Does it pay to be nice? Personality and earnings in the UK

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Abstract

This study uses data from the British Household Panel Study (BHPS) and employs all basic traits from the Five Factor Personality Inventory – openness to experience, conscientiousness, extraversion, agreeableness and neuroticism – to examine the relationship between individuals' personality and wages in the UK. The results indicate a negative linear relationship between wages and agreeableness and, for females, wages and neuroticism whereas openness to experience is rewarded. There however are nonlinear gradients between wages and conscientiousness, and wages and extraversion. There further are no joint effects of personality and tenure, and there is evidence for a stronger causal pathway for females.

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In contrast to research in industrial and organizational psychology, economists have investigated the importance of personality for labor market success much less than the impact of cognitive abilities. For a long time, personality traits were not considered particularly relevant for labor market outcomes compared to the intelligence of a person (for a summary of evidence see Cawley et al., 2001). It moreover was difficult to examine this issue due to the lack of appropriate survey data. Whereas cognitive skills, or measures thereof, are for example included in the National Longitudinal Survey of Youth (NLSY) for the US or the National Child Development Study (NCDS) for the UK, labor economists had barely any information on individuals' personality. The great variety of psychometric measures of personality further needs some familiarity with the relevant psychological methods and literature which usually is not the case for the mainstream trained economist.

Similar to cognitive skills, individuals' personality may however also result in job performance differentials: Mueller and Plug (2006) as well as Heckman et al. (2006) and Borghans et al. (2008) argue that differences in (cognitive and non-cognitive) skills and differences in preferences may exert direct and indirect effects on productivity: 1) directly, personality might be thought of as part of an individual's set of productive traits just as education or job-related training.[1] 2) Indirectly, individuals' personality may affect labor market success through e.g. the type of schooling or occupation chosen.

Given these channels, it is unsurprising to find a non-trivial relationship between individuals' personality traits and labor market success in the limited economic research. This study adds to the literature in several ways: a) there so far is only work on British women (Bowles et al., 2001a, 2001b; Osborne Groves, 2005) so this paper updates and generalizes evidence for both women and men in the UK; b) adding to previous research that mostly employs single personality dimensions, the BHPS allows implementing the Five Factor Model as unifying framework to describe an individual's personality; c) further adapting and

extending prior research, the analysis attempts to address potential endogeneity between personality and earnings, to correct for measurement error, and to account for non-linearities in the relation between personality traits; d) despite having only one wave of information on individuals' personality, the study exploits the panel dimension of the BHPS in order to account for unobservable heterogeneity.

However, since the data allow eliciting causal mechanisms only to some extent, the results should be understood more from an exploratory point of view. In light of the yet scarce economic literature, this has its own value in order to further our understanding of the determinants of individuals' labor market success.

Background, previous findings and expectations

Conceptual considerations Despite the plausible and easily acceptable notion that individuals' behavior affects job performance, looking at the impact of personality on labor market success yields a rather complex picture. This is because there is a large and somewhat heterogeneous battery of psychometric measures which capture different aspects of individuals' personality. In addition to concepts such as locus of control, self-esteem, aggression-withdrawal or challenge-affiliation there are a few studies that employ the so-called Five Factor Model (FFM) (McCrae and Costa, 1996, 1999) which is a unifying framework to describe an individual's personality. According to the FFM, personality traits can be linked to one of the following five basic characteristics: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (or emotional instability). While there is a large number of theoretical conjectures regarding the relationship between each personality trait and labor market success, Judge et al. (1999) point to a consensus in the organizational psychology literature that out of these five traits conscientiousness, extraversion, and neuroticism are most relevant to job performance.

To start with, neuroticism describes the attribute of e.g. being tense, anxious, or moody. It is related to activation theory (Gardner and Cummings, 1988) which suggests that neurotic, i.e. emotionally unstable individuals may experience either too much or too little external stimulation which may then lead to poor task performance. As a consequence, neurotic individuals are less suited to higher level jobs that are more complex and supply more stress (Spector et al., 1995).

Extraversion is a broad construct that includes a range of factors but is typically thought to consist of sociability. As Judge et al. (1999: 624) point out, "extraverts tend to be socially oriented (outgoing and gregarious), but also are surgent (dominant and ambitious) and active (adventuresome and assertive)". On the one hand, it is plausible to assume that social orientation is of advantage in for example team-based job environments. The effect of dominance and ambition may on the other hand be ambiguous.

