clarify the direction of influence by using the British Cohort Study (N = 4,206) to examine whether conscientiousness and other Big Five personality traits at age 16-17 predict unemployment over age 16-42. Our hypothesis that higher conscientiousness in adolescence would predict lower unemployment was supported. In analyses controlling for intelligence, gender, and parental socioeconomic status, the less conscientious (-1*SD*) had a predicted probability of unemployment twice as high (3.4% vs 1.7%) as the highly conscientious (+1*SD*), an effect size comparable to intelligence. Mediation analysis revealed that academic motivation and educational attainment explained only 8.9% of this association. Fostering conscientiousness in early-life may be an effective way to reduce unemployment throughout adulthood.

Keywords: conscientiousness, Big Five personality, unemployment, longitudinal data, cohort studies

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Unemployment profoundly affects human welfare (McKee-Ryan, Song, Wanberg, & Kinicki, 2005), has long-term scarring effects on well-being and wages (Gregg & Tominey, 2005; Daly & Delaney, 2013) and incurs large economic costs to society via increased welfare payments and reduced productivity. Unemployment is often viewed as directly resulting from economic factors including the business cycle, economic recessions, and a mismatch between the skills sought by employers and the qualifications of those available for work (Hogan, Chamorro-Premuzic, & Kaiser, 2013). Whilst these factors are undoubtedly important, it is also likely that unemployment depends, at least partially, on psychological characteristics. Organizational research has identified the role of dispositional variables in shaping job performance and career success but has been less successful in pinpointing the traits that contribute to finding and retaining a job (Hogan et al., 2013; Ones, Dilchert, Viswesvaran, & Judge, 2007). Identifying the psychological characteristics that help people find and retain employment could help direct resources towards fostering these characteristics (Heckman & Kautz, 2013).

Personality traits, often indexed by the Big Five framework of conscientiousness, neuroticism, extraversion, openness and agreeableness (Costa & McCrae, 1985) are among the most important psychological characteristics given their predictive power for many consequential labor market outcomes (Borghans, Duckworth, Heckman & ter Weel, 2008). Of the Big Five, conscientiousness has the strongest links with career performance and occupational status (Almlund, Duckworth, Heckman & Kautz, 2011). Conscientious individuals are organized, responsible, hardworking, and ambitious, all quintessentially desirable habits in employees. Decades of organizational research has provided empirical evidence that conscientious employees thrive in the workplace (Barrick, Mount, & Judge, 2001; Judge, Higgins, Thoresen, & Barrick, 1999), are highly motivated to learn (Colquitt,

LePine, & Noe, 2000), set high work goals (Judge & Ilies, 2002), tend to avoid procrastination and other counterproductive behaviors (Berry, Ones, & Sackett, 2007; Steel, 2007), show superior individual and team performance (Judge, Rodell, Klinger, Simon, & Crawford, 2013; Peeters, Van Tuijl, Rutte, & Reymen, 2006), and go on to emerge as leaders (Judge, Bono, Ilies, & Gerhardt, 2002).

Despite the established importance of conscientiousness in the work domain, it is not clear whether conscientiousness shapes employment prospects. Results from Germany, America and Finland are mixed, with some studies showing that high levels of conscientiousness are associated with lower unemployment (Uysal & Pohlmeier, 2011; Fletcher, 2013) and others finding null effects (Specht, Egloff, & Schmukle, 2011; Viinikainen & Kokko, 2012; Boyce, Wood, Daly, & Sedikides, 2015). This is despite evidence that the conscientious are more effective at the job search process, which helps them re-enter employment more quickly (Kanfer, Wanberg, & Kantrowitz, 2001). Furthermore, they also appear to experience greater drops in well-being following unemployment and gain greater satisfaction from their jobs and higher income, suggesting they may be particularly motivated to achieve productive employment (Boyce, Wood, & Brown, 2010; Boyce & Wood, 2011; Judge, Heller, & Mount, 2002).

However, a key limitation of prior studies examining the link between conscientiousness and unemployment is their use of personality measures elicited several years after the respondent entered the labor market. Given that unemployment can change personality (Boyce, Wood, Daly, & Sedikides, 2015), these studies cannot rule out the possibility that personality was at least partly determined by unemployment, thus explaining why the two variables are related – indeed one test of reverse causality in Viinikainen and Kokko (2012) could not rule out that unemployment in early life may have affected personality by middle age. Some studies have clarified the direction of influence by

examining traits measured before the respondents accumulated substantial labor market experience; for example Daly, Delaney, Egan, and Baumeister (2015) showed that more self-controlled children tend to experience less unemployment as adults. Self-controlled children are thought to better internalize and comply with standards and norms for behavior in order to become more conscientious adolescents (Eisenberg, Duckworth, Spinrad, & Valiente, 2014). Conscientiousness captures more than the continuity of childhood self-control into adolescence and adulthood; it encapsulates work-promoting tendencies such as being responsible and punctual, being orderly and organized and persevering to achieve important goals. Additionally, prior studies have been limited by the use of small samples or have neglected to control for important early-life predictors of future employment success (such as cognitive ability and social class at birth) which are known to correlate with personality (e.g. see Daly, Delaney, Egan, and Baumeister, 2015).

We seek to address this gap in the literature and avoid the limitations of prior studies. We therefore examine the hypothesis that higher conscientiousness in adolescence will predict lower future unemployment. We examine this relationship over three decades in a large sample of British adults while controlling for cognitive ability and social class. Because the personality measures we employ were elicited before the cohort members accumulated substantial experience in the labor market, this design limits the possibility of unemployment influencing personality. Since this is the first paper we are aware of which uses pre-labor market measures of Big Five personality to examine this outcome, our results may help to settle previously mixed findings in this literature.

Hypothesis 1: More conscientious adolescents will be less likely to experience unemployment as adults.

