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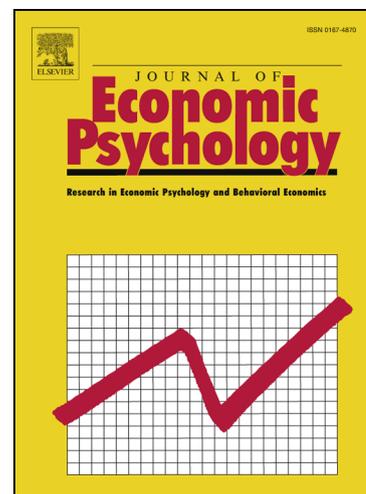
Is personality related to permanent earnings? Evidence using a twin design

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Is personality related to permanent earnings? Evidence using a twin design**Is personality related to permanent earnings? Evidence using a twin design**Terhi Maczulskij^a and Jutta Viinikainen^b

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ABSTRACT

Using twin survey combined with register-based panel data on labor market outcomes, the authors examine the association between personality characteristics and long-term earnings among prime working-age individuals. The long-term earnings were measured over the 1990-2008 period. The sample contains 4,642 twin pairs, of which 53% are females. In contrast to previous studies, this paper uses the within-twin dimension of the data to control for shared family background and confounding genetic factors. The results suggest that unobserved genetic differences may introduce omitted variable bias in standard ordinary least square results. After controlling for shared environment and genetic background, the authors find that a facet of extraversion (activity) is related to higher ($\beta = 0.046$), and neuroticism is related to lower ($\beta = -0.060$) permanent earnings in the labor market. The lower earnings of more neurotic individuals are likely explained by the weaker attachment in the labor market.

Keywords: personality; earnings; labor market outcomes; unobserved heterogeneity; twin studies

JEL codes: J24; J31

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1. INTRODUCTION

The role of personality in the labor market has gained growing interest in economics, and as Heckman, Stixrud and Urzua (2006) noted, non-cognitive and cognitive skills are both important for personal achievement. Personality characteristics can be considered determinants of workers' productivity. Therefore, similar to cognitive ability, personality characteristics are an essential element of human capital, which may lead to variations in labor market success such as earnings and labor market attachment (Mueller & Plug, 2006).

The relationship between personality and earnings has been recently documented in many studies (e.g., Lindqvist & Vestman, 2011; Borghans, Duckworth, Heckman & Ter Weel, 2008). The Five Factor model, which has become the leading taxonomy of personality structure (Musek, 2007), comprises five personality traits: extraversion, openness to new experiences, conscientiousness, agreeableness and neuroticism (Costa & McCrae, 1992). Among the Big Five taxonomy, neuroticism has been linked to lower earnings and weaker extrinsic career success and job performance (Judge, Higgins, Thoresen & Barrick, 1999; Barrick, Mount & Judge, 2001; Heineck, 2011; Nandi & Nicoletti, 2014), as has agreeableness (Heineck, 2011; Nandi & Nicoletti, 2014). The Big Five personality characteristics that have been related to favorable labor market outcomes include openness to new experiences (Nandi & Nicoletti, 2014) and conscientiousness (Judge, Higgins, Thoresen & Barrick, 1999; Barrick, Mount & Judge, 2001; Prevoe & Ter Weel, 2015). The results regarding extraversion are mixed. Judge, Higgins, Thoresen and Barrick (1999), Nandi and Nicoletti (2014) and Viinikainen, Kokko, Pulkkinen and Pehkonen (2014) have found that extraversion is positively related to labor market outcomes, while Nyhus and Pons (2005)

have found a negative association between extraversion and wages. Mueller and Plug (2006) reported the association to be negligible.¹

Preferences towards education and occupational sorting may explain the correlation between personality characteristics and earnings. Of the Big Five personality traits, openness to experiences and conscientiousness have been linked to increased years of education (see Almlund, Duckworth, Heckman & Kautz, 2011, for a review). The findings regarding occupational sorting show that lower neuroticism increases the probability of working in a challenging job (Judge, Bono & Locke, 2000), more social or extraverted individuals tend to work in jobs that involve more social interactions, such as managing and service jobs (Krueger & Schkade, 2008; Nieken & Strömer, 2010; Ham, Junankar & Wells, 2009) and that relatively more caring people end up working in less-paying caring jobs, such as nursing or teaching (Borghans, Ter Weel & Weinberg, 2008). Managers are also found to be less agreeable and labourers are found to be less conscientious (Ham, Junankar & Wells, 2009).

Personality characteristics may also affect earnings via productivity. For example, conscientiousness and lower neuroticism have been linked to better overall work performance (Barrick, Mount & Judge, 2001) and better performance in mathematical tasks (Cubel, Nuevo-Chiquero, Sanchez-Pages & Vidal-Fernandez, 2016). The explanation of why personality is related to earnings may also depend on age. At the early career stages, personality is likely to affect educational choices and occupational sorting, whereas at later

¹ Previous studies have related also other personality characteristics such as self-esteem and locus of control to labor market outcomes. For reviews, see, e.g., Drago (2011) and Heineck and Anger (2010).

stages, personality may influence whether the person moves up the career ladder within a specific profession.

As the previous research shows, personality characteristic may have a significant impact on individual's labor market performance. This paper contributes to this literature by exploring the relationship between personality and long-term earnings for prime working-age individuals. As an outcome variable we use the average of an individual's earnings over the period 1990-2008. Thus, the results are likely to reflect the role of personality on earnings, which results from both occupational sorting and productivity differences.

The paper contributes to the literature in three major ways. First, the identification of the contribution of personality is challenging because there may be unobserved characteristics that affect both personality traits and earnings and therefore bias linear regression estimates (e.g., Almlund, Duckworth, Heckman & Kautz, 2011; Fletcher, 2013). Based on behavioral genetic studies, individual differences in personality arise from three distinct sources: genetic inheritance, shared environment and non-shared environment (Krueger & Johnson, 2008).² Approximately one-half of the variation in personality trait can be explained by genetic factors, coupled with a limited contribution of shared environment (Bouchard & Loehlin, 2001). Any remaining variation in self-reported personality is therefore due to non-shared environment (such as having different friends and random life events) or measurement error.

² The distinction between shared and non-shared experiences is subtle. Although family members may experience objectively similar events (e.g., a household move), the event is a shared experience only to the extent that it makes family members similar. Also gene-environment correlation and interaction could be relevant too, but cannot be investigated in our setting.

Since shared environmental and genetic factors may affect both personality and earnings, it is important to control for these potential confounders in order to obtain unbiased results.

Otherwise, if the same genes, which affect personality, are also related to other unobserved wage-related traits, such as cognitive ability, linear regression estimates are likely to be biased.³ Fletcher (2013) studied the relationship between personality and income using data on siblings. Although the within-sibling analysis controls for the shared environmental effects, it is unable to fully consider inherited genetic traits since siblings share, on average, 50% of their genes. Our contribution is to use data both on non-identical (dizygotic, DZ) and identical (monozygotic, MZ) twins. The use of well-established twin-differencing method for identical twins allows us to control for both shared family background and genetic factors (e.g. Goldberger, 1979; Ashenfelter & Krueger, 1994).

