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# Youth unemployment and the effect of personality traits

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**JEL codes:** I10, I21

## **Abstract:**

This paper investigates the relationship between personality traits in adolescence and education and labour market choices. In particular, we investigate the impact of locus of control, effort and diligence, and self-esteem, on the risk of youths being unemployed (sometimes referred to as NEET (“Not in Education, Employment or Training”). Thus, our focus is on early drop-out from both education and the labour market at age 18-20. We use matching methods to control for a rich set of adolescent and family characteristics by estimating the treatment effects of multiple personality traits at the same time (Woolridge, 2010). Finally, we use the methodology proposed by Altonji et al. (2005) that involves making hypotheses about the correlation between the unobservables and observables that determine the outcomes and the unobservables that influence personality. Our results show that individuals that display low effort and diligence, low self-esteem, and external locus of control are more likely to drop out of education and employment.

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## 1. Introduction

The objective of this paper is to analyse the role of personality traits on education and labour market choices. In particular, we study the effect of effort and diligence, self-esteem, and locus of control, observed at age 15-16, on the risk of dropping out from education and labour market at 18-21 years of age. Our study specifically focuses on the role of personality traits in adolescence and early adulthood. It has policy relevance because several studies have shown that personality traits are stable during adult life (Cobb-Clark and Schurer, 2012 and 2013) but are relatively malleable over the early lifecycle, even up to the mid 20's, and can be affected by policy interventions aimed at suppressing harmful traits that affect later life (see Carneiro and Heckman, 2003 for a discussion).

This study contributes to the existing literature on the effect of personality traits in two ways. First, we analyse the effect of non-cognitive skills on the chances of youth unemployment associated with dropping out of education *and* employment (sometimes referred to as being NEET - Not in Education, Employment or Training). These young people are one of the most vulnerable groups in the society, at high risk of being marginalised, and their numbers have been rising in most OECD countries in recent years. In 2011-2012, 15% of individuals between the ages of 15 and 29 were neither employed nor in education or training, on average across OECD countries (OECD, 2014). The NEET rate was over 15% in the United States even higher in many European Countries. Over 14 million young people under the age of 30 years were not in employment, education or training across the European Union as a whole and the economic cost of not integrating NEETs has been estimated at over €150 billion (Eurofound, 2012). Several policies have been put in place in order to prevent young people from becoming NEET, including preventing early school leaving, targeting vulnerable geographic areas, and promoting parental engagement (Eurofound, 2012).

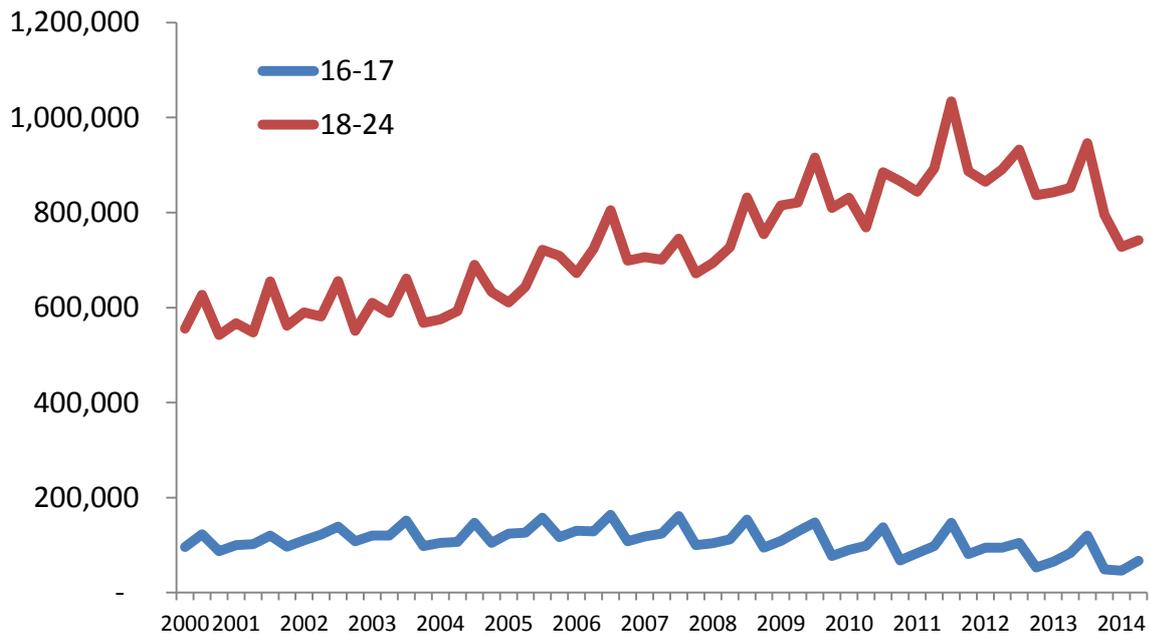
The analysis of this condition is particularly relevant for the British population: OECD figures suggest that the proportion of young people in the UK who do not have upper secondary education and are neither employed nor in education or training (24%) has been larger than the

OECD and EU average (15%) by about 10 percentage points (OECD, 2014). Figure 1 shows the numbers of young people who are classified as NEET in England from 2000 to 2014 by age range. There is clear seasonality associated with the school leaving cycle and while the numbers of 16-17 year olds who are NEET has been trending downwards since 2008, because of the rise in post compulsory participation in education that has been driven, in part, by the increase in educational attainment in the high powered tests, known as GCSEs, that take place at the end of grade 11 in the UK at age 16. Attainment in these tests provides entry into the academic track provided by senior high school in grades 12 and 13. However there has been only modest growth in attainment in the grade 13 high powered tests, at age 18 that determines entry to university courses. Attainment at this age is more likely to be affected by non-cognitive skills associated with sustained effort in education than the earlier tests at age 16 would have been. Thus, the 2008 crisis has seen a steady growth in the NEET rate of 18-25 year olds that is reflected in Figure 1 that confounded the demographic trends that were already driving the adult NEET rate upwards. (see van Reened and Petrongolo, 2010 and Bell and Blanchflower, 2011 for an analysis of the trends in youth unemployment in the UK)

The existing literature has analysed the effect of non-cognitive skills on education and labour market outcomes, but has focused on very different indicators, such as years of schooling, college graduation (Heckman et al. 2006; Coleman and Deleire, 2003; Cebi, 2007), occupational attainment, and wages (Duncan and Duniform, 1998; Groves, 2005; Nyuns and Pons, 2005; Cobb-Clark and Tan, 2011; Drago, 2011).

Secondly, the existing literature relies mostly on relatively dated data (for example, Heckman et al., 2006 and Cebi, 2007 use NLSY1979; Coleman and Deleire, 2003 uses NELS1988 ; and, in the UK, Carneiro et al., 2007 uses the NCDS1958 birth cohort),. Moreover, the literature does not have a specific focus on personality traits in adolescents (Chamorro et al., 2003; Delaney et al., 2013). Thus, here we provide evidence from a dataset based on a large cohort of English teenagers born in 1990 and followed for seven years, starting in 2004.

Figure 1 NEET numbers by age in England: 2000 Q2 – 2014 Q2



Source: Department for education. *NEET Quarterly Brief – April to June 2014*

Young people who spend time being NEET have been shown to have poorer short and medium term economic outcomes than those who enter work or who remain in fulltime education (Crawford et al., 2010; Gregg, 2001; Mroz and Savage, 2006; Machin and Manning, 1999). For example, they are more likely to remain NEET in subsequent periods if they experience this condition for one year when they are 17-18 (Crawford et al., 2010). Moreover, research by Crawford et al. (2010) shows that the longer a young person spends being NEET the higher the risk of them having poor labour market outcomes in the longer term and that, if young people find work after being NEET, they were more likely to get a job that does not provide opportunities for training.. Our analysis is particularly relevant to recent policy changes that effectively have raised the minimum education leaving age from 16 to 18. This aims to ensure that all young people in England continue in education or training leading to an accredited qualification at the end of the academic year in which they turn 17 (from 2013) and to age 18 (from 2015).

We use matching methods to investigate the relationship between personality traits and the risk of dropping out from education and employment and test the robustness of our results by

estimating treatment effects of multiple personality traits by using inverse-probability weighted regression-adjustment (IPWRA) estimators (Woolridge 2010).

Finally, we further examine the robustness of our results using the methodology proposed by Altonji et al. (2005) - the AET method. This method uses the information on observable differences between youths, with and without a particular personality trait, to provide information regarding the likely magnitude and direction of selection along unobserved characteristics. OLS is widely regarded as providing an estimate of an upper bound on the causal effect. Matching and treatment effect estimation methods focus on treatments and controls that are observably comparable and therefore provide closer estimates to the causal effect than OLS. AET could provide a further test by exploring the effect of varying the correlation between the unobservables that determine the treatment and those that determine the outcome.

Our results suggest very strong effects of personality traits on youth unemployment and this is substantiated by our robustness analyses. Statistically significant and economically very important effects of personality remain even when we control for having achieved good results in GCSE at age 16, which is regarded as the gold standard of academic achievement at this age in the UK.