Theoretical research by Cunha and Heckman (2007) on lifecourse skill development, emphasizing the compounding benefits over time of high levels of early noncognitive skills (a term which includes personality traits), suggests that higher conscientiousness in early-life could lead to better labor market outcomes through education. Highly conscientious young people perform better academically and gain more advanced educational qualifications (Almlund et al., 2011). Meta-analytic evidence indicates that the consistent positive association between conscientiousness and academic performance (d = .46) may even be comparable in magnitude to that of cognitive ability (d = .52) (Poropat, 2009). More years of education are in turn linked with better labor market prospects in the form of higher earnings and employment rates (Card, 1999; Lundborg, Nilsson, & Rooth, 2014). Unemployment rates also differ markedly as a function of educational attainment: unemployment rates among the OECD countries in 2012 were 5.4% for those with a tertiary education, 8.3% for those with an upper secondary education and 13.5% for those without an upper secondary education (figures taken from Table A5.2a in OECD, 2014).

The close link between conscientiousness and educational attainment partially reflects the tendency of conscientious students to be highly academically motivated (De Feyter, Caers, Vigna, & Berings, 2012; Steel, 2007). They value education, enjoy learning, and are interested in mastering new and challenging tasks (Gottfried, 1990; Komarraju, Karau, & Schmeck, 2009). The benefits of a preference for active learning could extend beyond the school and college years into the workplace where employees need to engage with professional development training, master course materials, and accumulate career relevant knowledge to improve their work competencies and enhance their career success (Bakker, Demerouti, & ten Brummelhuis, 2012).

Given the established link between conscientiousness and greater academic motivation and educational attainment, we therefore examine whether these serve as intervening variables explaining the conscientiousness-unemployment link.

Hypothesis 2: The relationship between conscientiousness and unemployment will be partially mediated by differences in academic motivation and educational attainment.

Data and Method

Participants and Procedure

We examined data from the British Cohort Study (BCS)[1] to test the relationship between adolescent personality and adult unemployment (all data-sets used are described in the Supplementary Materials, Section 1). The BCS, a nationally-representative study of 17,000 children born in Britain in a single week in 1970, contains self-reported personality measures at age 16-17 and month-by-month employment data spanning January 1986 to April 2009. Although the age 16-17 sweep recorded data from 11,622 cohort members, many did not report personality data due to teacher strikes preventing them from receiving questionnaires in school. The survey design was altered so that questionnaires were sent directly to cohort members' homes, but this process had relatively high rates of non-response: only 4,947 cohort members reported complete data for all four personality measures used in our analysis. Those reporting personality data differed on important observable background characteristics from the rest of the sample: They were more likely to be female (57% female for those with personality data vs. 43% for those without), have a father from the two highest socioeconomic classes (21% vs. 14%) and have higher scores on an intelligence test at age 10

[1] For an overview of the British Cohort Study see http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=795&sitesectiontitle=Welcome+to+the+1970+British+Cohort+Study. For a list of publications using this data see http://www.cls.ioe.ac.uk/Bibliography.aspx?sitesectionid=647&sitesectiontitle=Bibliography&d=1&yf=&yt=&a=&s=BCS70&o=&j=.

(79.8 vs. 73.9, $t(10,907) = -20.6$, $p < .0001$). After retaining data for those with complete data for all four personality items, imputing values for intelligence, and matching with adult unemployment data, we used a sample size of 4,206 (835,454 observations) for our main regressions. To account for the over-representation of females and higher SES groups in our sample, we applied weights to all of our regression analyses so that these variables tracked the nationally-representative distribution present in the first wave of the BCS. Our results do not substantially differ in the weighted versus unweighted analyses (latter available upon request).

Measures

Adolescent Personality. Four personality measures were derived from 12 individual items, elicited via self-report when the cohort members were aged 16-17 as part of a set of questionnaires concerning attitudes. In order to select the questions which best captured elements of personality as indexed by the Big Five, we followed the factor analysis Lenton (2014) conducted using the BCS, whereby three questions for each personality trait were used. We created variables for four of the Big Five personality traits using Lenton's recommended items. Although we were unable to find suitable items to construct Openness, we did control for intelligence which typically correlates positively with openness (Zeidner & Matthews, 2000). From the 'Knowing Myself' questionnaire, we used 10 statements which appeared to capture elements of Conscientiousness ("I am punctual / reliable / responsible"), Extraversion ("I am quiet / shy / popular"), Agreeableness ("I am friendly / helpful / obedient") and Neuroticism ("I am nervous"). These statements were rated on a scale of (1) "Does not apply", (2) "Applies somewhat", (3) "Applies very much". We used two statements from the 'How I Feel' questionnaire for the Neuroticism measure ("Felt constantly under strain", "Been losing confidence in myself"). These two questions were rated on a scale of (1) "Not at all", (2) "No more than usual", (3) "Rather more than usual", (4) "Much more than usual".

We recoded these latter two variables to combine categories (3) and (4) to maintain consistency with the previous questions, such that all responses ranged in value from 1 to 3. After reverse scoring the appropriate items, we summed 3 questions per trait to create variables for Conscientiousness, Extraversion, Agreeableness and Neuroticism. We then standardized these four personality variables to have a mean of 0 and standard deviation of 1.

In order to determine the validity of the BCS personality measures, we examined the extent to which they correlated with a standard contemporary personality scale. Specifically, we collected a sample of 389 Americans ranging in age from 18 to 75 (M = 31.7, SD = 11.5) via the website Amazon Mechanical Turk and asked them to rate their personality using the 12 items from the present study and the 50-item version of the International Personality Item Pool (IPIP) (Goldberg, 1992). We used AMOS 19 to examine factor covariances for each personality trait as gauged using the BCS measures and the IPIP. The four personality domains from the present study all exhibited high correlations with their counterparts in the IPIP (r = .78 on average), indicating a good degree of convergent validity. The correlations for the Conscientiousness (r = .67), Extraversion (r = .93), Agreeableness (r = .70) and Neuroticism measures (r = .83) were significant at $p < .01$. The size of the convergence is in keeping with personality validation studies (Muck, Hell & Gosling, 2007; Rammstedt & John, 2007) which found similar levels of correspondence between short personality scales and a Big Five Inventory, as well as a similar pattern of higher convergent validity for short measures of Extraversion (average r = .72 across those two validation studies) and lower convergent validity for short measures of Agreeableness (r = .55).