The second contribution to the literature is to use register-based data on earnings that originate from accurate administrative registers. The use of self-reported earnings would be problematic if personality affects the way individuals assess their job market performance (Hamermesh, 2004). Our outcome variable is independent of data collection. Therefore, the potential bias resulting from self-reported labor market information is eliminated.

³ Previous evidence finds that genetic heritability explains a significant share of variation in lifetime income (e.g., Hyytinen, Ilmakunnas, Johansson, & Toivanen, 2017) and intelligence (e.g., Nisbett, Aronson, Blair, Dickens, Flynn, Halpern & Turkheimer, 2012). The phenomenon in which one gene influences two or more seemingly unrelated traits is called pleiotropy in genetics. It is also possible that family/genetic background affects earnings via personality, although we do not study this in our paper.

Third, as Haider and Solon (2006) and Böhlmark and Lindquist (2006) noted, cross-sectional measures on wages are inaccurate proxies for individuals' long-term labor market success. In the context of personality, this is particularly worrying because the relationship between personality and labor market success may be sensitive to economic situations, for example, because of occupational differences in vulnerability to macroeconomic shocks. To address these idiosyncratic occupational differences, we concentrate on long-term labor market outcomes over the period of nearly 20 years.

In the remainder of this paper we describe the data and latent personality characteristics that are constructed through principal component analysis. The data also include information on neuroticism. The descriptive evidence on the relationship between personality and earnings is further presented. We then present the econometric model, the results and their various robustness tests. The final section discusses and concludes the paper.

2. DATA AND METHODS

2.1. *Data sources and the sample*

The data are based on the Older Finnish Twin Cohort Study (of the Department of Public Health at the University of Helsinki), which has been linked to the Finnish Longitudinal Employer-Employee Data (FLEED) of Statistics Finland. Previous studies have documented the representativeness of the twin data by comparing these data to a one-third random sample of all Finns using FLEED and covering the same age cohorts (e.g., Hyytinen, Ilmakunnas & Toivanen, 2013; Maczulskij, 2013).

The Finnish Cohort Study was initially compiled from the Central Population Registry of Finland. Initial twin candidates were same-sex twins born before 1958 with both co-twin alive in 1975 (Kaprio, Koskenvuo, Artimo, Sarna & Rantasalo, 1979). A questionnaire was mailed to these candidates in 1975 to collect baseline data and to determine the zygosity of the twins. The response rate for the 1975 survey was 89% (N = 12,502 twin pairs with responses from both twins, age ≥ 18). Two follow-up surveys were conducted in 1981 (response rate 84%) and 1990 (response rate 77%). The 1990 survey was solely sent to twins who were born between the years 1930 and 1957, so the number of twin pairs in the 1990 survey is approximately one-half of that in the 1981 survey. The zygosity was determined based on twins' responses to two questions on similarity of appearance during childhood. A subsample was collected, for which the classification was redone, using eleven blood markers. When zygosity, determined by blood samples, was compared to the questionnaire-based zygosity information, it was found that the probability of misclassification was only 1.7% (Kaprio, Koskenvuo, Artimo, Sarna & Rantasalo, 1979).

The twin data are linked to FLEED using unique personal identifiers for each individual. FLEED is an annual panel over the years 1990-2008 that covers the working-age population of Finland. Thus, it is possible to track the labor market behavior of the twins who participated in the original surveys. The matching is exact, and there are no misreported ID codes. Therefore, we avoid problems created by errors in record linkages (Ridder & Moffitt, 2007). FLEED is constructed from a number of different administrative registers on individuals, firms and establishments that are maintained by Statistics Finland. The data include information on individuals' labor market status and earnings, collected directly from tax and other administrative registers. Thus, the earnings data do not suffer from underreporting, recall errors or top-coding.

The main analyses are performed using personality characteristics from the 1981 survey ($N = 9,881$ twin pairs). We restrict our sample to prime working-age individuals and therefore retired persons and persons over 50 years old are excluded from the sample. This decreases the number of twin pairs from 9,881 to 6,731. Restricting the analyses to individuals who have valid information on personality characteristics and other background variables further reduces the sample size to 6,607 twin pairs. Finally, after excluding individuals who have no corresponding information on his/her co-twin, the sample reduces to 4,642 twin pairs (9,284 individuals).

2.2. *Variable definitions*

The main outcome variable is long-term earnings among prime-age workers. This outcome is calculated by the logarithm of the average of annual earnings and self-employment income over the 1990-2008 sample period. Because the logarithm of zero is not defined, the average earnings were replaced with average earnings plus one before logarithmization.⁴ The earnings measure is deflated to 2008 euros by using the consumer price index. The youngest participants were 33 years old in 1990 and 50 years old in 2008, while the oldest participants were already 50 years old in 1990. Thus, for some individuals, the earnings data do not cover

⁴ We performed robustness test by excluding persons who had no wage or salary earnings during the whole inspection period from the analysis (less than 1% of individuals in the final sample). The results were in large part robust to the ones reported in this paper (not reported in tables).

the entire 19-year period from 1990 to 2008. On average, we observe individuals in the data for 11 years.

The data contain information on neuroticism that originates from the 1981 survey.

Neuroticism is comprised of 9 yes (= 1) and no (= 0) items from the short version of the Eysenck Personality Inventory. The total score of neuroticism is the sum of yes/no answers and yields a total score that has been rescaled and ranges from 1 to 2. The data also contain information on 18 statements that describe different dimensions of personality. Statements such as ‘unsure – self-confident’ and ‘lazy – studious’ were self-assessed on a five-point scale (1 = strongly disagree, 5 = strongly agree).⁵ The correlations among these statements were, in many cases, high, suggesting that the clusters of the statements represent the same underlying personality dimensions. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO \approx 0.773) and Bartlett’s test of sphericity ($\chi^2 = 40618.48$, $df = 153$, $p < 0.001$) both supported the factorability of our personality data. Therefore, we applied a principal component analysis to reduce multiple variables to a lesser number of underlying (latent) factors that are measured by the initial variables. The number of retained factors was six.

The results of the rotated factor loadings are presented in Table 1. As suggested by Matsunaga (2010), the rotation method was specified as ‘Promax’, which provides solutions with correlated components, i.e., oblique solutions. The rotated factor loadings were also performed using an orthogonal solution, but the results were similar to the ones reported in this paper. Based on Kaiser’s criterion, six factors were retained, with their eigenvalues varying between 2.757 and 1.589. The cumulative variance explained by these six factors was

⁵ The English translation for the 1981 questionnaire can be found at <https://wiki.helsinki.fi/display/twineng/Older+cohort>.

64%. The parallel analysis (Horn, 1965) was also performed and the method supported that six factors should be retained (the results and the graph of the parallel analysis is available from the authors).