## **2. Overview of the existing literature**

The relationship between personality traits and education and employment has received increased interest from economists in recent years. Research in personality psychology has focused on the widely used taxonomy of traits, known as the Big Five (Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism or Emotional Stability). Some of these studies in personality psychology research have demonstrated that some personality traits, such as Conscientiousness and Openness to Experience, have a positive effect on educational outcomes through various mechanisms such as better study behaviours, concentration and effort. Aspects of emotional stability, such as self-esteem and locus of control, have also been shown to

have significant effects on labour market success. Almlund et al. (2011) provides an excellent review of the major findings from studies conducted in economics and psychology.

Literature in psychology and sociology has analysed the role of internal locus of control, openness to experience, and conscientiousness in promoting better academic performance, increased years of schooling, and greater chances to go to university (see for example Goldberg *et al.*, 1998, and van Eijck, Koen and de Graaf, 2004). However, the majority of these studies have used small or unrepresentative samples and have described correlations between non-cognitive skills and educational outcomes rather than causal relationships. Meta-analyses conducted by Duckworth and Seligam, 2005, Ross and Broh, 2000, and Poropat, 2009 aim to overcome the former shortcoming, but do not address the latter.

A growing body of economics literature has analysed the impact of personality traits on educational attainment, with a particular focus on high school dropouts. The results generally suggest that traits such as conscientiousness and internal locus of control do affect educational outcomes, even if there is some evidence that the effect of personality traits is different across socio-economic groups (Lundberg, 2013) and there are some contradictory results in the previous literature. For example, Coleman and Deleire (2003) show that teenagers with internal locus of control are more likely to make educational investments such as completing high school and attending a four-year college. On the other hand, Cebi (2007) replicates the Coleman and Deleire (2003) study using NLSY and suggest that locus of control is not a significant determinant of high school completion and college attendance, once cognitive ability is taken into account. Baron and Cobb-Clark (2010) use data on a recent cohort of Australian youths to show that people with internal locus of control are more likely to complete high school and go to university and that there is very limited evidence that young people growing up in economic disadvantage are more likely to have external locus of control.

A more limited literature in economics has looked at the impact of personality traits on unemployment experience. For example, Caliendo et al. (2014) show that people with greater internal locus of control will look for jobs more intensively and tend to have higher reservation wages. Similarly, a study by McGee and McGee (2011) shows that people with internal locus of control believe that search effort has a higher return, but locus of control seems to affect beliefs (and not productivity) and therefore does not affect re-employment wages. Macmillan (2013) uses the British Cohort Study of 1970 births to analyse intergenerational transmission of disadvantage and shows that non-cognitive skills (and in particular extroversion, hyperactivity and conscientiousness, measured at age 5 and 10) play an important role in predicting future spells of unemployment.

Heckman and Rubinstein (2001) study the performance of Graduate Equivalence Diplomas (GED) recipients and conclude that GED recipients' lower achievements in the labour market and their higher prevalence of criminal or risky behaviours can be attributed to a lack of "ability to think ahead, persist in tasks and adapt to their environment" (Heckman and Rubinstein, 2001, p. 146). Heckman, et al. (2006) use data from the US NLSY1979 and show that locus of control and self-esteem affect schooling decisions, wages, occupational choices, and health-risky behaviours. Heckman and Masterov (2007) and Heckman et al. (2010) analyse the effect of the famous Perry Preschool program and emphasize the importance of investing in promoting positive non-cognitive skills from a very early age.

A separate strand of literature in psychology has analysed the role of "grit", which defined as perseverance with respect to long-term goals, in predicting a variety of success outcomes, including educational attainment. This work shows that continuous and focused application of talent over time is crucial for the achievement of difficult goals (Duckworth et al., 2007; Eskreis-Winkler et al., in press). Research in this area has shown, for example, that grit predicts: graduation from Chicago public high schools, (Eskreis-Winkler et al., in press), achieving outstanding results at the National Spelling Bee competition (Duckworth et al., 2007), as well as retention and performance

in several different professions, such as teachers, (Duckworth, Quinn, & Seligman, 2009, Robertson-Kraft & Duckworth, 2014) sales agents (Eskreis-Winkler et al., in press), or members of Special Forces (Eskreis-Winkler et al., in press).

Our own analysis is important because we try to establish a connection between several personality traits, and the risk of dropping out from education and employment (becoming NEET), for English teenagers. The economics literature on the causes of NEET status is very limited, despite a great deal of policy attention and investments to address this phenomenon. Cornaglia et al. (2012) show that poor mental health increases the probability of being NEET by around 3 p.p, after controlling for exam performance at age 16. Carneiro et al. (2007) use data from the NCDS to show that social skills have an important role in determining school attainment and labour market outcomes more generally. Britton et al. (2011) discuss different definitions of youth unemployment and NEET, and identify a group of characteristics measured at age 14 that may be used to predict the risk of becoming NEET such as low test scores, and poor socio-economic background. High school results appear to be stronger predictors of NEET status than socio-economic status (see also Crawford et al., 2010). However, none of these studies has looked at the importance of personality traits in predicting (and avoiding) NEET status.

### **3. Data**

This study uses data from the Longitudinal Study of Young People in England (LSYPE). The data collection is managed by the UK Department of Education and covers a wide range of topics, including academic achievements, family relationships, attitudes toward school, family and labour market, and some more sensitive or challenging issues, such as risky health behaviours (smoking, alcohol drinking, drug taking), personal relationships, etc. Young people included in LSYPE were selected to be representative of all young people in England but at the same time the survey oversampled specific groups (and in particular, young people from a low socio-economic background). The survey started when these adolescents were in year 9 at school in 2004 at the age

of 14 and the records of LSYPE children can be linked to the National Pupil Database (NPD), a pupil-level administrative database of all English pupils including detailed information on pupil test scores and achievements, as well as school characteristics. We use this data to collect information about LSYPE children's results in test scores at age 16, which is the minimum school leaving age for this cohort. This occurs at the end of a stage of the national curriculum known as Key Stage 4 and which culminates in national tests known as the General Certificate of Secondary Education (or GCSEs).

In the first wave around 15,500 young people were interviewed. In the first four waves, parents/guardians were also interviewed. Our final sample includes around 6,000 observations of children with non-missing information on personality traits, test scores, and other essential information on the child's birth and family background (the selected observations were not significantly different from the original data in terms of their observable characteristics).

*a. Outcomes*

We investigate the effect of personality traits on the chances of dropping out from education but not being employed (i.e. being NEET). In particular, at each wave, the youths in LSYPE are asked to report their main activity. We use this information collected at wave 4, 5, 6 and 7 (age 17-18 to 20-21) and follow the definition of NEET reported in the LSYPE documentation. In particular, a young person is defined as NEET if they are: unemployed (and looking for work); looking after the family; or having a break from study and work (excluding people who are waiting for exam results, have applied for a university course, are waiting to participate in government training programs, or are travelling). We consider three different NEET outcomes: Having been NEET at least once in the 4 waves; having been NEET for two or more years (referred to as "core NEET", in Britton et al., 2011); and the number of years spent being NEET.

*b. Personality traits*

Factor analysis has been widely utilised in personality psychology to analyse personality traits and to identify common factors derived from a variety of questions (Cobb-Clark et al., 2014; Piatek and Pinger 2010; and Almlund *et al.*, 2011). LSYPE does not explicitly include information about the “Big Five” personality traits that have been the focus of some recent research (see Almlund *et al.*, 2011 for a review of possible alternatives), nor does it replicate the definition of grit that is commonly used. But it does include a series of questions on effort and diligence, attitudes towards school, long term goals and interests, locus of control, and self-esteem.

Almlund et al. (2011) suggest that self-discipline, competence and dutifulness are facets of conscientiousness. LSYPE includes four questions on working attitudes (in particular with respect to school work) asked at wave 2 and three questions on perseverance and long term objectives, asked at wave 7 (see the Appendix for details). The combination of these questions allow us to construct a measure of personality that includes effort and hard-working attitude and at the same time an indication of the ability of pursue long term objectives and planning for the future – that are likely to be important contributions to “grittiness”. The combination of these traits is likely to play a key role in the choices that individuals make with respect to the education and labour force status after compulsory education. We follow Duckworth et al. (2007) and combine answers to these question and derive a scale of “effort and diligence”, where the maximum score is 4 (very high effort and diligence) and the lowest score is 1 (very low effort and diligence). We also construct a binary indicator, and define an individual as having “high effort and diligence” if her/his score is in the top quartile of this effort index.

A natural concern is that the three questions on future objectives are only asked at wave 7 (age 20-21) and therefore present a higher risk of reverse causality with respect to the NEET status. For this reason, we run a sensitivity test only using the four question on effort and work ethics asked at wave 2 and discuss the results in Section 5. The main pattern of results is unchanged and

therefore our preferred specification includes all seven questions, under the assumption that individuals' answers would have been similar if all the questions were asked at age 15-16.