Unemployment. We created binary variables (0 = “Employed”, 1 = “Unemployed”) tracking whether the cohort member was unemployed on a month-by-month basis from January 1986 to April 2009. This variable followed the conventional coding by excluding people outside the labor force, such as students or homemakers. The average cohort member

reported 198 months of data (*SD* = 58.4) and the average (unweighted) unemployment rate was 2.2% among the 4,206 cohort members in our sample (18,264 out of 835,454 observations). Unemployment statistics from the Labor Force Survey over 1992 to 2008 among people of a similar age to our sample members are around 7% in the population compared to around 2-3% in our sample ("A05 NSA," 2016). The low rate of unemployment in our sample reflects the fact that those who provided personality data were more likely to be female and be from a higher SES background, both groups less likely to experience unemployment

Childhood Factors. We included childhood intelligence, gender and initial socioeconomic status as control variables as these are all established predictors of adult socioeconomic outcomes. Intelligence was measured at age 10 using the British Ability Scales which was made up of two verbal (word definitions, word similarities) and two non-verbal (digit-span, matrices) subscales (Elliot et al., 1978). Intelligence scores were standardized to have a mean of 0 and standard deviation of 1 to allow direct comparison with the standardized personality variables. We included the child's gender and a measure of socioeconomic status (SES) derived from the father's occupation in 1970. The five main categories for this measure were: I = "Professional occupations"; II = "Managerial or technical occupations"; III = "Skilled occupations"; IV = "Semi-skilled occupations"; V = "Unskilled occupations"). In order to maximize sample size we also included two additional categories "Other status" and "Missing data"; these categories represented 191 out of 3,280 observations for this variable. Because self-control and conscientiousness are conceptually related, and because childhood self-control has been shown to be an important future predictor of unemployment (Daly, Delaney, Egan, & Baumeister 2015), we also conducted a robustness check by rerunning our main analyses while controlling for a 9-item self-control measure elicited when the cohort members were aged 10 (see Supplementary Materials,

Section 2). This scale, described in detail in Daly, Delaney, Egan, and Baumeister (2015), was based on teacher-scored items which gauged attentional control (e.g. "cannot concentrate on a particular task") and perseverance (e.g. "shows perseverance"). If the inclusion of the self-control variable in our robustness check did not markedly diminish the relationship between adolescent conscientiousness and later unemployment, then we would consider the latter relationship not to be strongly affected by confounding.

Pathways between Conscientiousness and Unemployment. We included two educational variables which we considered plausible pathways between adolescent conscientiousness and future unemployment. Academic motivation was measured at age 16 by having students rate their level of agreement with eight statements (e.g. "school is largely a waste of time", "never take work seriously") on a 3-point Likert scale. While we would prefer a measure of academic motivation measured at a separate time-point to conscientiousness, the collinearity between these two variables ($r = .26$, $p < .01$) is not sufficiently large as to markedly attenuate the unique variance available to explain our outcome, unemployment. Higher scores on this scale have been found to predict better adult occupational status and educational attainment after controlling for intelligence and initial socioeconomic status in the British Cohort Study and National Child Development Study (Ritchie & Bates, 2013; Schoon, 2008). In our data this scale demonstrated good internal consistency (Cronbach's alpha = .76 for a sample of 2,997 reporting data on this measure). After coding individual item scores so that a higher score always meant more academic motivation, we summed scores for the eight items and standardized the resulting variable to have a mean of 0 and standard deviation of 1. We also included a measure of educational attainment assessed at ages 26 and 30. Although this variable was elicited several years after the cohort members entered the labor market, we consider it reasonable to treat it as an intermediate step between conscientiousness and unemployment because very few cohort

members experienced unemployment prior to leaving education: almost 97% completed their full-time education by age 23, and by that same age 89% had experienced 3 months or less of unemployment (figures refer to a sample size of 3,788 individuals reporting both unemployment histories and information on when they completed full-time education). Omitting from the sample the cohort members who experienced more than 3 months of unemployment before completing their education by age 23 does not substantially change our mediation results. The education variable was indexed using National Vocational Qualifications (NVQ). There were six categories ranging from 0 = No qualification to 5 = NVQ 5 indicating higher degrees. We first used data from the age 30 measure; if this was unavailable we used the age 26 measure.

Missing Data. Of the cohort members reporting data on the four personality measures, gender, the SES variable and the outcome variable (N = 4,206), only 3,204 reported intelligence data. Analysis of the pattern of missing data found that this variable was not missing completely at random (MCAR), indicating that intelligence values could be estimated using observed values for the other variables. We therefore applied Rubin's multiple imputation method (Rubin, 1987) to impute missing intelligence values using multiple imputation chained equations (MICE), a technique which carries out a series of sequential regressions for each of the multiple imputations (White, Royston, & White, 2011). We used predictive mean matching to limit the imputed intelligence values to within the possible score range and created five imputed values. These imputed values were then pooled to produce the final estimates. Using this method instead of listwise deletion did not substantially alter the regression results, nor did supplemental analyses using both imputed intelligence and imputed personality values (see Supplementary Materials, Section 3).