Among the personality traits that characterize the first component with high scores (between 0.67 and 0.82) are talkative, emotional, open and communicative. This first factor is labeled 'sociability'. Factor 2 is the most highly associated with the dominant variable (loading = 0.79), although the loadings for ambitious, determined and confident are also fairly substantial (ranking from 0.62 to 0.70). Based on these findings the second factor is labeled 'achievement'. The significant loadings on the third rotated factor, which was labeled 'agreeableness', are also strong (the lowest is 0.81): calm, amicable and peaceful.⁶ The personality aspects that load highest on factor 4 are quick, studious, and prompt, with the loadings varying between 0.63 and 0.77. This factor was labeled 'order'. Factor 5, which was labeled 'honesty', is dominated by the variables truthful (loading = 0.86) and honesty (loading = 0.82). The loadings that are significant on the sixth factor are active (loading = 0.70) and multitasking (loading = 0.79). Thus, the sixth rotated factor was labeled 'activity'. The factor scores are then computed with the following names: sociability, achievement, agreeableness, order, honesty and activity. The latent factors of sociability and activity contain aspects that are related to the Big Five's extraversion trait, and achievement and order are related to the Big Five's conscientiousness trait (Costa & McCrae, 1992; Dudley, Orvis,

⁶ Using the same sample of twins, Koskenvuo, Kaprio, Rose, Kesäniemi, Sarna, Heikkilä and Langinvainio (1988) examined hostility as a risk factor for mortality and heart diseases. In their epidemiological study, the hostility scale was also factor-analytically constructed and included three items: irritability, ease of anger arousal and argumentativeness; these are exactly the same items that we have in our latent factor.

Lebiecki & Cortina, 2006). Interestingly, a sixth factor of personality beyond the Big Five traits has also been proposed: honesty-humility. This trait describes individual differences in sincerity, fairness, greed avoidance and modesty (e.g., Ashton & Lee, 2005). Thus, all of the personality measures are closely related to previously well-established Big Five personality traits. Therefore, we are inclined to interpret those traits in a similar fashion. All the personality variables, including neuroticism, are standardized to have a mean of zero and a standard deviation of one in regression analyses to obtain easily comparable regression coefficients.

The correlation coefficients between each personality trait between 1981 and 1990 (for neuroticism between 1975 and 1981) varied between the levels of 0.5 – 0.7. The rank order stability, measured by Kendall's tau, varied between the levels of 0.33 for honesty to 0.50 for sociability. The results thus suggest that the personality measures are relatively stable over time. The generalizability of the factor analysis was tested by using personality data from the 1990 survey. The communalities and factor loadings were the same in both analyses, suggesting that the findings are generalizable and valid.

As a measure for internal consistency and reliability, we calculated the McDonald's omega values (Dunn, Baguley & Brunsten, 2014). The omega value is higher for sociability (0.63), achievement (0.58) and agreeableness (0.49) and lower for honesty (0.38), order (0.33) and activity (0.32). The values are below the general guideline of 0.7, which suggests increased error margins and decreased the statistical power. Low power increases the risk of Type II error (false negative). The McDonald's omega values decrease with number of important factor loadings.⁷

⁷ If a factor is defined by only few loadings (as for example for Activity), then the factor can be thought as being variable specific. This hardly change the interpretation of the estimation

[Table 1 in here]

2.3. Descriptive statistics

Figure 1 presents the scales and the distributions of the unstandardized personality trait scores. The distributions are right skewed for honesty and agreeableness; for other personality trait scores, the distributions are approximately normal. Figure 2 presents the within-twin differences in unstandardized personality trait scores. Table 2 reports the average scores for unstandardized personality measures and demographic characteristics for the sample of all twins. The demographic characteristics show that 53% of the participants are women, 61% are married, the average age of the participants over the period 1990-2008 is 40, and they have completed on average of 12 years of education. The means of the absolute values of the twin differences show that MZ twins are much more similar to each other with respect to earnings, demographic characteristics and their reported personality traits compared to DZ twins.⁸ However, there is a sufficient amount of within-twin pair variation in

results, as Stevens (2012) also notes. As a robustness test, we estimated regression models in which we explained long-term earnings by neuroticism and 2-4 items of different latent personality characteristics, which received the highest factor loadings (for example, we replaced latent factor Order by items quick, studious and prompt and latent factor Activity by items active and multitasking). All the specifications were primarily robust to main findings (results are not reported but are available from the corresponding author).

⁸ The actual within-twin differences in variables can be negative, zero or positive, which indicates that the *means* of the within-twin characteristics would converge to zero. The means

the data among MZ twins, which is necessary for model identification. Previous evidence shows that sibling interaction, parental treatment, peer group (e.g., Baker & Daniels, 1990) and life stressors (e.g., Torgensen & Janson, 2002) appear to be related to the differences in personality characteristics among identical twins. To illustrate the role of these non-shared experiences on differences in twins' personalities, some of these components are examined using our twin data. The results are presented and discussed in Appendix A.

[Figures 1-2 in here]

Table 3 reports the average long-term earnings in euros, conditional on personality traits in 1981. Each personality trait is divided into a low dimension (personality trait score under the median) and a high dimension (personality trait score over the median). Persons who have high scores on agreeableness, achievement, and activity have significantly higher permanent earnings compared with persons who have low scores on those characteristics. In turn, those who have higher scores on neuroticism have significantly worse labor market success in the long run.

[Tables 2-3 in here]

3. EMPIRICAL MODEL

The econometric analysis builds on the following model:

of within-twin differences are only reported in absolute values to be more informative on the overall variability in characteristics within siblings.

$$Y_{ij} = \alpha + \boldsymbol{\beta}'\mathbf{P}_{ij} + f_j + g_{ij} + \varepsilon_{ij} \quad (1)$$

where Y_{ij} represents long-term earnings of twin i in twin-pair j . \mathbf{P}_{ij} is a vector of seven personality characteristics, f_j is unobserved family endowments common to both twins of pair j , g_{ij} is unobserved genetic endowments specific to twin i of pair j , and ε_{ij} is a random shock to twin i of pair j .

The labor market equation is first estimated by OLS. This model provides estimates for $\boldsymbol{\beta}$ that are denoted by $\boldsymbol{\beta}_{OLS}$. For $\boldsymbol{\beta}_{OLS}$ to be a consistent estimator of the coefficient vector of personality traits, $\boldsymbol{\beta}$, the moment condition $E[f_j + g_{ij} + \varepsilon_{ij} | \mathbf{P}_{ij}] = 0$ should hold. This condition does not hold if f_j or g_{ij} is correlated with people's personality characteristics.

Because f_j and g_{ij} are generally unobserved (or poorly measured), Equation (1) omits these terms and may yield biased estimates of the association between personality traits and labor market outcomes. For example, a negative correlation between risk-aversion and personality traits (such as sociability, a facet of extraversion) would lead $\boldsymbol{\beta}_{OLS}$ to underestimate the true value of $\boldsymbol{\beta}$.