Locus of control refers to the extent to which individuals believe that they can affect and control events happening in their own life (Rotter, 1966). People with external locus of control believe that their own actions and behaviours do not have an effect on future life outcomes, while individuals with internal locus of control generally believe that life events are mostly caused by their own decisions and behaviours. We measure locus of control using children's responses to six questions (see the Appendix for details). We follow the previous literature in the field (see for example Cobb-Clark *et al.*, 2014 and Piatek and Pinger 2010) and use factor analysis to create indices of internal and external locus of control. Children are classified as external if they have a score in the top quartile of the distribution of the external index, derived from factor analysis (see Schurer, 2014). We also examine the robustness of this definition, by classifying children as external if they have a score in the top third or half of the distribution of the external index (see Caliendo *et al.*, 2014).

Self-esteem refers to an individual emotional evaluation of her/his own value. LSYPE includes two questions on self-esteem (see Appendix for details) asked at waves 2 and 4. We construct an indicator of low self-esteem equal to 1 if they have placed themselves in the most distressed category for one of the two questions at least once between the two waves (around 27% of the children in the sample)<sup>1</sup>.

*c. Other explanatory variables*

We estimate three versions of our model, progressively increasing the set of independent variables. All of the variables we control for are, arguably, pre-determined variables – that is, not themselves influenced by personality traits. Our first most parsimonious model only includes at-birth characteristics such as: birth-weight; whether the child was premature; ethnic background; sex

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<sup>1</sup> Alternative/more restrictive indicators of low self-esteem were constructed to test the robustness of our estimates and results are available on request.

of the child; and family characteristics such as marital status and age of the mother at birth. In the second model we include other family's characteristics (measured at wave 1) such as: child's or parent's disability, maternal education and employment status, whether the child lives in a single parent family, grandparents' education, family income and older siblings. In the last version of the model, we also control for test scores at age 16. At the end of Key Stage 4 (from 13 to 16 years old), pupils take the national public examinations known as General Certificate in Secondary Education (GCSE) in most subjects studied – often in as many as 10 subjects<sup>2</sup>. GCSE grades range from A\* to G. Our independent variables is a binary variable indicating having 5 GCSE passes (A\* to C) including Mathematics and English which is usually required for students following an academic track for progression beyond age 16.

Table 1 presents the proportion of young people who are NEET, by age, in LSYPE. Table 2 presents descriptive statistics on the outcome variables, broken down by personality traits. Individuals who have external locus of control or low self-esteem seem a lot more likely to end up being NEET (and being in this condition for a longer period of time), while effort and diligence seem to have a protective effect. Table 3 analyses personality traits by NEET status. Not surprisingly, there is a higher prevalence of external locus of control and low self-esteem among youths that are NEET.

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<sup>2</sup> Results are unchanged if we drop the youths taking less than 5 GCSEs (the weakest students) from our sample.

*Table 1 Proportion of young people Not in Education, Employment or Training (NEET) by age group in LSYPE*

	17	18	19	20	21
NEET rate	5%	5.4%	7.3%	9%	8.8%

*Table 2 Descriptive statistics of outcome variables by personality traits*

	Whole sample	External locus of Control	Low self-esteem	High level of effort and diligence
NEET in w4-7	0.15 (0.36)	0.24 (0.42)	0.23 (0.42)	0.08 (0.27)
NEET for 2+ years	0.05 (0.21)	0.09 (0.29)	0.076 (0.026)	0.018 (0.13)
No. years NEET				
0	0.84 (0.36)	0.76 (0.43)	0.77 (0.42)	0.29 (0.27)
1	0.11 (0.31)	0.15 (0.36)	0.16 (0.37)	0.06 (0.25)
2	0.03 (0.17)	0.06 (0.23)	0.04 (0.20)	0.008 (0.09)
3	0.01 (0.10)	0.02 (0.15)	0.02 (0.13)	0.005 (0.06)
4	0.004 (0.06)	0.006 (0.08)	0.005 (0.07)	0.002 (0.04)

Note: Standard Deviations in brackets

*Table 3 Descriptive statistics of personality traits by NEET status*

	Whole sample	Never NEET	Has been NEET at least once(w4 to w7)	Has been NEET for 2+ years
High Effort and diligence	0.25 (0.44)	0.30 (0.46)	0.14 (0.34)	0.08 (0.27)
External Locus of Control	0.25 (0.43)	0.21 (0.41)	0.37 (0.48)	0.38 (0.49)
Low Self-Esteem	0.27 (0.44)	0.25 (0.43)	0.40 (0.49)	0.45 (0.49)

Note: Standard Deviations in brackets

Table 4 Descriptive statistics of other independent variables by NEET status

	Never NEET	Has been NEET at least once(w4 to w7)	Has been NEET for 2+ years
No. with 5+ GCSE A*-C	7.4	3.5	2.4
Income <£11,400	20%	31%	34%
£11,400<income<£31,200	42%	50%	54%
Income >£31,200	38%	19%	12%
Mother has university degree	16%	6%	5%
Mother has other higher education	15%	10%	6%
Mother senior high school graduate	16%	11%	9%
Mother junior high school graduate	30%	32%	29%
Mother has a lower qualification	8%	13%	18%
Mother has other qualification	3%	5%	5%
Mother has no qualifications	12%	23%	28%
Single mother household at birth	17%	32%	33%
Mother ≤ 20 years old at birth	5%	10%	13%
Male	52%	56%	55%
Black	5%	4%	4%
Asian	9%	6%	6%
Mixed	6%	6%	5%
Mother unemployed at wave 1	1%	2%	4%
Mother out of labour force at wave 1	20%	34%	42%

#### 4. Estimation

Our basic specification is firstly estimated using Ordinary Least Squares to control for observable confounders. The linear model can be written as:

$$Y_i = \alpha + \mathbf{P}_i' \boldsymbol{\beta} + \mathbf{X}_i' \boldsymbol{\gamma} + \varepsilon_i \quad (1)$$

where  $Y_i$  represents NEET outcomes (chances of being NEET at least once between wave 4 and wave 7; having been NEET for at least two years; number of years in NEET condition),  $\mathbf{P}_i'$  is a vector of psychological traits (binary indicators of high effort and diligence, external locus of control, low self-esteem) and  $\mathbf{X}_i'$  is a vector of child's and family's characteristics. However, this

method is well known to lead to biased estimates of the causal effects because of neglected heterogeneity.

Regrettably, our data does not contain any quasi-experimental variation across the sample that might allow us to address the selection on unobservables problem. Therefore, we try to tighten the upper bound provided by OLS estimation through the estimation of three different specifications of our model, gradually including a more detailed set of independent variables. Estimation by OLS could be biased if we are not controlling for variables that actually play an important role in determining NEET status (so-called omitted variable bias), or because of reverse causality (i.e. change in personality because of NEET status). Further, standard OLS regression, that controls linearly for the observable characteristics and personality traits may be biased if the true model were not linear in terms of the observed variables and if the effect of personality traits on NEET outcomes is not homogeneous (i.e. the same for all individuals). Both these biases are exacerbated if some children fall outside the so-called common support of the observables – that is, if we cannot find in our sample some children with a particular personality trait that are comparable to other children in the sample without that particular trait. If that is the case then OLS would be comparing non comparable children using linear extrapolation. Therefore, we also provide estimates obtained from propensity score matching that limits inference to samples where we can find overlap in the distribution of covariates across the treatment and does not rely on any assumptions about the functional form.

As with OLS, PSM relies on conditional independence that requires no selection on unobservables conditional on the observables. On the other hand, PSM attaches weights to the observations in the control group, so that the distribution of their observable characteristics is realigned to the treatment group. Thus, it is preferred to OLS because of its more convincing comparison of treated and control units. For this reason, matching provides a convincing way to select the observations on which other estimation methods can be based. Moreover, there is some

evidence that suggests that it contributes to a reduction in selection bias (see Dehejia and Wahba 2002, Dehejia 2005, and Smith and Todd 2004).

Propensity Score Matching has already been used in various recent papers investigating the determinants of child well-being (see for example Ruhm, 2008, Berger *et al.*, 2005, and Goodman and Sianesi, 2005); and the effect of personality traits (Caliendo *et al.*, 2014; Mendolia and Walker, 2014). The idea of propensity score matching is to match children with different personality traits (for example, with and without a high level of effort) who are as comparable as possible in all other observable characteristics. More specifically, we first estimate the conditional probability of having a specific personality trait, such as having high levels of effort and diligence, for each child, given our covariates. Then, each treated child is matched with a comparison child (i.e. without the specific personality trait) with the closest propensity score. In other words, estimated propensity scores are used to create a matched control group. Non-matched individuals are dropped from the analysis. Our analysis is performed using the STATA routine *psmatch2* and appropriate tests have been run, in order to compare covariate distributions across our matched groups to ensure that adequate balance has been obtained (results available in Appendix Table A1)<sup>3</sup>.

Further, we estimate the treatment effects of multiple personality traits using the STATA routine *teffects*, and explore two different specifications of the treatments. In the first specification, we consider the different quartiles of the same personality trait (effort and external locus of control) as separate treatments, and therefore we compare youths who are, for example, in the bottom quartile of the effort scale with similar youths who are in higher quartiles of the distribution of the same index. In the second specification, we focus on youths who show “negative personality traits”, i.e. low effort, low self-esteem and external locus of control and we consider different personality traits (individually and combined in groups of two or three traits) as multiple treatments.