Conscientiousness is related to an individual's degree of e.g. self-control, the need for achievement, order, and persistence. In terms of labor related skills, conscientiousness refers to one's ability and willingness to work hard, to be responsible, and organized (Costa et al., 1991). It therefore is unsurprising that conscientiousness has been shown to be a valid predictor of job performance.[2]

Similar to extraversion, the remaining two facets – openness to experience and agreeableness – may be related either way to job performance and other labor market outcomes. Individuals who are open to new experiences typically are flexible, creative, and intellectually orientated. This may on the one hand be advantageous to career success. Openness is however also related to autonomy and non-conformity which may be a hindrance. Similarly, agreeable individuals who are more likely cooperative and likeable may benefit from these characteristics in teamwork settings or in occupations with a higher frequency of customer contacts. There however is also a flip side of agreeableness since, as

Judge et al. (1999: 625) put it, "extremely agreeable individuals may sacrifice their success in pleasing others".

Previous findings A review of more recent economic research[3] provides clear evidence that some personality traits are rewarded on the labor market while others are punished. Studies that for example employ Rotter's concept of locus of control (Rotter, 1966) indicate that externality – i.e. the individual's belief that outcomes are the result of fate or luck rather than hard work – is negatively related to earnings (e.g. Bowles et al., 2001a , Osborne Groves, 2005, Semykina and Linz, 2007, Heineck and Anger, 2008). Research based on the Rosenberg self-esteem taxonomy (Rosenberg, 1965) suggests that self-esteem and earnings are positively associated (Goldsmith et al., 1997, Murnane et al., 2001).

A different approach is chosen by Heckman and Rubinstein (2001): They compare the returns of cognitive abilities for high school dropouts, GED (General Educational Development Testing Program) participants and high school graduates. Since the GED exam is a second chance program for dropouts, the authors argue that the three states signal the individual's personality with respect to persistence and self-discipline. Controlling for measured cognitive ability and although dropouts who take the GED test are as smart as ordinary high school graduates, their findings suggest that GED participants earn less than other dropouts because they "are 'wiseguys', who lack the abilities to think ahead, to persist in tasks, or to adapt to their environments" (Heckman and Rubinstein, 2001: 146).

Two recent studies that employ the FFM taxonomy of personality are by Nyhus and Pons (2005) and by Mueller and Plug (2006). Nyhus and Pons base their analyses on Dutch data from the DNB Household Survey (DHS). The DHS includes the Five Factor Personality Inventory developed by Hendriks et al. (1999) which is a shorter version than the original inventory by Costa and McCrae (1985). The personality dimensions covered are either similar or equivalent to what is used in this study. Similar traits are conscientiousness,

extraversion, and agreeableness. Autonomy is another trait covered in the DHS which is to some extent comparable to openness to experience. The fifth trait included in their study is emotional stability, i.e. obverse neuroticism. Their findings suggest that emotional stability is positively associated with wages of both males and females but that agreeableness is negatively related to females' wages suggesting a wage differential of roughly 10%. Furthermore, men benefit from conscientiousness at the beginning of an employment relationship but from autonomy as tenure increases.

The results of Mueller and Plug (2006) who use data from the Wisconsin Longitudinal Study imply that non-agreeableness, openness, and to a somewhat lesser extent emotional stability (obverse neuroticism) are positively related to men's earnings. Women receive a wage premium for being more conscientious and open. Their findings also suggest that returns to non-agreeableness or, as they put it, antagonism are quite different for males and females. There for example is no wage penalty for agreeableness for women once socio-economic background characteristics are controlled for. Men on the other hand receive a wage premium of 4 to 6% for a one standard deviation increase in antagonism.

Expectations Regarding expectations for the following analyses, it should have become clear from the above noted evidence that – first – personality matters. Second, because of the variety of the psychometrical measures it is not quite clear a priori which personality traits are more relevant for earnings and which are not. Focusing on the two studies that employ the FFM taxonomy (Nyhus and Pons, 2005; Mueller and Plug, 2006), it might be expected that

- openness and conscientiousness are rewarded, though there might be differences by gender,
- agreeableness and neuroticism are negatively associated with earnings, again with possible gender differences,
- extraversion may or may not be related to earnings.