We use within-twin variation among the DZ twins to difference out the family effects, f_j . In the twin-differenced DZ sample, the estimator is consistent if $E[(g_{2j} - g_{1j}) + (\varepsilon_{2j} - \varepsilon_{1j}) | (\mathbf{P}_{2j} - \mathbf{P}_{1j})] = 0$, where the terms inside the brackets refer to the within-sibling differences of variables. The condition does not hold if $(g_{2j} - g_{1j})$ is correlated with $(\mathbf{P}_{2j} - \mathbf{P}_{1j})$. Furthermore, if the twins are identical, then $(g_{2j} - g_{1j}) = 0$, and so the genetic effects can also be differenced out. Using the within-twins variation among the MZ twins

yields an estimator denoted by β_{MZ} . The assumption is that β_{MZ} is a consistent estimate of β and less biased than β_{OLS} .⁹

Although twin data are used to control for shared environmental and genetic factors, the twin design does not come without problems. As previously discussed in Gerdtham, Lundborg, Lyttkens and Nystedt (2015), there are two well-known potential problems with the within-twin-based design. First, twin data are not a silver bullet to endogeneity problems caused by omitted variables because there may be unobserved initial differences, such as differences in birth weight, intelligence (e.g., Sandewall, Cesarini & Johannesson, 2014) or life events, which affect both personality and labor market outcomes (Bound & Solon, 1999). The second problem is that twin-differencing may exacerbate the measurement error problem when compared with ordinary cross-section analysis and may lead to downward biased estimates (Griliches, 1979, Bound & Solon, 1999). These potential problems are discussed in Sections 5 and 6.

4. MAIN RESULTS

The coefficients of the standardized personality characteristics are reported in Table 4.

Gender and age are included in the OLS specification to be more comparable to the

⁹ The model assumes that the beta coefficients on the vector of personality variables is the same for the components of personality that are due to genetic, family and random factors (i.e. $\beta_{genetic} = \beta_{shared_environment} = \beta_{non-shared_environment}$). Thus, the model assumes that the within-MZ twin estimate, which is truly an estimate of $\beta_{non-shared_environment}$, is a consistent estimate of all three betas.

specifications that are estimated using the within-twin pair regression that automatically controls for such invariant within-twin variables.

The baseline estimates using the standard OLS specification imply that higher neuroticism is related to lower earnings, whereas activity, achievement and agreeableness are associated with favorable earnings (Column 1). The point estimates imply that a one-standard deviation increase in neuroticism score is associated with a decrease in the permanent earnings by approximately 8%. Similar increases in a facet of extraversion (activity) and a facet of conscientiousness (achievement) are related to 8% higher earnings. Finally, sociability (a facet of extraversion) is negatively related to permanent earnings in the baseline OLS model.

The results do not change much when we focus on the twin-differenced models that control for the shared environment (Columns 2 and 3). In these models only the coefficient of agreeableness is no longer statistically significant and the estimate is close to zero in both specification. The preferred results are from the within-MZ model that is able to fully account for both shared environment and genetic effects (Column 4). Those results reveal that the estimates of neuroticism and a facet of extraversion (activity) remain statistically significant. The coefficient is -0.060 for neuroticism ($p < 0.010$) and 0.046 for activity ($p < 0.050$). The coefficient for achievement reduced and is no longer statistically significant at conventional level.

Since the within-MZ sample is smaller than the total sample, it is possible that the reduced power has decreased chances of detecting a true effect. This may explain the statistical insignificancies of some personality coefficients. To this end, we increased the statistical power by using cross-section data and estimated the personality-earnings relationships for

yearly observations. The number of twin pairs in the within-MZ sample increased from 1,557 to 16,384. The results were robust to main specification: neuroticism was negatively, and activity was positively related to earnings. Other personality traits showed statistically insignificant relationships. The results are available from the authors.

[Table 4 in here]

To examine potential heterogeneity in personality-earnings associations, the earnings model is stratified based on gender, education level and age. The baseline OLS estimates and within-MZ estimates are presented in Table 5. Based on the information on the highest completed degree, we assigned the twins to one of two educational categories: Low education (=primary or secondary education, ISCED levels 1-4) or High education (= tertiary education, ISCED levels 5A, 5B and 6). We also estimated separate models for two age groups, i.e., “young” (those who were 33-40 years old in 1990) and “old” (those who were 41-50 years old in 1990). Because of limited number of observations, the within-MZ regression results should be treated with caution.

The OLS results largely support the baseline findings for the total data and suggest that neuroticism and sociability are negatively related to earnings, and that achievement, agreeableness and activity are positively related to earnings. However, there are two exceptions. First, the role of honesty seems to be gender-specific; the estimate is positive for men and negative for women. Second, based on OLS results, neuroticism and sociability are *not* related to lower earnings for the group of highly educated. The preferred within-MZ results show that neuroticism is related to lower earnings among women, older individuals and among both educational groups. Activity is, on the other hand, positively related to

earnings among men, highly educated and younger individuals. Extraversion (such as activity) has typically been connected to better job performance, particularly in occupations in which interaction with others plays a significant role (Barrick, Mount & Judge, 2001). High extraversion is also associated with leadership (see Buch & Anderson, 2009 for a review), which could explain the positive correlation between activity and the labor market success among the highly educated individuals.

[Table 5 in here]

5. ROBUSTNESS TESTS

5.1. *Additional covariates*

The baseline models did not include control variables because many of the potential explanatory variables may not be predetermined. In robustness tests, however, years of education, marital status (measured in 1981), and five socioeconomic status (SES) indicators (measured in 1990) were included as additional control variables.¹⁰ The education and SES dummies are able to control for the potential pathways between personality-earnings relationship. The estimates for neuroticism and activity reduced but remained statistically significant in the within-MZ model (Table 6, Column 1). Interestingly, the relative importance of activity and neuroticism as predictors of earnings is almost as important as

¹⁰ The five indicator variables distinguish between self-employed, upper-level employees (managers, technical and professionals), lower-level employees (clerks and service workers), laborers (e.g. craft, service, plant-operators and elementary workers) and low SES group (e.g., unemployed).

education years ($\beta = 0.034$ for activity, $\beta = -0.040$ for neuroticism and $\beta = 0.033$ for education years). Accordingly, a one-standard deviation increase in neuroticism (activity) score is roughly equivalent to a “loss” (gain) of one education year.

5.2. *Alternative outcome measures*

We have re-run the within-MZ estimations using three alternative outcome variables. Each variable was chosen to reflect an individual’s long-term labor market position. First, we used the average of monthly earnings as the outcome variable. The rationale behind the use of monthly earnings comes with the possibility that the association between personality characteristics and earnings is due to the differences in labor market attachment instead of greater earnings per unit of labor supplied. All of the individuals with zero employment months per year were excluded. The estimate for activity remained statistically significant ($\beta = 0.025$, $p < 0.025$), but the coefficient for neuroticism lost its significance (Table 6, Column 2). This indicates that the negative association between neuroticism and permanent earnings is likely due to weaker attachment in the labor market.

The second alternative outcome variable measures an individual’s long-term tendency to be frequently employed (i.e. labor market attachment). It is calculated as the average number of employment months per year over the period 1990-2008. The findings largely support the interpretation that neuroticism negatively contributes to employment (Table 6, Column 3).

Third, we used schooling years (measured in 1981) as an outcome variable. This variable is an important extension because personality traits may affect preferences towards education (see Almlund et al., 2011). The results show that neuroticism is negatively related to

schooling years ($\beta = -0.066$, $p < 0.10$), while the point estimate of activity is close to zero and statistically insignificant. However, achievement ($\beta = 0.095$, $p < 0.001$) and agreeableness ($\beta = 0.063$, $p < 0.100$) are both positively related to schooling years. These results suggest that although achievement (a facet of conscientiousness) and agreeableness are positively related to school success, these traits do not necessarily enhance earnings. This apparent discrepancy may result either because of occupational sorting or because these traits do not promote the possibilities or preferences toward moving up the career ladder. Instead, activity, which was not statistically significantly related to school success, may help people to get ahead in their working life.