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<sup>3</sup> Our approach is similar to Goodman and Sianesi (2005) and we use propensity score matching with the nearest neighbour method with replacement (as it has been shown to reduce bias relative to matching without replacement, see Dehejia and Wahba, 2002) and then used the *common* option, so that off-support observations are automatically dropped. Similar results were obtained with other matching methods.

In this framework, we are interested in estimating the difference in the outcome with and without treatment,  $Y_1 - Y_0$ , i.e. the difference in NEET status caused by an individual having one personality trait. As explained in Rosenbaum and Rubin (1983) and Wooldridge (2010), this parameter of interest is the average treatment effect (ATE) defined as  $E(Y_1 - Y_0)$ . This is the expected effect of a particular personality trait on a randomly selected person from the population. Further, we are interested in estimating the average treatment effect on the treated (ATT), which is defined as  $E(Y_1 - Y_0|P=1)$  which is the mean effect for those who actually have a particular personality trait.

As it is well-known in the econometrics literature, the difficulty in estimating ATT and ATE is that we observe only  $y_0$  or  $y_1$  (being or not being NEET) for each person. Further, randomisation of personality traits is impossible and conditional independence assumption is needed to estimate average treatment effects generally. In other words, we can overcome the problem that the treatment is not randomized by assuming that conditioning on observable covariates makes the outcome conditionally independent of the treatment. Conditional independence allows us to use differences in model-adjusted averages to estimate the ATE.

We estimate treatment effects by using the inverse-probability-weighted-regression-adjustment estimator (IPWRA), which uses two different models to estimate the outcome and the treatment and uses weighted regression coefficients to calculate averages of predicted NEET outcomes for each personality trait, where the weights are the estimated inverse probabilities of having each personality trait. In the first step, the probability of treatment is estimated and in the second step regression methods are used, with weights by the inverse of the probability of treatment (Wooldridge, 2010). The weights do not affect the accuracy of the RA estimator if the treatment model is wrongly specified and the outcome model is correct. The weights correct the RA estimator if the treatment model is correct and the outcome model is wrongly specified. In other words, IPWRA estimators have the so-called *double-robustness* property (Wooldridge, 2007 and 2010), so

only one of the two models must be correctly specified to consistently estimate the effects of interest.

The model aims to capture the effect of multiple treatments and the score is therefore estimated using a multinomial logit specification that allows us to calculate multiple treatment effects of the different personality traits individually, as well as consider different combinations of two or three personality traits.

The main advantage of the IPWRA estimator over propensity score matching is that it allows estimating the average treatment effects of multiple treatments at the same time, by specifying a multinomial logit model for the treatment, and combining regression adjustment and probability weighting to achieve some robustness to misspecifications of the parametric models.

Lastly, we examine the robustness of our results using the methodology proposed by Altonji *et al.* (2005) (AET) that uses the selection on *observable* traits to provide information about the potential for selection on *unobservable* characteristics. According to this approach, the part of an outcome (such as having been NEET) that is related to the observables has the same relationship with personality traits as the part related to the unobservables. This method requires some stringent assumptions (see Altonji *et al.*, 2005 for the details and Chatterji *et al.*, 2011 and Johnston *et al.*, 2013 for applications of the methodology) but has the advantage of not relying on exclusion restrictions for identification. According to the AET approach, we estimate a bivariate probit model with a constrained correlation coefficient. Identification comes from this restriction as well as from functional form (Altonji *et al.*, 2005). Following the AET approach, if the observable determinants of an outcome are a random set of the complete set of determinants, then selection on unobservable characteristics will be the same as the selection on observable characteristics. Altonji *et al.* (2005) show that we can estimate the following bivariate probit model:

$$Y = \mathbf{1}(\alpha + \beta P + X' \gamma + \varepsilon > 0) \tag{2}$$

$$P = \mathbf{1}(Z' \theta + u > 0) \tag{3}$$

$$\begin{pmatrix} u \\ \varepsilon \end{pmatrix} \sim N \begin{pmatrix} 0 \\ 0 \end{pmatrix} \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \quad (4)$$

In this model, we use the degree of selection on the observables as a guide to identify the parameter  $\rho$ . The idea that “selection on the observables is the same as the selection on unobservables” which implies that :

$$\frac{Cov(P, \varepsilon)}{Var(\varepsilon)} = \frac{Cov(P, X'\gamma)}{Var(X'\gamma)} \quad (5)$$

As explained in Altonji *et al.* (2005), this condition holds under the following assumptions: the elements of  $X$  are chosen randomly from the full set of variables that determine  $Y$ ; and the number of observed and unobserved factors is large enough so that no element dominates the distribution of the outcome. These assumptions are very strong but, as argued in Altonji *et al.* (2005), weaker than the standard OLS assumption that  $Cov(X, \varepsilon) = 0$ . Following Altonji *et al.* (2005), we present estimates that maximise the likelihood imposing  $\rho = \frac{Cov(P'\beta, P'\gamma)}{Var(P'\gamma)}$ , equivalent to condition (5).

Altonji *et al.* (2005) argue that if the observable determinants of  $Y$  are a random sample of the complete set of determinants, selection on observable characteristics would be equal to selection on unobservable characteristics. In practice, the estimates obtained under this set of assumptions could be treated as a lower bound on the true effect, since we might expect that the relationship between the unobservables and any potentially endogenous treatment will be weaker than the relationship between the observables and the treatment. For example, as noted in Altonji *et al.* (2005), the set of covariates  $X$  available in the dataset have probably been selected with the intention of reducing bias, rather than having been selected at random.

## 5. Results

The results from the estimation of the effect of personality traits on chances of dropping out of education and employment are presented in Tables 5, 6, 7, and 8. As already explained, we present results from different specifications of our model, progressively increasing the set of

independent variables. Model 3 includes the same variables of Model 2, but also includes a binary variable, indicating whether the youths have achieved 5 or more GCSEs with a grade between A\* and C. Results from this specification are therefore conditioned on GCSE achievements. We believe it is important to show the stability of our main findings from Model 2 when controlling for GCSE achievements, because the previous literature has shown that high school attainments are among the main determinants of NEET status. Figures 1 and 2 show the distribution of propensity scores across treatment and control groups. Both graphs show that there is sufficient overlap between the treatment and control groups.

Table 5 presents results from OLS and Probit models, where all three personality traits are included in the estimation at the same time. Personality traits have a strong effect on the chances of being NEET, and remaining in this condition for a relatively long period of time. In particular, the strongest negative effect comes from low self-esteem. Note that the mean of having ever been NEET is 15%, while the proportion in the data who have been NEET for two or more years is 4.7%. Having low self-esteem increases the chances of being NEET at least once in the survey by almost 9 percentage points (p.p) in Model 2 and 8 p.p in Model 3. On the other hand, effort and diligence have a strong protective effect, as individuals who have these characteristics are far less likely to have ever been NEET (- 7 p.p. in Model 2 and -5 p.p. in Model 3) and to remain in this condition for a long time. Interestingly, individuals with external locus of control and low self-esteem are more likely to be “core NEET” (NEET for at least two years) by about 2 p.p. and the protective effect of effort is even higher (-2.5 p.p.). The magnitude of these effects is economically important given our sample means. The results from the estimation using Propensity Score Matching are presented in Table 6 and confirm our OLS findings. Effort and diligence strongly decrease the chances of being NEET by 10 p.p., and almost 7 p.p when we control for GCSE results in Model 3.