Statistical Methods

We specified a longitudinal Probit model to estimate the association between adolescent personality and the average probability of being unemployed from age 16 to 38 (*Model 1)* and calculated marginal effects to estimate percentage point changes in the probability of unemployment for unit changes in the independent variables (Long & Freese, 2014). We also included a time variable (ranging from the year 1986 to 2009) to account for the decreasing unemployment rate as the cohort members entered middle age (a trend evident in Figure 1), and clustered observations by ID to account for repeated observations on the same individual. The formal specification of this model was:

Model 1: Unemployment from age 16 to $38_{it} = \beta_0 + \beta_1$ adolescent $\text{personality}_i + \sum\beta_2$ childhood $\text{factors}_i + \beta_3 \text{year}_t + \varepsilon_{it}$

Our examination of explanatory pathways added our intermediary variables to this model (*Model 2*). Because our examination of the mediating role of education in isolation (omitting academic motivation) found no indirect pathway from conscientiousness to unemployment, it was not possible to conduct sequential path analysis. For this reason we used parallel path analysis. Our mediation analysis was implemented using the *khb* procedure in Stata (Kohler, Bernt Karlson, & Holm, 2011), which adjusts for the rescaling issues which occur when attempting cross-model comparisons of non-linear models and can provide an unbiased decomposition of the total effect of conscientiousness on unemployment into direct and indirect (mediation) effects. The khb method calculates the mediation effect by comparing the results from a full model, which includes the mediating variables, to the results from a reduced model, which includes the residuals of the mediating variables (calculated separately by regressing the mediating variables on the model covariates). This method standardizes the scale between the two equations. The difference between the main

coefficients in the two analyses can then be interpreted as the mediation effect. The khb procedure assumes a normal distribution of the indirect effect, an assumption shown to be valid in large samples such as the one we use in this study (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Including academic motivation and educational attainment in the regression model, and omitting imputed intelligence values which are not supported in the *khb* procedure, reduced the number of cohort members in the mediation analysis from 4,206 to 2,933. The formal specification of this model was:

Model 2: Unemployment from age 16 to $38_{it} = \beta_0 + \beta_1$ adolescent personality$_i + \sum\beta_2$ childhood factors$_i + \beta_3$ year$_t + \beta_4$ academic motivation$_i + \beta_5$ education$_i + \varepsilon_{it}$

Lastly, we conducted analyses testing three alternative unemployment outcomes used in Viinikainen and Kokko (2012). These were the total duration of unemployment in months, the number of spells of unemployment, and length of unemployment spells among those who experienced at least one spell (see Supplementary Materials, Section 4).

Results

Descriptives

Table 1 contains descriptive statistics and correlations among key variables respectively. The average unweighted unemployment rate across all time periods was 2.2%, ranging from a high of 7.7% at age 16 to a low of 0.9% at age 35. The average total number of months of unemployment was 4.3 (*SD* = 16.9) and the median was 0. Although the sample differed on observable covariates from the cohort members who did not report personality data, there was not substantial attrition over time on the basis of childhood intelligence, personality, gender or SES, diminishing the risk that certain cohort members (e.g. the less conscientious) may have been less likely to engage with the survey over time. Conscientiousness correlated positively with academic motivation ($r = .26$, $p < .01$) and

educational attainment (r = .08, p < .01) and negatively with months of unemployment (r = -.07, p < .01). More months of unemployment also correlated with worse academic motivation (r = -.08, p < .01) and lower educational attainment (r = -.11, p < .01), supporting our rationale for including these variables as potential pathways between conscientiousness and unemployment.

Unemployment rates varied considerably by level of conscientiousness (see Figure 1). From age 16 to 38, the average unweighted unemployment rate for the highly conscientiousness (those scoring 1 *SD* and above the mean conscientious score) was 1.5%, compared to 3% for those with low conscientiousness scores (those scoring 1 *SD* and below the mean conscientiousness score) and the less conscientious reported an average of 5.8 months of unemployment (*SD* = 19.7) compared to 3.0 months (*SD* = 13.1) for the highly conscientious.

[Insert Table 1 and Figure 1 here]

Regressions

Table 2 describes our regression results. After controlling for intelligence, gender and SES, and computing marginal effects, a 1 *SD* increase in conscientiousness was associated with a 0.8 percentage point (95% confidence intervals (CI) = [-0.5, -1.2]) lower average probability of unemployment from age 16 to 38. In percentage terms this was equivalent to a 34% reduced likelihood of unemployment. Stated differently, the less conscientious (-1 *SD*) had a predicted unemployment rate twice as high as the highly conscientious (+1 *SD*): 3.4% (95% CI = [2.7%, 4.0%]) vs. 1.7% (95% CI = [1.4%, 2.0%]). The effect of higher conscientiousness was similar to the effect of a 1 *SD* increase in intelligence (-0.6 percentage points; 95% CI = [-0.1, -1.1]), and larger than the effects of extraversion, agreeableness or neuroticism, none of which were significantly associated with unemployment.

Additional regressions, not presented here, did not find substantive gender differences in the association between any personality trait and unemployment. Because self-control is considered to be a lower-order facet of conscientiousness (Roberts, Chernyshenko, Stark, & Goldberg, 2005) and is an established predictor of unemployment (Daly, Delaney, Egan, & Baumeister, 2015), we tested whether conscientiousness was associated with unemployment independently of the effects of self-control. That robustness test found that controlling for childhood self-control reduced the conscientiousness coefficient slightly without altering its significance level (see Table S1). Conscientiousness predicted unemployment in analyses when using both imputed intelligence and personality scores (see Table S2), and when using alternative specifications of the outcome variable (Tables S3-5). In the latter, higher conscientiousness predicted fewer total months of unemployment (b = -0.27, SE = 0.06, p < .001) and fewer spells of unemployment (b = -0.19, SE = 0.04, p < .001) but not significantly shorter unemployment spell durations (b = 0.81, SE = 0.38, p = 0.06).

[Insert Table 2 here]

Higher conscientiousness was predictive of higher academic motivation (b = 0.53, SE = 0.06, p < .001) and greater educational attainment (b = 0.10, SE = 0.03, p < .001) in OLS regressions (see Table 3), providing initial support for our prediction that these variables might partly explain the long-run association between conscientiousness and unemployment. Adjusting for the two mediation variables decreased the effect of higher conscientiousness on unemployment by 0.2 percentage points (see Model 2 in Table 2): of the two mediators, higher academic motivation predicted a 0.4 point lower probability of unemployment (p < .05), whereas more educational attainment had no statistically significant impact on unemployment.