[Table 6 in here]

5.3. Non-linear relationships and interactions between personality traits

The personality traits are allowed to enter earnings regression in a more flexible manner. First, the nonlinearities were tested by including quadratic terms of the personality traits into the earnings regression. The results indicated a linear relationship between neuroticism and earnings ($\beta = -0.061$), and activity and earnings ($\beta = 0.045$). Interestingly, there was also a U-shape relationship between sociability and earnings (the coefficient of sociability and the quadratic term were -0.005 and 0.025 , respectively; the results are not reported in tables). This finding suggests that the initial negative connection between sociability and earnings turns into positive after reaching the critical minimum point of 0.1 , which is slightly above the mean value of the standardized personality score (i.e., zero). The U-shape form suggests that in order to have positive labor market effects, sociability needs to reach certain level. Otherwise, higher sociability may reduce productivity, e.g., because it may induce spending excessive time socializing and talking with other people.

Finally, interactions between neuroticism and other personality traits were added into the earnings regression to examine if there are personality traits that would provide protection against the negative effects of neuroticism. None of the interaction terms were statistically significant (not reported in tables).

5.4. Measurement error

A potential problem with twin-differencing is that it may exacerbate the measurement error problem compared to that of an ordinary cross-section analysis (Griliches, 1979; Bound & Solon, 1999). Classical measurement error in personality variables could cause a downward bias for the effect of personality on earnings. To correct the (classical) measurement error an instrumental variables approach was used (see Ashenfelter & Kruger, 1994) by differencing the data within a family and using the differences in personality measures surveyed in 1981 as instruments for the differences in 1990 scores. Neuroticism is reported only in the 1975 and 1981 surveys. Therefore, we have used the difference in neuroticism score from the 1975 survey as instrument for the difference in 1981 score. The IV approach does not mitigate potential endogeneity bias. Thus, the IV is not used to establish causal inference, but rather it is used to tackle potential measurement error in personality traits.

The IV regressions are estimated by including a full set of personality traits as controls in the model, and instrumenting each personality trait separately. Table 7 reports the estimates of the instrumented variables from seven regressions. The first-stage results are as expected, and the F-statistics well exceed the common threshold of 10 varying between 75.3 (honesty) and

387.3 (sociability) (Staiger & Stock, 1997). Even in this much smaller sample, the negative relationship between neuroticism and earnings and the positive relationship between activity and earnings remain statistically significant. The IV point estimates are larger than the corresponding baseline estimates (-0.06 versus -0.12 for neuroticism and 0.05 versus 0.10 for activity). However, the IV estimates have larger standard errors and 95% confidence intervals such that the baseline point estimates are included in the 95% confidence intervals of the IV estimates.

According to Bound and Solon (1999), the measurement error in personality characteristics may also be mean-reverting. This would cause the self-reported personality scores to be biased toward the mean. For example, those who have high scores in neuroticism may under-report, while those who have low scores in neuroticism may over-report their actual neuroticism trait. This means that the measured twin-difference in neuroticism score would be smaller than the true difference in that trait, which may lead to upward biased estimates. If neuroticism is negatively correlated with earnings, then this type of measurement error may lead to an estimate that is closer to zero.¹¹

The third potential problem in self-reported personality trait is that twins may use their co-twin as a reference point for the self-reported answers. For example, if the answers reflect their co-twins' personality rather than their own, then the observed within-twin difference is smaller than the true difference. In this case, the within-twin regression analysis

¹¹ See also Böckerman, Hyytinen and Maczulskij (2017), who introduce a similar type for discussion regarding the effect of alcohol consumption on labor market outcomes.

underestimates the effect of personality on earnings and would again yield in conservative estimates.

6. DISCUSSION AND CONCLUSIONS

The importance of personality characteristics in the labor market has been acknowledged in economics and it is likely that technological and organizational changes will further increase the importance of noncognitive skills in the work place (Borghans, Ter Weel & Weinberg, 2006). This paper contributes to the literature by examining the role of personality on earnings using twin data. The major advantage of the twin design is that it allows us to account for shared environmental and genetic effects, which could drive the observed relationship between personality and labor market success.

The standard OLS findings were well in accordance with earlier studies: neuroticism was related to lower earnings, whereas agreeableness, activity and achievement were related to higher earnings. The standardized estimates were approximately of the same magnitude with Flecher (2013) and Nandi and Nicoletti (2014). Interestingly, Dudley et al. (2006) found that achievement dimension of conscientiousness was favorably associated with earnings while Prevo and Ter Weel (2015) found that orderliness does not seem to be a significant determinant of wages. Both of these results are consistent with our standard OLS findings.

Based on earlier evidence, extraversion may be related to higher earnings (Nandi & Nicoletti, 2014; Viinikainen, Kokko, Pulkkinen & Pehkonen, 2014). Our results suggest, however, that certain facets of extraversion may contribute to the opposite direction as a facet of extraversion (sociability) had a negative coefficient in the baseline results. Sociability may

lead to counterproductive behavior such as spending excessive time talking and socializing with others, which could further reduce wages. Social individuals may also be more present-oriented, which could lead to more short-sighted choices in the labor market.

The results did not change much when the shared environmental effects were fully controlled. This result is in line with Bouchard and Loehlin (2001), who show that shared environment has only a limited role in explaining the variation in the Big Five personality traits. When also genetic effects were controlled for, only neuroticism and a facet of extraversion (activity) were related to lower and higher permanent earnings, respectively. Sociability and achievement were no longer statistically significant. Thus, our first important finding is that unobserved genetic differences may cause omitted-variable bias to the relationship between personality characteristics and earnings in standard OLS estimations.

The findings suggest that some of the genetic factors are positively (negatively) correlated with achievement (sociability), which may lead to an upward (downward) bias in the estimates that are unable to account for genetic effects. Personality and risk preferences are correlated (e.g., Nicholson, Soane, Fenton-O’Creevy & Willman, 2005). In particular, risk aversion is positively correlated with conscientiousness (related to achievement) and negatively correlated with extraversion (related to sociability). Because risk preferences are at least partially genetically inherited (e.g., Cesarini, Dawes, Johannesson, Lichtenstein & Wallace, 2009), they are better differentiated out in the MZ sample than in the DZ sample.

The negative relationship between neuroticism and earnings appeared to be relevant at all levels of education and particularly among women and in the older age group, whereas activity was rewarded in the younger age group and among men and highly educated

individuals. Our results suggest that education and occupational sorting may partly, but not comprehensively, explain the connection between personality traits and earnings. Thus, personality traits may also affect promotion possibilities. The results also show that the negative relationship between neuroticism and permanent earnings is likely explained by a weaker attachment in the labor market.

The second important finding is that variation in personality characteristics, which stems from different life experiences, may have a significant effect on labor market outcomes. From the policy point of view, this possibility suggests that it may be possible to design intervention programs, e.g., for children from disadvantaged background that foster non-cognitive skills and have a positive impact on labor market performance. An example of such a program was the Perry Preschool program in the US during the mid-1960s. Although the intervention did not have long-lasting effect on participants' IQ, it did foster their non-cognitive skills and had a positive impact on participants' labor market and other adult life outcomes (Heckman, Pinto & Savelyev, 2013).