Data and methods

The data are derived from the British Household Panel Survey (BHPS) which is nationally representative for the UK (Taylor et al., 2007). The BHPS started in 1991 and it provides detailed information on individual and household related characteristics on an annual basis. While the survey does not contain information on individuals' cognitive abilities,[4] the 2005 wave includes a set of questions intended to give a psychological profile of the respondent. The items relate to the Five Factor Model as outlined above comprising the five basic psychological dimensions: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Since extensive psychological questioning is not practicable in large-scale surveys,[5] the BHPS provides a set of fifteen items of which three each are to capture the respective personality dimension. Answers are given on a Likert-type 7-point scale ranging from 1 – "does not apply" to 7 – "applies perfectly" (see the Appendix for the list of items used). The measures employed in this analysis are generated by standardizing the average score from the dimension-specific questions.[6] The indicators are included in augmented Mincer-type earnings equations which is the standard approach of measuring differentials in individual specific endowment and traits. In addition to individuals' personality traits, there are two more vectors of control variables which are outlined below (see model sensitivity). Accounting for the differences by gender found in previous research, the regressions are run separately for males and females. All estimations are furthermore corrected for sample selection bias: following Wooldridge (2002), period specific Inverse Mills Ratios (IMR) are estimated and included in the estimations.[7] Based on the below explained approach of generating personality traits that are constant over time, it moreover is possible to exploit the panel structure of the data. The final unbalanced panel sample comprises 51,982 person-year observations from 7,087 employed individuals in main

working age (20-60 years). Summary statistics for the final sample are provided in the Appendix.

Problems and solutions There is a range of potential problems that are taken into account as follows: first, the relationship between personality and earnings might be endogenous. On the one hand, previous research suggests that individuals' personality is partially inherited (Jang et al., 1996) and fairly stable for adults (Costa and McCrae, 1988, 1994) which would imply exogeneity. Heckman et al. (2006) however show for a sample of young individuals that parental background and the schooling level at the date of the test may affect test scores of both cognitive abilities and personality traits. Furthermore, while Costa and McCrae (1988, 1994) suggest that personality traits stop changing at age 30, recent research by Srivastava et al. (2003) show that an individual's (social and job) environment affects personality traits also in early and middle adulthood. It may therefore well be that earnings affect personality which then again may affect earnings through productivity differentials.

As a consequence, empirical research that attempts to examine causal effects of personality on labor market outcomes has to deal with the issue of reverse causality. In the present paper and similar to Semykina and Linz (2007), endogeneity of personality and schooling should not matter much since the respondents' mean age is 39 so that the interdependency between current schooling level and test scores is not given.[8] The possible interdependency between current earnings and personality however is taken into account. Adapting the approach of Nyhus and Pons (2005) and Osborne Groves (2005), each personality trait is regressed on gender, age (also squared) and terms interacting gender and age. The residuals from these regressions then are free from age and gender effects. While far from perfect, this will to some extent also pick up possible feedback-effects of an individual's job environment on her personality.[9]

A second issue is that the variability in personality dimensions might arise from measurement error. To quantify this, and to later correct it, Cronbach's alphas (Cronbach, 1951) are calculated: openness 0.68; conscientiousness 0.65, extraversion 0.69, agreeableness 0.61, and neuroticism 0.69. These reliability coefficients are not that high compared to what is typically found in the literature (John and Srivastava, 1999), i.e. ranging between 0.70 and 0.90. However, given that there are at most 3 items for each personality trait in the BHPS, the ratios found are satisfactory.[10] Now, in addition to the baseline regressions, another set of regressions is estimated to correct for the measurement error problem by imposing the calculated reliability ratios in order to adjust both parameter estimates and standard errors (Kmenta, 1997: 352-357).

Panel approach Furthermore, while the FFM personality items are only available in the 2005 wave of the BHPS, it is still possible to exploit the longitudinal structure of the survey to account for individual specific heterogeneity. Assuming that the 'residualized' personality traits are constant over time it is possible to match this information to all preceding waves of the BHPS (1991-2004). This excludes the use of fixed effects estimation, but random effects models can be estimated in order to account for unobservable heterogeneity. As usual, using the random effects estimator comes at the price of assuming no correlation between individual specific heterogeneity and personality which might not be appropriate. One possible alternative to this 'all-or-nothing' choice between random effects or fixed effects models is the Hausman-Taylor IV (HT-IV) estimator which allows including time-invariant covariates that are either exogenous or endogenous (cf. Appendix for details).[11]