Figure 1 - Histogram of propensity scores of treatment vs. control group

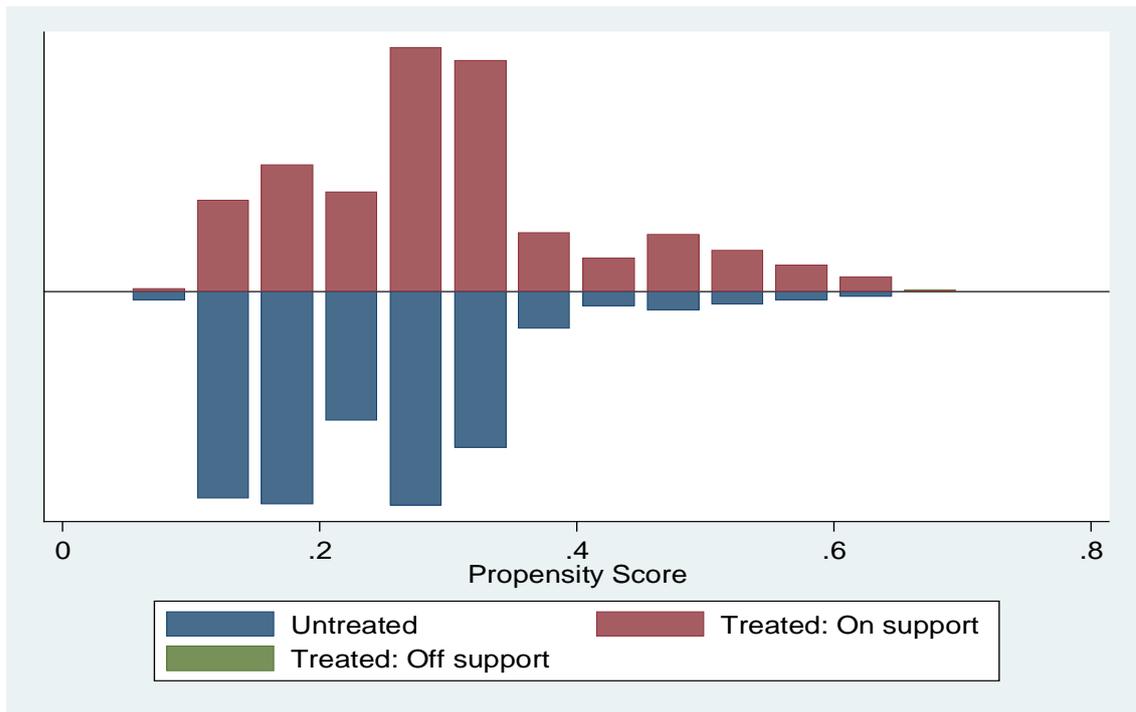
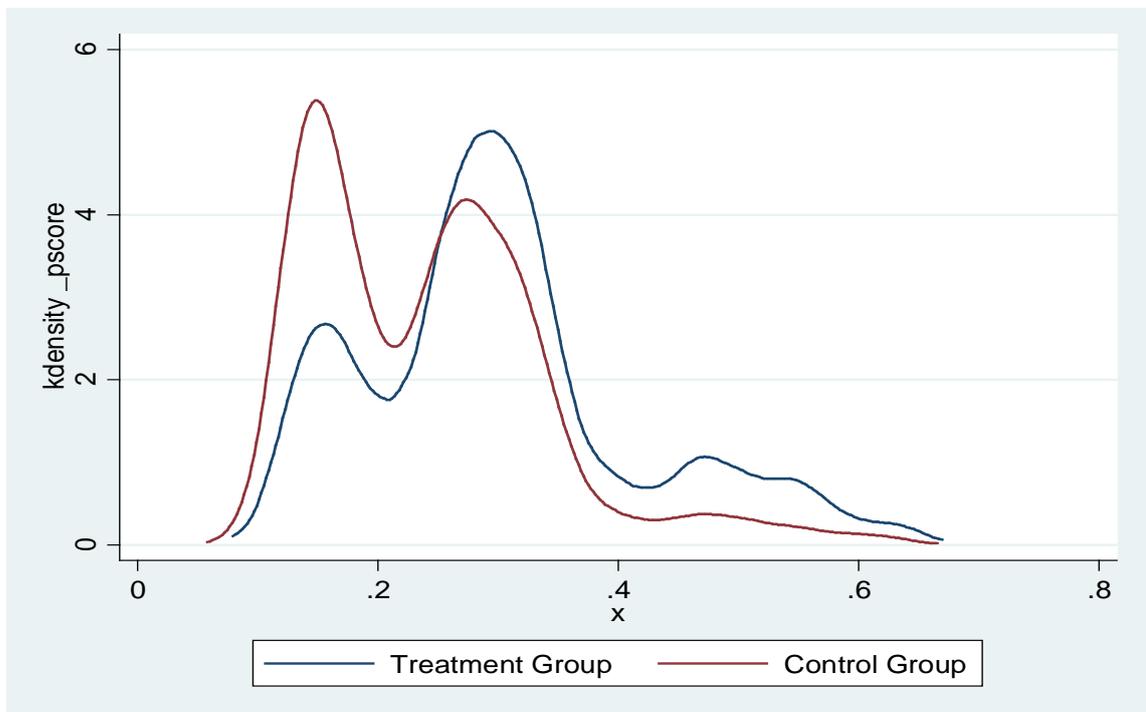


Figure 2 - Kernel graphs of propensity score for treated and control group



Our results on the effect of effort and diligence have been examined for robustness by estimating the model only using the four questions on hard working attitude asked at wave 2 and using factor analysis to combine them in an indicator of high work ethics. The results are not shown for the sake of parsimony but are available on request. They show that individuals with high work ethics (measured only at wave 2) are around 6 p.p less likely to be NEET (4 p.p in the model including GCSE) and results are highly significant. Thus, these support our reported results above which include wave 7 responses as well as wave 2.

Youths with external locus of control and low self-esteem face higher risks of being NEET and remaining in this condition for a long period of time. The effect of self-esteem is particularly noticeable, as the size of the effect is very stable (a 9 p.p rise in the chance of being NEET and a 2 p.p. rise in chance of being core NEET) even when we control for GCSE attainment. The results from the balancing tests for the PSM model are reported and discussed in Appendix Table A1.

One possible explanation for the negative effect of low self-esteem is that youths with this trait tend to have a generally negative opinion of themselves and their value. Low self-esteem may have an impact on many different aspects of individuals' life, such as aspirations and attempts to achieve the potential, and this may in turn affect the ability to make decisions about the future, and choices about education and labour market participation.

Similarly, individuals with external locus of control tend to think that their choices have less impact on their future, which they believe are mostly driven by luck and external circumstances. As a consequence, these youths are less likely to make constructive decisions about their future and to put lots of effort into achieving their goals.

Lastly, individuals with high levels of effort and diligence are more likely to have higher levels of perseverance towards long term goals and be able to maintain focus on long-term challenges. As already shown by the literature in psychology (see for example Duckworth et al.,

Table 5 Effect of personality traits on NEET status – OLS and Probit Estimation Results

	Model 1			Model 2			Model 3		
	NEET	Core NEET	No. years NEET	NEET	Core NEET	No. years NEET	NEET	Core NEET	No. years NEET
<b>OLS</b>									
External	0.079	0.044	0.142	0.048	0.031	0.092	0.018	0.020	0.047
Locus of Control	(0.010)***	(0.006)***	(0.017)***	(0.011)***	(0.0069)***	(0.018)***	(0.011)***	(0.006)***	(0.019)**
High effort and diligence	-0.082	-0.035	-0.131	-0.072	-0.032	-0.114	-0.053	-0.026	-0.085
	(0.010)***	(0.006)***	(0.017)***	(0.011)***	(0.006)***	(0.018)***	(0.011)***	(0.006)***	(0.018)***
Low Self-Esteem	0.082	0.019	0.111	0.087	0.018	0.113	0.0824	0.018	0.107
	(0.010)***	(0.006)***	(0.016)***	(0.011)***	(0.006)***	(0.018)***	(0.011)***	(0.006)***	(0.017)***
F stat	34.42	16.50	31.38	22.88	11.32	21.78	30.06	12.47	27.22
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N. observations	6,474	6,474	6,474	5,224	5,224	5,224	5,180	5,180	5,180
<b>Probit (Marginal Effects)</b>									
External	0.075	0.037		0.041	0.019		0.012	0.009	
Locus of Control	(0.011)***	(0.007)***		(0.011)***	(0.006)***		(0.010)***	(0.004)***	
High effort and diligence	-0.086	-0.036		-0.076	-0.028		-0.059	-0.021	
	(0.0089)***	(0.004)***		(0.009)***	(0.004)***		(0.009)***	(0.004)***	
Low Self-Esteem	0.082	0.017		0.085	0.013		0.078	0.011	
	(0.011)***	(0.006)***		(0.012)***	(0.005)***		(0.011)***	(0.004)***	
N. observations	6,474	6,474		5,224	5,224		5,180	5,180	

Note: Standard errors are in brackets. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*at 1%. Additional variables included in the analysis are listed at p. 9-10. Model 1 only includes at birth characteristics. Model 2 adds mother's and family's characteristics measured at wave 1 and Model 3 adds results in test score at age 16. See p. 11.

Table 6 Effect of personality traits on NEET status – PSM Estimation Results

	Model 1			Model 2			Model 3		
	NEET	Core NEET	No years NEET	NEET	Core NEET	No. years NEET	NEET	Core NEET	No. years NEET
External locus of control	0.089 (0.024)***	0.038 (0.014)***	0.153 (0.039)***	0.091 (0.017)***	0.041 (0.011)***	0.146 (0.029)***	0.044 (0.018)***	0.025 (0.011)***	0.078 (0.031)***
High effort and diligence	-0.105 (0.025)***	-0.043 (0.013)***	-0.162 (0.036)***	-0.100 (0.013)***	-0.042 (0.007)***	-0.161 (0.021)***	-0.067 (0.012)***	-0.022 (0.006)***	-0.096 (0.019)
Low Self-Esteem	0.097 (0.022)***	0.024 (0.012)*	0.140 (0.035)***	0.094 (0.013)***	0.019 (0.008)***	0.114 (0.023)***	0.095 (0.013)***	0.024 (0.008)***	0.128 (0.022)***

Note: Std errors are in brackets. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*1%. Additional variables included are listed at p. 12.