A limitation of this study is that the analysis does not completely rule out the possibility of non-causal explanations of the association between personality characteristics and labor market outcomes later in life. If there are differences in initial endowments (such as birth weight) or non-shared experiences (such as adverse shocks), which affect both personality and earnings, then the within-twin coefficients are subjected to omitted variable bias. Another caveat with twin design is that they may exacerbate the errors-in-variables bias caused by measurement error in personality characteristics (Bound & Solon, 1999). To address the errors-in-variables bias, we used the instrumental variables method. The IV- results were in accordance with our main estimation results.

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TABLES

Table 1. Rotated factor loadings

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Talkative	0.737	0.125	-0.025	0.003	-0.073	0.110
Emotional	0.666	0.002	-0.185	-0.120	0.212	-0.035
Open	0.816	0.016	0.047	0.060	0.085	-0.018
Communicative	0.786	0.013	0.087	0.016	-0.080	-0.017
Determined	0.115	0.646	0.093	0.266	0.029	-0.127
Confident	0.181	0.703	0.102	0.122	-0.039	-0.081
Dominant	0.042	0.786	-0.167	-0.114	0.000	0.037
Ambitious	-0.158	0.620	0.021	-0.048	0.038	0.368
Amicable	-0.017	-0.042	0.812	0.047	0.015	0.009
Peaceful	-0.012	0.012	0.888	-0.028	0.001	0.002
Calm	0.042	0.033	0.805	-0.071	0.048	-0.037
Quick	0.260	0.043	-0.033	0.655	-0.135	0.178
Studious	-0.022	-0.031	0.036	0.772	0.097	0.096
Prompt	-0.153	0.083	-0.100	0.631	0.122	-0.268
Honest	-0.030	0.015	0.046	0.091	0.821	0.021
Truthful	0.068	-0.015	0.019	-0.017	0.863	0.023
Active	-0.002	0.002	0.042	-0.350	-0.033	0.698
Multitasking	0.037	-0.031	-0.013	-0.115	0.015	0.786
Factor name	Sociabi- lity	Achieve- ment	Agreeab- leness	Order	Honesty	Activity

Note: High factor loadings are bolded.

Table 2. Summary statistics of basic characteristics

	(1)	(2)	(3)	(4)
	Mean	Std	Within DZ differences in absolute values	Within MZ differences in absolute values
<i>Outcome variable</i>				
Average long-term earnings, €	20,518	11,445	10,046	7,596
<i>Personality characteristics</i>				
Neuroticism	1.41	0.24	0.24	0.21
Sociability	3.03	1.03	1.10	0.82
Agreeableness	3.35	1.00	1.05	0.91
Achievement	3.43	1.00	1.04	0.86
Order	4.11	1.00	1.03	0.90
Activity	2.31	1.00	1.07	0.91
Honesty	3.08	1.00	1.05	0.90
<i>Demographic characteristics</i>				
Female, dummy	0.53	0.50	0.00	0.00
Age	39.7	1.82	0.00	0.00
Education years	11.9	1.82	1.71	1.15
Married, dummy	0.61	0.49	0.36	0.31
Number of obs.	9,284		3,085	1,557

Notes: Unstandardized personality scores. DZ = dizygotic (non-identical); MZ = monozygotic (identical). Both DZ and MZ samples consists of only same-sex twin pairs. Items related to neuroticism were assessed on a 2-point scale, whereas items related to other personality characteristics were assessed on a 5-point scale.

Table 3. Permanent earnings by personality trait

	Low score	High score	F-test statistics
Neuroticism	21,668	18,925	134.26 ***
Sociability	20,713	20,323	2.69
Agreeableness	19,634	21,403	55.79 ***
Achievement	18,473	22,563	306.15 ***
Order	20,442	20,595	0.41
Activity	19,529	21,507	69.86 ***
Honesty	20,529	20,507	0.01

Notes: Heteroscedasticity-robust F-test statistics for the null hypothesis of equal group means. *** ($p < 0.01$), ** ($p < 0.05$). Low score: personality trait score is under the twin population median score. High score: personality trait score is over the twin population median score.

Table 4. Regressions of long-term earnings

	(1)	(2)	(3)	(4)
	All twins, OLS	Within DZ – MZ sample	Within-DZ sample	Within-MZ sample
Neuroticism	-0.075 (0.010) ***	-0.049 (0.013) ***	-0.044 (0.016) ***	-0.060 (0.020) ***
Sociability	-0.036 (0.008) ***	-0.029 (0.011) **	-0.038 (0.014) ***	-0.006 (0.018)
Agreeableness	0.028 (0.009) ***	0.013 (0.012)	0.008 (0.015)	0.028 (0.019)
Order	-0.002 (0.009)	0.014 (0.012)	0.090 (0.015) ***	-0.005 (0.020)
Achievement	0.080 (0.009) ***	0.069 (0.012) ***	0.066 (0.014) ***	0.017 (0.020)
Activity	0.084 (0.009) ***	0.060 (0.011) ***	0.037 (0.009) ***	0.046 (0.018) **
Honesty	-0.001 (0.008)	-0.001 (0.011)	-0.001 (0.014)	-0.001 (0.016)
Obs.	9,284	4,642	3,085	1,557
R ²	0.09	0.02	0.03	0.01

Notes: Standardized coefficients. *** ($p < 0.01$), ** ($p < 0.05$), * ($p < 0.10$). Dependent variable: long-term earnings. OLS specification includes controls for gender and age. DZ = dizygotic (non-identical) and MZ = monozygotic (identical). Standard errors are clustered by twin pairs. Both DZ and MZ samples consists of same-sex twin pairs. Obs = Number of individuals (column 1) or number of twin pairs (columns 2-4).

Table 5. OLS and within-MZ twins regressions of long-term earnings by sex, education and age group.

	All twins, OLS	Within-MZ sample	All twins, OLS	Within-MZ sample
<i>By gender</i>	Men	Men	Women	Women
Neuroticism	-0.074 (0.014) ***	-0.020 (0.030)	-0.078 (0.014) ***	-0.095 (0.028) ***
Sociability	-0.055 (0.013) ***	-0.017 (0.030)	-0.021 (0.011) *	0.001 (0.023)
Agreeableness	0.039 (0.013) ***	0.036 (0.033)	0.017 (0.012)	0.023 (0.023)
Order	-0.022 (0.012) *	0.002 (0.029)	0.015 (0.012)	-0.017 (0.027)
Achievement	0.067 (0.014) ***	0.050 (0.035)	0.090 (0.012) ***	-0.007 (0.024)
Activity	0.088 (0.013) ***	0.054 (0.029) *	0.082 (0.012) ***	0.037 (0.022)
Honesty	0.034 (0.013) ***	-0.005 (0.025)	-0.033 (0.011) ***	0.006 (0.022)
Obs.	4372	690	4912	867
R ²	0.06	0.02	0.05	0.02
	All twins, OLS	Within-MZ sample	All twins, OLS	Within-MZ twins
<i>By education</i>	Low education	Low education	High education	High education
Neuroticism	-0.064 (0.011) ***	-0.041 (0.004) *	-0.025 (0.016)	-0.104 (0.038) ***
Sociability	-0.017 (0.001) *	0.004 (0.023)	-0.022 (0.015)	-0.030 (0.030)
Agreeableness	0.026 (0.010) **	0.027 (0.024)	0.005 (0.014)	0.029 (0.033)
Order	0.023 (0.010) **	-0.008 (0.024)	0.013 (0.015)	0.002 (0.033)
Achievement	0.043 (0.010) ***	0.019 (0.025)	0.058 (0.016) ***	0.011 (0.032)
Activity	0.058 (0.010) ***	0.030 (0.021)	0.057 (0.015) ***	0.089 (0.037) **
Honesty	0.001 (0.010)	0.007 (0.019)	-0.003 (0.015)	-0.019 (0.030)
Obs.	6803	1111	2481	446
R ²	0.07	0.01	0.12	0.04
	All twins, OLS	Within-MZ sample	All twins, OLS	Within-MZ twins