[Insert Table 3 here]

Formal mediation analysis, produced using the *khb* procedure (see Table 4), found similar results; the association between conscientiousness and unemployment (total effect: b = -0.15, SE = 0.04, $p < .001$) was partially mediated by differences in academic motivation and educational attainment but their combined effect was not statistically significant (indirect effect: b = -0.01, SE = 0.01, p = .06). Separating their effects revealed a significant mediation effect for academic motivation (b = -0.01, SE = 0.00, $p < .05$) and a non-significant mediation effect for educational attainment (b = -0.00, SE = 0.00, p = .73), but differences in academic motivation still only explained 8.9% of the association between conscientiousness and unemployment. In other words, the vast majority of the association between conscientiousness and unemployment was not explained by our mediating variables.

[Insert Table 4 here]

Discussion

Our results showed that conscientiousness at age 16-17 predicted unemployment across two decades. The long reach of conscientiousness could not be attributed to either childhood socioeconomic status, intelligence, or other personality traits. The effect of conscientiousness was comparable to intelligence, traditionally the strongest predictor of occupational outcomes (e.g. Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). Previous research examining how Big Five personality predicts unemployment has used personality measures elicited after the study participants had entered the labor market. Since unemployment can itself influence personality (Boyce, Wood, Daly, & Sedikides, 2015), this may partly explain the hitherto mixed results in this literature. A key benefit of the data used in the study is that personality was measured before the cohort members had accumulated much labor market experience, clarifying the direction of influence as flowing from personality to unemployment.

Our findings suggest that conscientiousness contributes to sustained employment and that its influence is meaningful and not conditional on life-stage. Our results also contribute to the growing research in organizational psychology looking at the determinants of employability (Hogan et al., 2013) by providing empirical evidence that conscientiousness is valued by employers. Whilst reliable, responsible adolescents went on to experience little unemployment in adulthood, we found no effects for neuroticism, agreeableness or extraversion. Given that neuroticism and distress have been shown to predict unemployment (Egan, Daly, & Delaney, 2016; Fletcher, 2013; Uysal & Pohlmeier, 2011), particularly during periods of economic turbulence (Egan, Daly, & Delaney, 2015; Egan, Daly, & Delaney, 2016), it is possible that the absence of a link in this study may be because the labor market experience of this cohort mostly coincided with a period of relatively low unemployment in Britain throughout the 1990s and early 2000s.

Early identification of the personality traits that influence who becomes unemployed may better guide the targets of interventions, such as school and work programs designed to foster the development of particular psychological characteristics (Heckman & Kautz, 2013). For instance, school programs which promote attentional control, patience and forward-looking behavior (Diamond & Lee, 2011) may be effective ways of producing lasting changes in conscientiousness (Eisenberg et al., 2014). This may in turn reduce later unemployment levels, although there is not yet strong evidence that such programs improve long-run labor market outcomes. Given the large economic and welfare costs of unemployment, the potential returns to such interventions may be high.

In addition to inducing dispositional changes, interventions could target the intermediary processes which connect conscientiousness and later labor market success. We found that conscientious adolescents were more academically motivated than their peers, and went on to experience less unemployment. Those who are motivated to devote time and effort

to their schoolwork will likely carry this work ethic into their adult occupations, become valued employees and find more employment opportunities. Given that educational attainment had little additional explanatory power for predicting unemployment after adjusting for academic motivation, this suggests that investing in motivational interventions in early life may yield positive returns. However, despite the explanatory power of the pathways we examined, over 90% of the association between conscientiousness and unemployment remained unexplained, suggesting a potential role for mediating factors outside the domain of education.

Industrial-organizational research points to additional pathways through which conscientiousness may confer resilience to unemployment. Conscientiousness forms an established dispositional basis for organizational citizenship behaviors, performance motivation and workplace performance (e.g. Judge & Ilies, 2002; Chiaburu, Oh, Berry, Li, & Gardner, 2011). The strong inclination of the conscientious to set goals, work hard, and go beyond their role requirements may explain, at least in part, why they tend to experience lower unemployment. Conversely, periods of unemployment experienced by the less conscientious could have long-lasting effects on their subsequent career prospects (Arulampalam, 2001), a negative cycle that could be compounded by the difficulties in the job-search process experienced by this group (Kanfer et al., 2001). However, the results of our supplemental analyses (Tables S3-5), which found that less conscientiousness individuals were more likely to experience a greater number of unemployment spells, but that these spells were not significantly longer than those experienced by the highly conscientious, suggests that low conscientiousness may be a greater concern for retaining a job rather than finding one.

We note three limitations. First, although we applied weights to our analyses to enable generalizability of our findings to the broader British population, the weighted unemployment

rate in our sample was still lower than the population rate. Adding a greater array of background variables (e.g. region of birth) to generate more precise weights might allay this problem, but this would reduce the sample size as many cohort members do not report data on these variables. Additionally, we cannot weigh for unobserved variables which may have affected the probability of the cohort members appearing in our sample, which we would not have been able to weigh for. For example, our sample may have been biased in terms of personality (e.g. more conscientious people may have been more likely to respond to the personality survey), although we were not able to directly test for this. However, we did find that self-control scores (a conceptually related trait to conscientiousness) were 0.4 SD higher among those who reported personality data compared to those who did not, suggesting that the more conscientious may also have been more likely to respond. The fact that we identify a relatively large effect of conscientiousness on unemployment despite the possible restriction in range of the conscientiousness variable suggests that our finding is robust. Secondly, we use not fully validated scales. Such trade-offs are near inevitable when using historical data and are, we believe, offset by the benefits of using a large panel sample, particularly when it was essential to measure personality prior to labor force entry. We mitigated this limitation by showing reasonably sized correlations with a fully validated Big Five questionnaire in a contemporary sample. A comprehensive assessment of the construct of conscientiousness, which coupled self-reports with observer ratings, informant reports, and behavioral measures, would reduce measurement error and provide a more precise estimate of the success of this trait in forecasting unemployment (Roberts, Lejuez, Krueger, & Hill, 2014). Thirdly, our use of observational data means that we are unable to categorically rule out potential third factors as being the ultimate cause of both personality scores and labor market outcomes. Since our analysis does not demonstrate causality, the policy implications of our results remain necessarily tentative. Future researchers may attempt to isolate the

causal association using study designs such as sibling fixed-effects models, which can implicitly adjust for a greater range of family background characteristics than was possible in the present data.