Table 7 Effect of personality traits on NEET status – PSM Estimation Results by gender

	Model 2			Model 3		
	NEET	Core NEET	No. years NEET	NEET	Core NEET	No. years NEET
<b>Girls</b>						
External locus of Control	0.079 (0.025)**	0.043 (0.015)**	0.128 (0.043)**	0.052 (0.027)**	0.033 (0.016)**	0.100 (0.45)**
High effort and diligence	-0.092 (0.017)***	-0.035 (0.009)***	-0.150 (0.028)***	-0.082 (0.017)***	-0.022 (0.008)***	-0.118 (0.026)***
Low Self-Esteem	0.102 (0.017)**	0.0251 (0.010)**	0.134 (0.028)***	0.0763 (0.017)**	0.011 (0.010)	.096 (0.028)***
<b>Boys</b>						
External locus of Control	0.069 (0.024)***	0.049 (0.014)***	0.138 (0.040)***	0.025 (0.026)	0.019 (0.016)	0.042 (0.045)
High effort and diligence	-0.080 (0.019)***	-0.039 (0.011)***	-0.132 (0.031)***	-0.068 (0.019)***	-0.029 (0.009)***	-0.106 (0.029)***
Low Self- Esteem	0.107 (0.021)***	0.044 (0.013)***	0.176 (0.034)***	0.127 (0.021)***	0.040 (0.0128)***	0.193 (0.034)***
F stat (p-value)						

Note: Std errors are in brackets. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*at 1%. Additional variables included are listed at p. 12.

2007), perseverance of effort could be even more important than talent to achieve ambitious career goals, and our results confirm the consistent positive effect in reducing the chance of dropping out of education and labour market. Our findings are also consistent with the previous literature from psychology and economics. For example, Almlund *et al.*, 2011 discuss findings from various studies showing that self-esteem and locus of control have very strong associations with educational attainment and labour market performance.

In Table 7, we split the results by gender. Interestingly, the positive effect of effort is very consistent and positive for both girls and boys, while the negative effect of low self-esteem seems more prominent for boys. This is particularly interesting, as the prevalence of low self-esteem is lower among boys in our sample (34% of girls experience this condition vs 21% of boys) and at the same time, effort and diligence are more common among girls (31% of girls have these characteristics vs 24% of boys).

Table 8 and 9 shows results from the estimation of treatment effects using personality traits as multiple treatments. The estimation is performed by using inverse-probability weighted regression-adjustment (IPWRA) estimator and multinomial logit to specify the treatment model. In Table 8, we compare youths who are in the bottom quartile of the effort scale (have very low effort) with youths who have higher levels of effort and youths who are in the bottom quartile of external locus of control with those in higher quartiles of the same index. Results from Table 8 confirm previous findings: young people who show very high levels of effort (top quartile) are significantly less likely to be NEET while the risk increase steadily for those with low effort and external locus of control (top quartile of the external index).

Table 8 *Effect of personality traits – Estimation of treatment effects with multiple quartiles of personality indexes*

	Model 2			Model 3		
	NEET	Core NEET	No. years NEET	NEET	Core NEET	No. years NEET
<b>Effort (1<sup>st</sup> Quartile is omitted)</b>						
2 <sup>nd</sup> Quartile	-0.074 (0.013)***	-0.028 (0.008)***	-0.110 (0.022)***	-0.049 (0.013)***	-0.017 (0.007)**	-0.069 (0.021)***
3 <sup>rd</sup> Quartile	-.079 (0.012)***	-0.024 (0.007)***	-0.118 (0.019)***	-0.051 (0.011)***	-0.013 (0.007)**	-0.074 (0.018)***
4 <sup>th</sup> Quartile	-0.138 (0.011)***	-0.058 (0.006)***	-0.219 (0.017)***	-0.101 (0.011)***	-0.045 (0.006)***	-0.162 (0.017)***
<b>External Locus of Control (1<sup>st</sup> Quartile is omitted)</b>						
2 <sup>nd</sup> Quartile	0.031 (0.013)***	0.006 (0.007)	0.040 (0.019)**	0.016 (0.014)	0.002 (0.007)	0.021 (0.021)
3 <sup>rd</sup> Quartile	0.037 (0.013)	0.020 (0.007)***	0.074 (0.021)***	0.010 (0.013)	0.0128 (0.007)	0.035 (0.022)
4 <sup>th</sup> Quartile	0.092 (0.014)	0.044 (0.008)***	0.156 (0.022)***	0.043 (0.014)***	0.028 (0.008)***	0.084 (0.022)***

Note: Standard errors are in parentheses. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*at 1%. Additional variables included in the analysis are listed at p. 9.

In Table 9, we focus on youths with low effort, low self-esteem and external locus of control and we analyse the effect of the combination of several personality traits at the same time, in a multinomial logit framework. For this analysis, we construct a variable called ‘personality’ that assumes different values, depending on possible combinations of personality traits:

- a. the young person does not show low self-esteem, low effort<sup>4</sup> and external locus of control (omitted group);
- b. the young person shows low effort and diligence only;
- c. the young person shows external locus of control only;
- d. the young person shows low self-esteem only;
- e. the young person shows low effort and external locus of control;
- f. the young person shows low effort and low self-esteem;
- g. the young person shows low self-esteem and external locus of control;
- h. the young person shows all three negative traits.

<sup>4</sup> We define an individual as having “low effort and diligence” if her/his score is in the lowest quartile of the effort scale describe in Section 3.2.

Results from Table 8 confirm the main findings. Low effort and diligence and low self-esteem are particularly detrimental and increase the likelihood of being NEET and remaining in this condition for a long time. The combination of these two traits and of all three “negative” traits seem particularly detrimental, and young people who show these characteristics experience significantly increase likelihood of being NEET. Results are consistent when we include achievements in GCSE exams as a control variable in Model 3.

Table 9 Effect of personality traits – Estimation of treatment effects with multiple treatments

	Model 2			Model 3		
	NEET	Core NEET	No. years NEET	NEET	Core NEET	No. years NEET
Low effort and diligence	0.085 (0.013)***	0.045 (0.008)***	0.145 (0.021)***	0.051 (0.0127)***	0.032 (0.008)***	0.093 (0.021)***
External LC	0.047 (0.017)***	0.016 (0.009)*	0.067 (0.027)**	0.015 (0.017)	0.004 (0.008)	0.018 (0.025)
Low Self-Esteem	0.083 (0.014)***	0.027 (0.008)***	0.121 (0.023)***	0.074 (0.015)	0.025 (0.009)	0.108 (0.025)***
Low effort and external LC	0.128 (0.027)***	0.068 (0.019)***	0.222 (0.047)***	0.090 (0.026)***	0.045 (0.015)***	0.149 (0.041)***
Low effort and low self esteem	0.205 (0.021)***	0.048 (0.012)***	0.278 (0.033)***	0.156 (0.021)***	0.032 (0.011)***	0.202 (0.031)***
Low self-est. and external LC	0.122 (0.028)***	0.065 (0.018)***	0.205 (0.046)***	0.078 (0.023)***	0.051 (0.016)***	0.142 (0.040)**
All 3 traits	0.209 (0.031)***	0.068 (0.019)***	0.314 (0.052)***	0.151 (0.029)***	0.050 (0.016)***	0.225 (0.046)***

Note: Standard errors are in parentheses. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*at 1%. Additional variables included in the analysis are listed at p. 9.

Lastly, in Table 10 we present results from the empirical strategy proposed by Altonji *et al.* (2005), as applied by Chatterji *et al.* (2011), which does not rely on untestable identifying assumptions. The first part of the AET method consists in varying the level of correlation between unobservables determining personality traits and NEET outcomes and determining whether the effect of personality is sensitive to these variations. The first column in Table 8 reports estimates

identical to a standard univariate probit (imposing no correlations between the unobservables determining outcomes and personality traits<sup>5</sup>), while the other columns report estimates of the effect of effort, external locus of control and low self-esteem on NEET outcomes from bivariate probit models imposing increasingly stronger levels of correlations between error terms. The true level of correlation between the errors is unknown. However, we follow Johnston *et al.* (2013) and we use the correlations between the outcomes and each specific personality traits in a linear model without other covariates (reported in the first column of Table 8) as a guide to varying  $\rho$ . For example, it is reasonable to assume that unobserved factors will affect effort and NEET outcomes in opposite directions. The coefficient of high effort in a linear model where we regress the probability of being NEET on it, with no other covariates, is equal to -0.11 and therefore we vary  $\rho$  between 0 and -0.15.

The results presented in Table 9 generally confirm the findings obtained with OLS and PSM that were presented in Tables 5 and 6. The effect of effort and diligence on the chances of being NEET for at least two years remains negative and significant when increasingly negative levels of correlations are imposed, especially in Model 2. The last column of Table 8 shows results for the second part of the AET method where a bivariate probit model is estimated under the stringent assumption that selection on observables is equal to selection on unobservables. The positive effects of effort on chances of being NEET for at least two years persist when selection on observables is set equal to selection on unobservables.

Similarly, results from the AET test confirm that youths with low self-esteem face increased chances of being NEET and remaining in this condition for at least two years. The results are sensitive to increasing the level of positive correlation between the error terms but the coefficient of low self-esteem remains positive and significant when selection on observable is set equal to selection on unobservables.