<i>By age</i>	33-40 years old	33-40 years old	41-50 years old	41-50 years old
Neuroticism	-0.064 (0.013) ***	-0.036 (0.026)	-0.085 (0.015) ***	-0.091 (0.032) ***
Sociability	-0.037 (0.011) ***	-0.028 (0.025)	-0.033 (0.013) **	0.020 (0.027)
Agreeableness	0.035 (0.012) ***	0.028 (0.024)	0.023 (0.013) *	0.029 (0.033)
Order	0.007 (0.011)	0.007 (0.025)	-0.013 (0.014)	-0.021 (0.031)
Achievement	0.079 (0.012) ***	0.042 (0.025) *	0.078 (0.014) ***	-0.015 (0.032)
Activity	0.079 (0.012) ***	0.059 (0.024) **	0.090 (0.013) ***	0.028 (0.028)
Honesty	-0.002 (0.011)	-0.020 (0.020)	0.008 (0.014)	0.027 (0.028)
Obs.	5316	895	3968	662
R ²	0.10	0.02	0.09	0.02

Notes: Standardized coefficients. *** (p < 0.01), ** (p < 0.05), * (p < 0.10). Dependent variable: long-term earnings. MZ = monozygotic (identical). Standard errors are clustered by twin pairs. Low education: primary or secondary education, High education: tertiary education. Both DZ and MZ samples consists of same-sex twin pairs. Obs = Number of individuals (column 1) or number of twin pairs (columns 2-4).

Table 6. Within-MZ twins regressions of alternative specifications

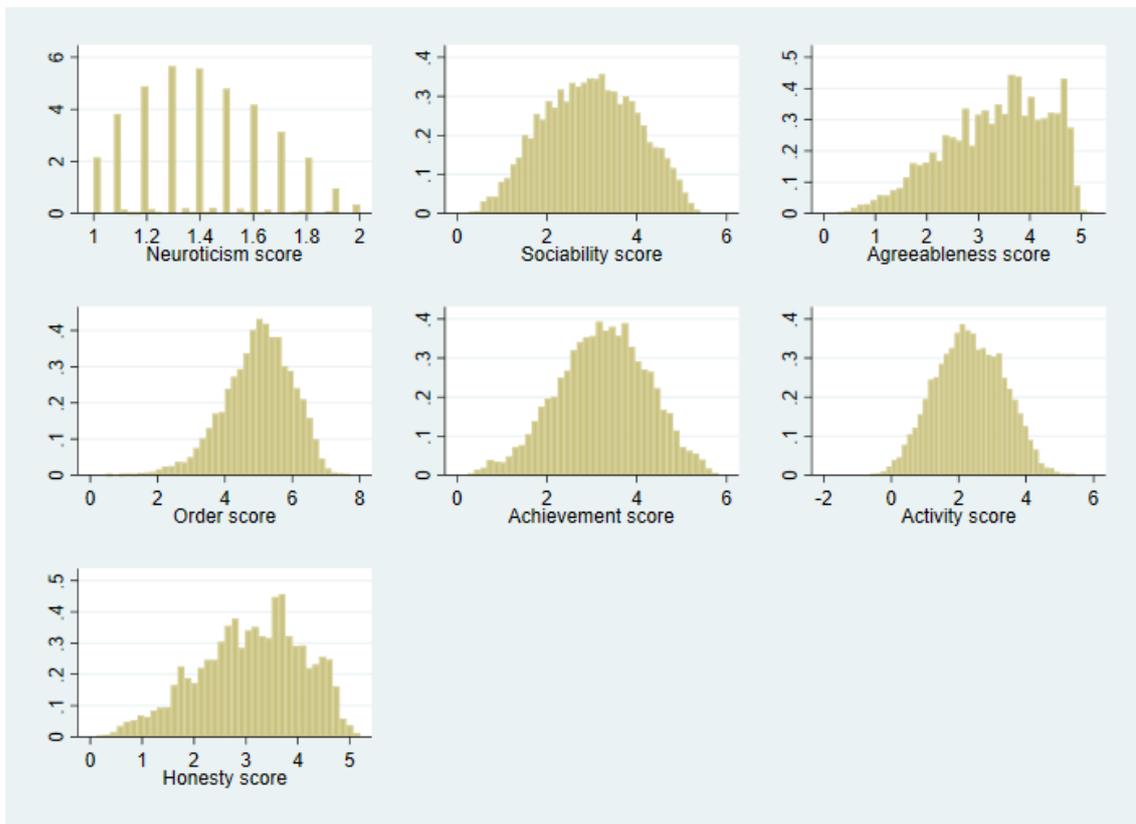
	(1)	(2)	(3)	(4)
	Within-MZ sample	Within-MZ sample	Within-MZ sample	Within-MZ sample
Dependent variable:	Permanent earnings	Permanent monthly earnings	Employment months	Schooling years
Neuroticism	-0.040 (0.019) **	-0.020 (0.013)	-0.281 (0.094) ***	-0.066 (0.037) *
Sociability	0.007 (0.018)	0.017 (0.011)	0.213 (0.095) **	0.016 (0.039)
Agreeableness	0.025 (0.019)	0.026 (0.012) **	0.000 (0.085)	0.063 (0.036) *
Order	0.007 (0.018)	-0.012 (0.012)	0.108 (0.090)	-0.050 (0.034)
Achievement	0.016 (0.019)	0.019 (0.012)	0.006 (0.096)	0.095 (0.036) ***
Activity	0.034 (0.017) **	0.025 (0.011) **	0.117 (0.086)	0.005 (0.038)
Honesty	-0.015 (0.016)	-0.002 (0.011)	0.040 (0.083)	-0.014 (0.032)
Education, 1981	0.033 (0.012) ***	-	-	-
Married, 1981	0.014 (0.035)	-	-	-
SES, 1990				
Upper-level emp.	0.549 (0.084) ***	-	-	-
Lower-level emp.	0.418 (0.064) ***	-	-	-
Laborer	0.357 (0.063) ***	-	-	-
Low sos.ec. group	-0.437 (0.103) ***	-	-	-
Twin pairs	1,456	1,504	1,557	1,456
R ²	0.16	0.01	0.01	0.01

Notes: Standardized coefficients. *** ($p < 0.01$), ** ($p < 0.05$), * ($p < 0.10$). MZ = monozygotic (identical). Standard errors are clustered by twin pairs. Because of missing information in educational attainment and marital status, the sample size is reduced in columns 1 and 4. Sample size in column 3 is also smaller due to exclusion of individuals with zero employment months per year. The reference group for SES is self-employed. Same-sex twin pairs.