In conclusion, this study underscores the importance of conscientiousness in shaping unemployment levels across working life, highlights the advantages of using adolescent personality measures to clarify the direction of influence, and identifies academic motivation as a mechanism linking adolescent conscientiousness and subsequent unemployment.

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Table 1. *Descriptive Statistics and Correlation Matrix for Key Variables.*

	Mean (SD) / % [range]	U	F	C	E	A	N	IQ	SES	M	E
Months unemployed	4.3 (16.8) [0-267]	1									
Female	58.1%	**-0.08**	1								
Conscientiousness	7.5 (1.3) [3-9]	**-0.07**	**0.07**	1							
Extraversion	6.6 (1.4) [3-9]	-0.02	**0.05**	0.03	1						
Agreeableness	7.0 (1.1) [3-9]	-0.03	**0.11**	**0.47**	**0.09**	1					
Neuroticism	5.2 (1.6) [3-9]	-0.00	**0.13**	-0.04	**-0.30**	-0.04	1				
Intelligence	80.3 (13.3) [31-123]	**-0.08**	**-0.07**	0.01	-0.01	**-0.06**	**0.05**	**1**			
SES at birth	2.9 (0.8) [1-5]	**0.10**	0.00	0.01	0.00	0.00	**-0.07**	**-0.27**	1		
Academic motivation	18.0 (3.1) [7-24]	**-0.08**	**0.07**	**0.26**	**-0.10**	**0.26**	-0.02	**0.15**	**-0.10**	1	
Education	2.9 (1.4) [0-5]	**-0.11**	**-0.06**	**0.07**	-0.04	0.03	**0.09**	**0.43**	**-0.26**	**0.30**	1

Note. Months of unemployment covers ages 16 to 38. SES excludes the categories “other” and “missing data”, and higher scores indicate lower SES. Bolded correlations are statistically significant at the 1% level. Data are unweighted.

Table 2. *Probit Regressions Predicting Average Probability of Unemployment from January 1986 to April 2009.*

	Outcome: Unemployment			
	Model 1		Model 2	
	Probit marginal effects		Probit marginal effects	
Independent variables	Coef.	SE	Coef.	SE
Conscientiousness	-0.008***	(0.002)	-0.006***	(0.002)
Extraversion	-0.002	(0.002)	-0.002	(0.002)
Agreeableness	0.004	(0.002)	0.004*	(0.002)
Neuroticism	0.002	(0.001)	0.001	(0.001)
Intelligence	-0.006*	(0.002)	-0.004	(0.003)
Female	-0.014***	(0.003)	-0.014***	(0.003)
SES				
I (highest)	-	-	-	-
II	0.004	(0.005)	0.002	(0.005)
III	-0.001	(0.003)	-0.004	(0.004)
IV	0.011*	(0.005)	0.006	(0.005)
V (lowest)	0.052**	(0.017)	0.039	(0.016)*
Other	0.015	(0.008)	0.014	(0.008)
Missing	0.011	(0.007)	0.006	(0.007)
Year	-0.002***	(0.000)	-0.002***	(0.000)
Academic motivation			-0.004*	(0.002)
Education			-0.002	(0.002)

Sample size	4,206	3,848
Observations	835,454	763,937

Note. Personality measures, intelligence and academic motivation are standardized ($M = 0$, $SD = 1$). The comparison category for SES is 'I'. Year ranges from 1986 to 2009; this variable captures the trend of declining unemployment over time. Education ranges from 0 (No qualification) to 5 (NVQ 5). Estimates are weighted by gender and SES, and include imputed intelligence values. Standard errors clustered by ID.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

Table 3. *OLS Regressions Predicting the Effect of Conscientiousness on Academic Motivation and Educational Attainment.*

Outcome	Academic motivation		Education	
	OLS coefficients		OLS coefficients	
Independent variable	Coef.	SE	Coef.	SE
Conscientiousness	0.531***	(0.057)	0.097***	(0.025)
Extraversion	-0.447***	(0.053)	-0.020	(0.023)
Agreeableness	0.600***	(0.062)	0.040	(0.025)
Neuroticism	-0.200***	(0.052)	0.109***	(0.023)
Intelligence	0.349***	(0.063)	0.429***	(0.031)
Female	0.374***	(0.100)	-0.143***	(0.044)
SES				
I (highest)	-	-	-	-
II	-0.589***	(0.199)	-0.460***	(0.081)
III	-0.819***	(0.171)	-0.779***	(0.071)
IV	-1.171***	(0.222)	-0.879***	(0.090)
V (lowest)	-1.063***	(0.358)	-1.137***	(0.142)
Other	-0.907***	(0.250)	-0.786***	(0.115)
Missing	-0.787***	(0.262)	-0.659***	(0.158)
Sample size	3,947		4,091	

Note. Academic motivation is unstandardized and ranges from 7 to 24. Education ranges from 0 (No qualification) to 5 (NVQ 5). Personality measures and intelligence are standardized ($M = 0$, $SD = 1$). The comparison category for SES is 'I'. Estimates are weighted by gender and SES, and include imputed intelligence values.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

Table 4. *Decomposition of Total Effect of Conscientiousness on Unemployment through Academic Motivation and Education*.