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<sup>5</sup> The results are slightly different from the ones from a probit model reported in Table 3 because in the AET test we consider one personality trait at a time, in order to construct the bivariate probit model.

Table 10 Sensitivity Analysis: Effect of personality traits on NEET status given different assumptions on the correlations of disturbances in Bivariate Probit (AET Test) – Marginal Effects

High effort and diligence – Model 2	$\rho=0$	$\rho=-0.05$	$\rho=-0.1$	$\rho=-0.15$	$\rho$ set such that select on obs.=select on unobs.
<b>NEET</b> <i>-0.11</i>	-0.481 (0.049)*** [-0.092]	-0.395 (0.049)*** [-0.077]	-0.307 (0.049)*** [-0.062]	-0.220 (0.049)*** [-0.046]	0.158 (0.047)** [0.037] rho = -0.29
<b>Core NEET</b> <i>-0.05</i>	-0.614 (0.086)*** [-0.033]	-0.527 (0.086)*** [-0.029]	-0.438 (0.085)*** [-0.026]	-0.349 (0.085)*** [-0.021]	-0.133 (0.080)* [-0.010] rho = -0.26
<b>High effort and diligence – Model 3</b>					
<b>NEET</b> <i>-0.11</i>	-0.386 (0.052)*** [-0.069]	-0.299 (0.051)*** [-0.055]	-0.211 (0.052)*** [-0.039]	-0.123 (0.052)** [-0.024]	0.408 (0.048)*** [0.097] rho = -0.43
<b>Core NEET</b> <i>-0.05</i>	-0.532 (0.091)*** [-0.022]	-0.443 (0.091)*** [-0.019]	-0.353 (0.091)*** [-0.016]	-0.262 (0.091)*** [-0.013]	0.169 (0.087)*** [0.011] rho = -0.36
<b>Low self-esteem – Model 2</b>	$\rho=0$	$\rho=0.05$	$\rho=0.1$	$\rho=0.15$	$\rho$ set such that select on obs.=select on unobs.
<b>NEET</b> <i>0.08</i>	0.401 (0.039)*** [0.098]	0.318 (0.039)*** [0.076]	0.233 (0.039)*** [0.055]	0.151 (0.039)*** [0.035]	0.423 (0.039)*** [0.104] rho = -0.01
<b>Core NEET</b> <i>0.03</i>	0.217 (0.057)*** [0.018]	0.133 (0.056)** [0.011]	0.050 (0.053) [0.004]	-0.031 (0.056) [-0.002]	0.226 (0.057)*** [0.019] rho = -0.005
<b>Low self-esteem – Model 3</b>					
<b>NEET</b> <i>0.08</i>	0.382 (0.041)*** [0.085]	0.299 (0.041)*** [0.065]	0.214 (0.041)*** [0.046]	0.132 (0.041)*** [0.028]	0.248 (0.041)*** [0.054] rho=0.08
<b>Core NEET</b> <i>0.03</i>	0.197 (0.059) [0.013]	0.114 (0.059)* [0.007]	0.031 (0.059) [0.001]	-0.049 (0.059) [-0.003]	0.073 (0.059) [0.004] rho = 0.07
<b>External Locus of Control – Model 2</b>	$\rho=0$	$\rho=0.05$	$\rho=0.1$	$\rho=0.15$	$\rho$ set such that select on obs.=select on unobs.
<b>NEET</b> <i>0.12</i>	0.290 (0.048)*** [0.067]	0.205 (0.048)*** [0.046]	0.121 (0.048)** [0.027]	0.039 (0.048) [0.008]	-0.634 (0.043)*** [-.126]rho = 0.55
<b>Core NEET</b> <i>0.05</i>	0.350 (0.067)*** [0.029]	0.267 (0.067)*** [0.021]	0.183 (0.067)*** [0.014]	0.102 (0.066) [0.007]	-0.573 (0.059)*** [-0.043] rho = 0.56
<b>External Locus of Control – Model 3</b>					
<b>NEET</b> <i>0.12</i>	0.148 (0.051)*** [0.030]	0.064 (0.051) [0.013]	-0.018 (0.051) [-0.003]	-0.099 (0.051) [-0.019]	-0.812 (0.044)*** [-0.143] rho = 0.59
<b>Core NEET</b> <i>0.05</i>	0.228 (0.071)*** [0.015]	0.145 (0.07)** [0.009]	0.0636 (0.071) [0.004]	-0.016 (0.070) [-0.00095]	-0.763 (0.062)*** [-0.047] rho = 0.60

Note: Standard errors are in parentheses. Marginal effects in brackets. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*at 1%. Additional variables included in the analysis are listed at p. 9. Results from an OLS regression of NEET outcomes on personality traits with no additional covariates are reported in the first column in *italic*.

Lastly, we vary the level of positive correlation between the error terms in the estimation of the effect of external locus of control. The effect of external locus of control on the chances of being NEET is relatively sensible to the imposed increasing level of correlation, especially in Model 3 (where we also control for previous GCSE attainments). When  $\rho$  is set equal to 0.15, the estimated effect of external locus of control on NEET outcomes becomes statistically insignificant. When selection on observables is set equal to selection on unobservables, the effect of external locus of control seems particularly sensitive to high levels of positive correlation ( $\rho = 0.55$ ) and changes sign. In general, the results from the AET method confirm our original findings of significant effects of personality traits (and in particular high effort and self-esteem) on decisions to drop out of education and from the labour market.

As shown in Appendix Table A2, the effects of personality traits are higher than the effect of other important variables, such as maternal education and employment status, or growing up in a single parent household. The results from Appendix Table A2 are consistent with our expectations and with the previous literature on NEET. The most important determinant of NEET status is GCSE attainment. Youths that have achieved at least 5 GCSE with grades from A\* to C are less likely to be NEET for one or more years in our sample. Generally, youths from high income and high education families are less likely to be NEET. Boys face higher risks than girls, and so do children who come from single parent households or whose mothers are unemployed or out of the labour force. Ethnic minorities seem less likely to become NEET. Nonetheless, significant and sizeable effects of personality remain even after controlling for 5+ GCSE passes.

## **6. Conclusion and Discussion**

This study has analysed the effect of high effort, low self-esteem and external locus of control on the risk of dropping out from education and labour market for English youths. We used the Longitudinal Study of Young People in England that is a rich source of information on English teenagers and can be linked to the National Pupil Database in order to get detailed information on

school outcomes. We find that personality traits have a strong and relevant effect on chances of being out of education or employment between ages 18 and 21. The size of the effect is notable and is higher than other important variables, such as maternal education or employment status, or growing up in a single parent household.

Our analysis is performed using Ordinary Least Squares, Propensity Score Matching, treatment Effects and the methodology proposed by Altonji *et al.* (2005), which relies on using the selection on observable traits to provide information about the selection on unobservable characteristics. We use the extensive information available in LSYPE and expand our set of independent variables, in order to control for a wide set of factors affecting both NEET outcomes and personality traits. Our results are stable over the three different specifications of our model. Further, Propensity Score Matching and Treatment Effects allow us to compare a group of children who did not have specific personality traits with youths with similar observable characteristics who have those characteristics.

The paper provides further evidence of the positive effects of high effort and diligence on long term life outcomes and on the negative effect of low self-esteem and external locus of control. In particular, we show that high effort significantly decreases the chances of dropping out of education or the labour market, while youths with low self-esteem and external locus of control are more likely to experience these conditions. For example, when we estimate the treatment effects of personality, youths with low self-esteem and low effort (external locus of control) are 15.6 p.p. (8) more likely to be NEET and 3 (5) p.p. more likely to be in this condition for a prolonged period of time.

A variety of interventions have been suggested that exploit the early malleability of personality to improve long term outcomes. The World Bank has recently promoted the STEP Skills Measurement Program, in collaboration with Angela Duckworth and other researchers in the field of psychology, with the objective of improving ways to measure and analyse the importance of

socio-emotional skills among youth and adults. Recent research in the area has confirmed the positive effect of interventions aimed at teaching school children the importance of effort, perseverance and motivation to increase school results, especially for disadvantaged children (Duckworth et al., 2013).

In the United States, programs such as the “Academic Youth Development”, “Brainology Online”, or “Character Growth Card” have been developed and implemented, with the purpose of changing high school students’ mindsets, and teaching that intelligence or skills are not fixed, but, rather, can be improved through effort and dedication (Dweck, 2007).

A UK example of a personality-targeted intervention is SEAL (Social and Emotional Aspects of Learning), a voluntary program designed to develop the social and emotional skills of all school pupils in the areas of self-awareness, managing feelings, empathy, motivation and social skills. SEAL is currently being implemented in around 90% of primary schools and 70% of secondary schools. Various evaluations of SEAL have been conducted. Hallam, Rhamie and Shaw (2006) concluded that primary SEAL “had a major impact on children’s well-being, confidence, social and communication skills, relationships, including bullying, playtime behaviour, pro-social behaviour and attitudes towards schools”. The evaluations of a number of existing policies have shown that changing personality is possible and interventions are useful, especially when they target young children and adolescents. Very recently, following a review of the literature (see Guttman and Schoon, 2013), the Department of Education has embraced the idea that such non-cognitive skills as we examine here may have important effects. For example, the Department has recently run a competition which schools have entered by outlining their own experiences with ad hoc initiatives.