Table 7. IV-regressions of permanent earnings, within-MZ sample

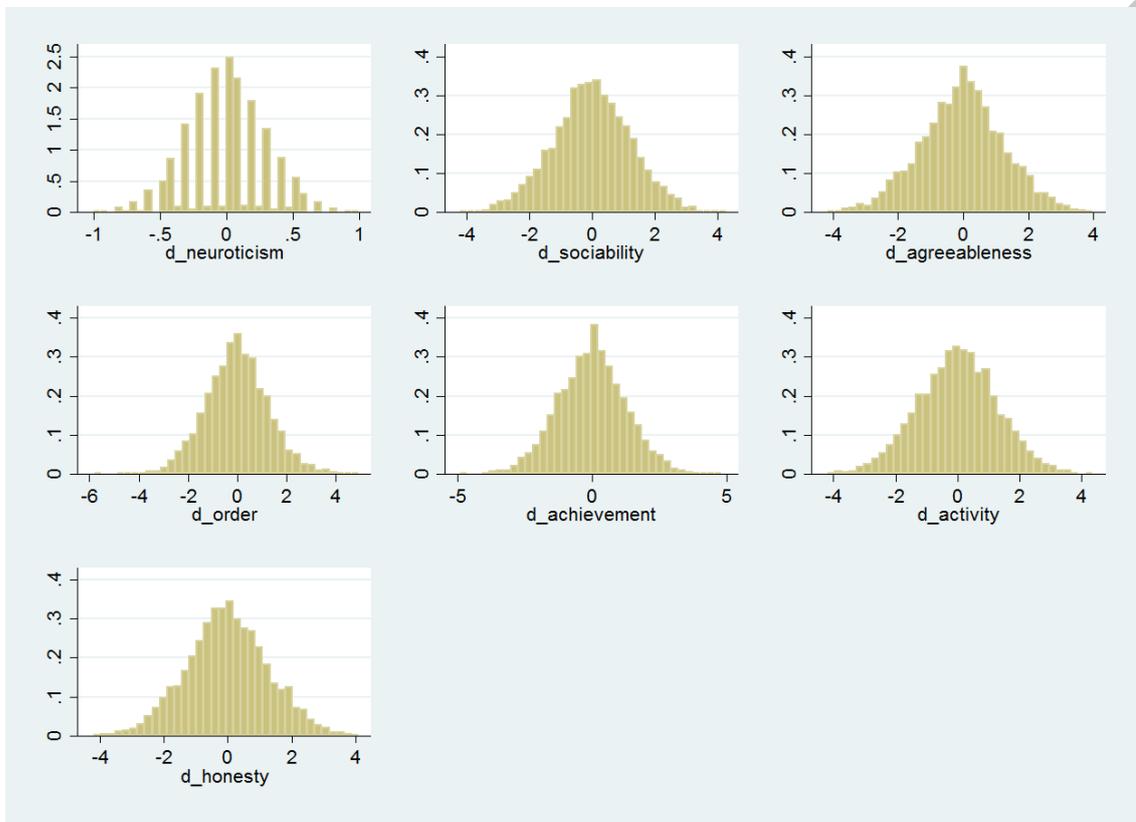
Within-MZ sample	
	IV regressions
Neuroticism ^a	-0.117 (0.063) *
Sociability	-0.035 (0.047)
Agreeableness	0.093 (0.064)
Order	-0.022 (0.068)
Achievement	0.064 (0.063)
Activity	0.104 (0.062) *
Honesty	-0.080 (0.071)
Twin pairs	880

Notes: Standardized coefficients. Standard errors are clustered by twin pairs. *** ($p < 0.01$), ** ($p < 0.05$), * ($p < 0.10$). The estimates of personality traits measured in 1990/1981 are instrumented by the personality traits measured in 1975/1981, and are collected from seven separate IV-regressions. ^a The sample size is 845.

Figure 1. Distributions of unstandardized personality trait scores

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Figure 2. Distributions of within-twin differences in unstandardized personality trait scores



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APPENDIX A

To illustrate the role of a non-shared environment on differences in twins' personalities, Table A1 shows the within-MZ correlations between personality differences, and differences in parental closeness, sibling closeness and life stressors. The subjects have responded to closeness items on a 5-point scale indicating how close they are with their parents and twin sibling. Life stressor index is measured by the weighted sum of experiencing 10 negative life events (Holmes and Rahe life event inventory) using self-reported data from the 1981 survey. The weights for the life stressors were calculated as the inverse of the lifetime prevalence (1 minus prevalence) of each negative event. Negative events include loss of a job, financial difficulties, divorce or separation, sexual difficulties, disease or injury causing a disability from work, death of a spouse or close relative or friend, and change in the health of a family member.

The results show that parental interactions are significantly related to twins' differences in personality traits. For example, the twin with a less (more) close relationship with his/her parents also report higher scores in neuroticism (sociability). Sibling peer effect is only weakly related to twins' differences in personality traits. This is in line with research of Bouchard, Lykken, McGue, Segal and Tellegan (1990), who show that MZ twin differences in personality traits are often equal to twins reared together or reared apart. Twins who have reported more negative life events also report higher scores in neuroticism (see also Riese, Snieder, Jeronimus, Korhonen, Rose, Kaprio & Ormel, 2014) and lower scores in order later in life. Although it is impossible to attach any causal interpretation to these associations, the results imply that MZ twin differences in personality traits are related to non-shared environmental experiences and possibly some random components, such as shocks in adulthood. However, if non-shared

experiences and different perceptions of similar environments affect both personality characteristics and earnings, omitted variable bias will be introduced. Interestingly, differences in family closeness and life stressors do not seem to be related to differences in long-term earnings (Table A1, row 1).

Table A1. Correlations between personality score and earnings differences and differences in family closeness and life stressors among MZ twins

	Within-MZ twin pair differences			
	Father closeness	Mother closeness	Twin closeness	Life stressors
Log of long-term earnings	-0.001	0.026	0.035	0.017
Neuroticism	-0.100 ***	-0.054 **	-0.032	0.150 ***
Sociability	0.084 **	0.073 ***	0.009	-0.035
Agreeableness	0.050 *	0.106 ***	0.083 ***	-0.014
Achievement	0.100 ***	0.027	0.018	0.018
Order	-0.052 **	0.088 ***	0.068 ***	-0.089 **
Activity	-0.026	-0.039	-0.039	0.065 *
Honesty	0.052 **	0.074 ***	0.029	-0.029

Note: *** ($p < 0.01$), ** ($p < 0.05$), * ($p < 0.10$).

Highlights:

- We study the relation between personality and permanent income using twin data
- Twin design allows us to control for shared genetic and family effects
- Standard OLS method may over-estimate the relation between personality and income
- Within-MZ estimates show that neuroticism is related to lower permanent income
- A facet of extraversion (activity) is related to higher permanent income

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