	Outcome: Unemployment	
	Model 2	
	Probit coefficients	
	Coef.	SE
Effect of conscientiousness on unemployment		
Total effect	-0.152***	0.036
Direct effect	-0.139***	0.035
Indirect effect (mediation effect)	-0.014	0.007
via Academic motivation	-0.013*	0.007
via Education	0.000	0.004
Sample size	2,933	
Observations	583,591	

Note. Estimates are weighted by gender and SES and control for all the covariates in *Model 2*. Standard errors clustered by ID. Sample size is smaller than that shown in Table 2, Model 2 because the mediation analysis does not use imputed intelligence values as these are not supported in the *khb* procedure.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

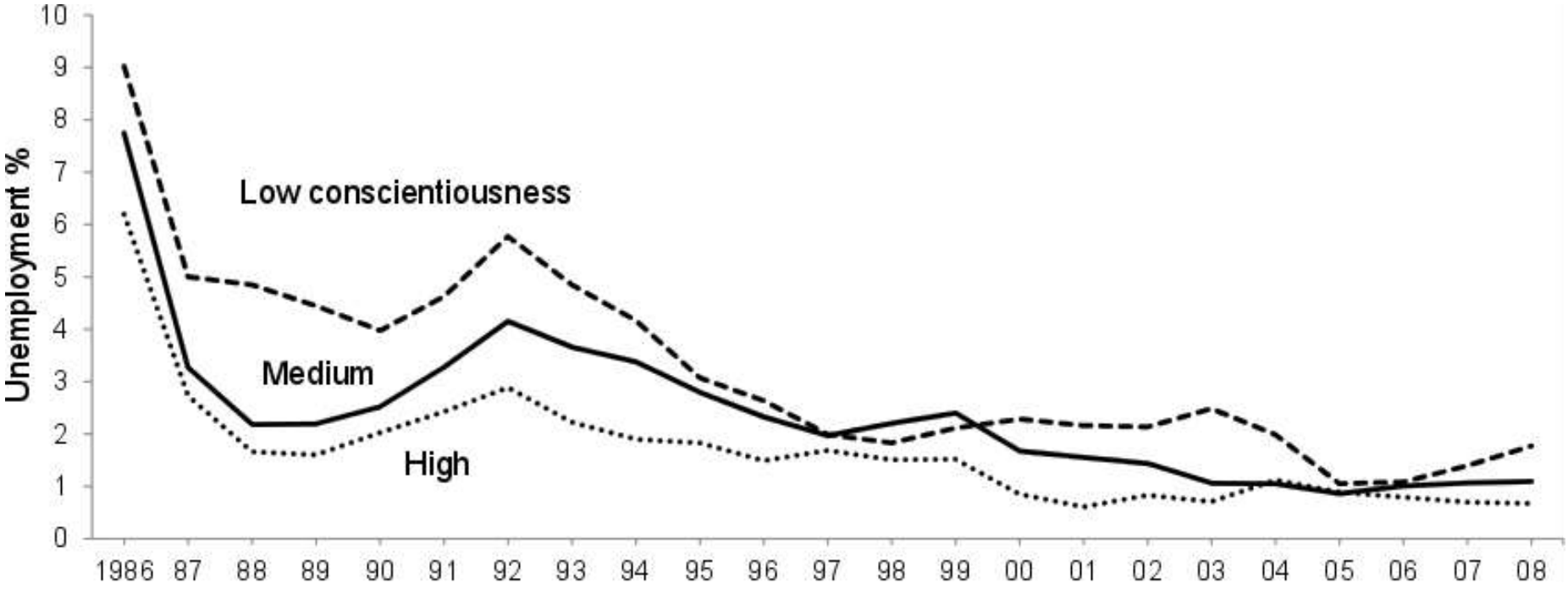

Figure 1. *Unemployment over time by levels of adolescent conscientiousness (N = 4,206; Observations = 834,530). "Low conscientiousness" refers to the 25.4% of cohort members scoring 1 SD and below the mean conscientious score; "Medium" is the 46.1% of cohort members scoring between 1 SD below and 1 SD above the average; "High" is the 28.5% of cohort members scoring 1 SD and above the average. Data are unweighted and omit the year 2009 due to small sample size.*

Supplementary information for:

Adolescent Conscientiousness Predicts Lower Lifetime Unemployment.

Section 1: List of data-sets used.

Section 2: Estimates of the association between conscientiousness and unemployment, before and after adjusting for childhood self-control.

Section 3: Estimates of the association between personality and unemployment using different levels of multiple imputation.

Section 4: Analyses using three alternative unemployment outcomes.

Section 1: List of data-sets used.

The British Cohort Study is managed by the Centre for Longitudinal Studies and is available to UK based researchers via the UK Data Archive (http://discover.ukdataservice.ac.uk/series/?sn=200001). The datasets used in this study are: Birth and 22-Month Subsample, 1970-1972 [SN2666], Ten-Year Follow-Up, 1980 [SN3723], Sixteen-Year Follow-Up, 1986 [SN3535], Twenty-Six Year Follow-Up, 1996 [SN3833], Thirty Year Follow-Up, 2000 [SN5558], Thirty-Four Year Follow-Up, 2004 [SN5585], Thirty-Eight Year Follow-Up, 2008 [SN6557], Activity Histories, 1986-2008 [SN 6943].

Section 2: Estimates of the association between conscientiousness and unemployment, before and after adjusting for childhood self-control.

Table S1. *Probit Regression Predicting the Average Probability of Unemployment from 1986 to 2008, Controlling for Childhood Self-Control.*

	Outcome variable: Unemployment			
	Model 1		Model 2	
	Probit marginal effects		Probit marginal effects	
Independent variables	Coef.	SE	Coef.	SE
Conscientiousness	-0.009***	(0.002)	-0.008***	(0.002)
Self-control			-0.006**	(0.002)
Sample size	2,876		2,876	
Observations	637,353		637,353	

Note. Conscientiousness and self-control are standardized ($M = 0$, $SD = 1$). Estimates are weighted by gender and SES, include imputed intelligence values and control for SES at birth, extraversion, agreeableness, neuroticism, intelligence, gender, and year of observation. Standard errors clustered by ID.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

Section 3: Estimates of the association between personality and unemployment using different levels of multiple imputation.