We believe that our analysis shows some of the long term benefits of programs focused on suppressing harmful traits (such as low self-esteem or external locus of control) and promoting positive attitudes, such as perseverance towards long term goals, determination and motivation. The

benefits of this kind of program may span a wide range of achievements, which might have important long lasting consequences on individuals' lives and society as a whole.

Our results here strongly suggest that there is a potential for policies that exploit possible changes in personality to promote positive choices and achievements in early adulthood – outcomes that are important determinants of long run living standards.

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## Appendix

### Effort and diligence– Questions in LSYPE

1. Doing well at school means a lot to me (wave 2)
2. At school, I work as hard as I can (wave 2)
3. Working hard at school now will help me to get on later in life (wave 2)
4. If you work hard at something, you will usually succeed (wave 2)
5. Studying to get a qualification is important to me (wave 7)
6. Having a job that leads somewhere is important (wave 7)
7. I don't really think much about what I might be doing in a few years (wave 7)

Possible answers: Strongly agree, Agree, Disagree, Strongly disagree. The effort and diligence scale is calculated following Duckworth et al. (2007) as follows:

For questions 1,2,3,4, 5, 6, we assign the following points: 1 = strongly disagree, 2= disagree, 3= agree, 4= strongly agree

For question 7, we assign the following points: 1 = strongly agree , 2= agree, 3= disagree, 4= strongly disagree

Then, we add up all the points and divide by 7. The maximum score on the scale is 4 (very high effort and diligence) and the lowest score on the scale is 1 (very low effort and diligence).

### Locus of control – Questions in LSYPE (wave 2)

1. I can pretty much decide what happens in my life
2. If someone is not a success in life, it is usually his fault
3. How well you get in this world is mostly a matter of luck
4. Even if I do well at school, I will have a hard time
5. People like me do not have much of a chance
6. If you work hard at something, you will usually succeed

Possible answers: Strongly agree, Agree, Disagree, Strongly disagree

### Self-esteem – Questions in LSYPE (repeated at wave 2 and wave 4)

1. How useful you have felt recently?
2. How much you have been thinking of yourself as a worthless person recently?

Possible answers: Not at all, No more than usual, Rather more than usual, Much more than usual.

Table A1 shows results from balance tests of the estimation performed with Model 3 on the effect of effort and diligence on the chances of being NEET in at least one wave, in the period w4-w7. The output shows values of each variable for the matched sample. In each row, it shows the mean of the variable for the treatment group and the mean for the control group. It also shows the “%bias,” which is the standardized bias. This “bias” is defined as the difference of the mean values of the treatment group and the (not matched / matched) non treatment group, divided by the square root of the average sample variance in the treatment group and the not matched non treatment group. The table also shows the % reduction in bias, which is how much of this bias was eliminated by matching. In this example, there are few variables exhibiting negative values for this column (meaning that the bias increased as a result of matching) and these are mostly cases in which the bias was already very low before matching. To assess balance, one should look at both the bias and the mean differences between treatment and control in the matched sample. In our example, the bias is significantly reduced after matching (the mean goes from 7.22 to 2.46). The last two columns present results from a t-test on the hypothesis that the mean value of each variable is the same in the treatment group and the non-treatment group after matching. If  $p > 0.1$ , the null hypothesis cannot be rejected on the 10% significance level. The null hypothesis that the mean values of the two groups do not differ after matching cannot be rejected for most of the variables included in our analysis. By matching, the differences between treatment group and non-treatment group are reduced considerably.

A summary of the distribution of the absolute bias shows that before matching: Mean = 7.22 SD=8.99 and after matching: Mean = 2.46; SD=1.91

*Table A1 Balance tests for Propensity Score Matching (Estimation of the effect of high effort and diligence on being NEET – Model 3)*

<b>Variable</b>	<b>Mean - Treated</b>	<b>Mean Control</b>	<b>% Bias</b>	<b>% Fall in Bias</b>	<b>t</b>	<b>p</b>
Has 5+ GCSE with grade A*-C	.6748	.68997	-3.1	91.3	-0.99	0.322
HH yearly income >31,200£	35339	.36043	-1.5	62.2	-0.45	0.655
HH yearly income betw. 11,400£ and 31,200£	.42493	.40163	4.7	5.6	1.44	0.151
Birth weight	3.2889	3.2976	-1.5	83.5	-0.45	0.651
Premature birth	.10298	.1084	-1.8	-143.1	-0.54	0.592
Has older siblings	.8065	.79675	0.9	89.8	0.29	0.772
Grandparents went to university	.09973	.1019	-0.7	84.9	-0.22	0.827
Child has disability	.12846	.129	-0.2	96.7	-0.05	0.961
Main parent has disability	.20054	.21138	-2.7	-35.4	-0.81	0.416
Mother has a university degree	.15501	.15447	0.2	98.0	0.05	0.964
Mother has other higher education	15014	.17019	-5.7	-221.6	-1.66	0.097
Mother senior high school graduate	.1355	.12466	3.1	24.5	0.98	0.328
Mother junior high school graduate	.29485	.29973	-1.1	57.3	-0.32	0.746
Mother has qualifications level 1 or below	.08618	.07425	4.2	-78.1	1.33	0.183
Mother has other qualification	.02764	.03035	-1.6	-59.7	-0.49	0.624
Male	.44878	.42873	4.0	75.2	1.23	0.220
Single parent at birth	.19675	.20108	-1.1	60.1	-0.33	0.742
Mother younger than 20 at birth	.05854	.05095	3.2	-218.3	1.01	0.311
Black	08943	.06992	8.1	65.1	2.19	0.029
Asian	.15014	.15989	-3.1	87.1	-0.82	0.413
Mixed	.06721	.0607	2.6	-26.0	0.81	0.420
Mother was unemployed at wave 1	.01138	.01084	0.5	-3014.5	0.16	0.875
Mother was out of the labour force at wave 1	.24444	.24065	0.9	59.4	0.27	0.788
Single mother at wave 1	.19512	.18482	2.5	58.8	0.80	0.425

Table A2 Effect of other independent variables on NEET Status and subjects' choice - OLS Estimation Results from Model 3

	NEET	Core NEET	NEET Years
Has 5+ GCSE with grade A*-C	-0.155 (0.011)***	-0.049 (0.006)***	-0.230 (0.017)***
HH income >31,200£	-0.031 (0.015)**	-0.011 (0.009)	-0.041 (0.024)*
Income betw. 11,400£ - 31,200£	-0.009 (0.013)	0.001 (0.008)	-0.003 (0.021)
Birth weight	-0.008 (0.009)	-0.001 (0.006)	-0.021 (0.015)
Premature birth	-0.033 (0.017)*	-0.006 (0.010)	-0.050 (0.028)*
Has older siblings	0.025 (0.005)***	0.008 (0.003)***	0.037 (0.008)***
Grandparents went to university	-0.010 (0.017)	-0.006 (0.010)	-0.018 (0.027)
Child has disability	0.024 (0.014)*	0.002 (0.008)	0.032 (0.022)
Main parent has disability	0.022 (0.012)*	-0.002 (0.007)	0.013 (0.020)
Mother –University degree	-0.046 (0.020)**	-0.021 (0.012)*	-0.087 (0.032)***
Mother – Other Higher Education	-0.047 (0.019)**	-0.034 (0.011)***	-0.105 (0.031)***
Mother senior high school gr.	-0.057 (0.018)***	-0.031 (0.011)***	-0.107 (0.030)***
Mother junior high school gr.	-0.028 (0.016)*	-0.023 (0.010)**	-0.066 (0.026)**
Mother has low qualification	-0.007 (0.020)	0.006 (0.012)	-0.009 (0.033)
Mother has other qualification	-0.002 (0.030)	-0.015 (0.018)	-0.032 (0.048)
Male	0.022 (0.010)**	0.002 (0.006)	0.026 (0.016)*
Single parent at birth	0.050 (0.013)***	0.008 (0.008)	0.060 (0.022)***
Mother younger than 20 at birth	0.027 (0.021)	0.022 (0.013)*	0.051 (0.034)
Black	-0.054 (0.022)**	-0.016 (0.013)	-0.074 (0.036)**
Asian	-0.071 (0.018)***	-0.027 (0.011)**	-0.108 (0.029)***
Mixed	-0.019 (0.020)	-0.013 (0.012)	-0.048 (0.033)
Mother unemployed at wave 1	0.011 (0.044)	0.101 (0.027)***	0.155 (0.072)**
Mother out of the labour force at Wave 1	0.041 (0.012)***	0.026 (0.007)***	0.084 (0.020)***
Single mother at wave 1	0.032 (0.014)**	0.017 (0.008)**	0.057 (0.022)***
Constant	0.246 (0.037)***	0.080 (0.022)***	0.402 (0.060)***
$R^2$	0.14	0.06	0.12
$N$	5,180	5,180	5,180

Note: Standard errors are in brackets. \* indicates that the underlying coefficient is significant at 10% level, \*\* at 5% and \*\*\*at 1%