Table S2. *Probit Regression Predicting the Average Probability of Unemployment from 1986 to 2008 Using Different Levels of Imputation.*

	Model 1		Model 2		Model 3	
	Probit marginal effects		Probit marginal effects		Probit marginal effects	
	Coef.	SE	Coef.	SE	Coef.	SE
Conscientiousness	-0.010***	(0.002)	-0.008***	(0.002)	-0.010***	(0.003)
Extraversion	-0.000	(0.002)	-0.002	(0.002)	-0.004***	(0.001)
Agreeableness	0.004	(0.002)	0.004	(0.002)	0.003	(0.002)
Neuroticism	0.002	(0.002)	0.002	(0.001)	0.001	(0.002)
Intelligence	-0.006*	(0.003)	-0.006*	(0.002)	-0.012***	(0.001)
Female	-0.012**	(0.004)	-0.014***	(0.003)	-0.016***	(0.002)
SES						
I (highest)	-	-	-	-	-	-
II	-0.001	(0.005)	0.004	(0.005)	-0.003	(0.005)
III	-0.004	(0.004)	-0.001	(0.003)	-0.003	(0.004)
IV	0.006	(0.006)	0.011*	(0.005)	0.004	(0.005)
V (lowest)	0.048*	(0.019)	0.052**	(0.017)	0.038***	(0.008)
Other	0.018	(0.010)	0.015	(0.008)	0.010	(0.006)
Missing	0.024	(0.039)	0.011	(0.007)	0.005	(0.007)
Year	-0.002***	(0.000)	-0.002***	(0.000)	-0.002***	(0.000)
Imputed variables	None		Intelligence		Intelligence, Personality	
Sample size	3,204		4,206		11,372	

Observations	638,251	835,454	2,239,024
Weighted unemployment rate	2.5%	2.5%	3.2%

Note. Personality measures and intelligence are standardized ($M = 0$, $SD = 1$). Year ranges from 1986 to 2009. Standard errors clustered by ID.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

Section 4: Analyses using three alternative unemployment outcomes.

In order to provide further insight on the nature of the relationship between personality and unemployment, we conducted analyses using three alternative unemployment outcome measures modelled on those used in previous research (Viinikainen & Kokko, 2012). We examined (i) the total months of unemployment experienced from age 16 to 38 (M = 4.34, SD = 16.9, Range = 0-267), (ii) the number of spells of unemployment experienced from age 16 to 38 (M = 0.34, SD = 0.75, Range = 0-9), where a spell was defined as being unemployed in month T after being employed in month T-1, and (iii) unemployment spell length in months among those reporting at least one spell of unemployment from age 16 to 38 (M = 12.9, SD = 23.0, Range = 1-267). We specified negative binomial models to examine these three outcomes, a suitable analytic method for over-dispersed (i.e. where the variance is greater than the mean) count data.

Our results are described in Tables S3-5. Higher conscientiousness predicted fewer total months of unemployment (b = -0.27, SE = 0.06, p < .001) and fewer spells of unemployment (b = -0.19, SE = 0.04, p < .001) but not significantly shorter unemployment spell durations (b = 0.81, SE = 0.38, p = 0.06). Calculating the marginal effects of these analyses to present the results more intuitively, a 1 standard deviation increase in conscientiousness predicted 1.4 fewer month of unemployment (b = -1.37, SE = 0.31, p < 0.001), 0.7 fewer spells of unemployment (b = -0.70, SE = 0.15, p < 0.001), and a non-significant 1 month shorter average unemployment spell duration (b = -1.05, SE = 0.63, p = 0.10).

Table S3. *Negative Binomial Regression Predicting the Total Months of Unemployment from 1986 to 2008.*

	Total months of unemployment	
	Coef.	SE
Conscientiousness	-0.274***	(0.057)
Extraversion	-0.091	(0.054)
Agreeableness	0.073	(0.056)
Neuroticism	0.034	(0.058)
Intelligence	-0.225***	(0.063)
Female	-0.631***	(0.113)
SES		
I (highest)	-	-
II	0.266	(0.233)
III	0.113	(0.174)
IV	0.550*	(0.214)
V (lowest)	1.415***	(0.283)
Other	0.660**	(0.254)
Missing	0.620*	(0.296)
Sample size	4,206	

Note. Personality measures and intelligence are standardized ($M = 0$, $SD = 1$). Estimates are weighted by gender and SES, control for SES at birth and include imputed intelligence values. Constant omitted.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

Table S4. *Negative Binomial Regression Predicting the Number of Spells of Unemployment from 1986 to 2008.*

	Spells of Unemployment	
	Coef.	SE
Conscientiousness	-0.192***	(0.040)
Extraversion	-0.123***	(0.036)
Agreeableness	0.035	(0.044)
Neuroticism	0.019	(0.036)
Intelligence	0.016	(0.043)
Female	-0.528***	(0.071)
SES		
I (highest)	-	-
II	-0.149	(0.153)
III	-0.178	(0.131)
IV	-0.046	(0.156)
V (lowest)	0.418*	(0.203)
Other	0.021	(0.204)
Missing	-0.252	(0.174)
Sample size	4,206	

Note. Personality measures and intelligence are standardized ($M = 0$, $SD = 1$). Estimates are weighted by gender and SES, control for SES at birth and include imputed intelligence values. Constant omitted.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.

Table S5. *Negative Binomial Regression Predicting the Length of Unemployment Spells Among Those Who Experienced at Least One Spell of Unemployment from 1986 to 2008.*

	Length of Unemployment Spell	
	Coef.	SE
Conscientiousness	-0.081	(0.048)
Extraversion	0.034	(0.047)
Agreeableness	0.012	(0.049)
Neuroticism	0.027	(0.049)
Intelligence	-0.211***	(0.059)
Female	-0.115	(0.098)
SES		
I (highest)	-	-
II	0.499*	(0.200)
III	0.296*	(0.130)
IV	0.569**	(0.172)
V (lowest)	0.977***	(0.249)
Other	0.723**	(0.223)
Missing	0.829***	(0.229)
Sample size	959	
Observations	1,151	

Note. Personality measures and intelligence are standardized ($M = 0$, $SD = 1$). Estimates are weighted by gender and SES, and include imputed intelligence values. Constant omitted. Standard errors clustered by ID.

*** Significant at the 0.1% level. ** Significant at the 1% level. * Significant at the 5% level.