Model sensitivity Sensitivity of the results is examined using a variety of specifications that include different sets of socio-economic control variables. First, the baseline specification controls for age and age squared, a set of dummy variables indicating the respondent's highest educational attainment (which to some extent captures individuals' cognitive

abilities), a dummy on whether she is married, one dummy on whether she is currently smoking, and twelve regional dummies. In addition, the base specification also includes a small set of employment-specific characteristics: tenure on current job (also squared), dummy variables capturing whether individual *i* works for a non-private employer, whether she is part-time or non-permanently employed, and two firm size dummies.[12] A second specification further includes eight industry dummies and eight occupation dummies. In line with Mueller and Plug (2006), this specification is informative since an individual's personality may also affect selection into certain jobs (e.g., Filer, 1986 or Jackson, 2006).[13]

Further following Mueller and Plug (2006), additional regressions are estimated that attempt to capture non-linearities in the personality-wage relationship: the models include dummies on whether the FFM scores are in the top or bottom 25% of the distribution. This is an appropriate approach since using linear scores may push the estimated average returns to zero if for example only moderate openness is rewarded but both being too open or not being open at all is punished.

It might moreover be argued that employees' personality is not observable to the employer at the beginning of an employment relationship but is revealed over time only so that returns to these traits might vary with tenure (Nyhus and Pons, 2005). Additional regressions are therefore estimated including variables which interact the FFM dimensions with job tenure.

Finally, being aware of the risk of reverse causality as explained above, earnings equations are estimated using socio-demographics and job characteristics from the 2006 wave of the BHPS but including individuals' personality traits from 2005. The idea is to eliminate any concurrent effects of wages on personality. The shortcoming however is that the sample size reduces substantially (n = 2,161 observations), which may trigger some coefficients statistically insignificant.

Results

Table 1 provides estimates from the pooled cross-sectional OLS regressions as well as from regressions that correct for measurement error (error-in-variables, EIV). With one exception as discussed below, the results from OLS and EIV do not differ qualitatively so only the latter are discussed to save space.[14] There are two overall findings. First, in line with prior evidence, the coefficients indicate mainly small wage benefits and penalties for individuals' personality traits, with some differences by gender. There second is evidence for self-selection into jobs by personality traits inasmuch as the coefficients decrease and partially lose statistical significance once SIC and SOC are accounted for.

In particular, there is a wage premium for a one standard deviation increase in openness to experience of about 2% for females (Table 1, column 3) and of 3% for males (Table 1, column 7). Including occupational and industry dummies, the coefficients turn statistically insignificant.

Conscientiousness is related to females' wages only. There is a 5% wage benefit for female workers in the first specification (Table 1, column 3) which decreases to about 2.5% in the full specification. There further are no effects at all of conscientiousness for males in these base specifications. These findings are in contrast to prior research and expectations which suggests that conscientiousness is a strong predictor of job performance. It should however be kept in mind that the base specifications neither account for unobservable heterogeneity nor non-linearities. The results below will show whether these aspects affects the first findings on conscientiousness.

Measurement error plays a role for extraversion: it first is weakly positively related to females' wages in the OLS models, indicating 1% higher wages for a one standard deviation increase in extraversion. Correcting for measurement error however increases both the

estimated coefficient and the standard error so that extraversion is not different from zero anymore (Table 1, columns 3 and 4). Similar to conscientiousness, there are no effects of extraversion on males' wages in the OLS and EIV regressions.

[Table 1 about here]

The results for agreeableness are in line with prior expectations and indicate a wage penalty of roughly 2% for both men and women in the OLS model and some 4% in the error corrected model. This finding might be counterintuitive at first but coincides with Mueller and Plug (2006) and Nyhus and Pons (2005). Corroborating the conjecture of Judge et al. (1999) it might well be that very agreeable persons are possibly too passive for example in conflict situations or are poorer wage negotiators.

Gender differences are again found for the relationship between neuroticism and wages. While the coefficients in the models for male workers are trivial, there are wage differentials for females: a one standard deviation increase in neuroticism is associated with wages that are about 3% lower. This reinforces the findings of Spector et al. (1995) who show that neurotic individuals perform worse in higher level job environments that are more stressful and more complex.

Panel estimates While the results from the measurement error corrected estimations improve on the baseline OLS findings, and although both sets of models are estimated taking into account that observations by individual might not be independent over time, unobservable heterogeneity is not explicitly modeled. The findings in Table 2 thus provide estimates from both random effects regressions[15] and from Hausman-Taylor IV estimations.

The results from these panel regressions first indicate that workers' self-selection into jobs that offset the effects of personality which resulted in insignificance is not that strong anymore. The coefficients in the full specifications are only slightly different than those in the models without SIC and SOC. This may to some extent be caused by explicitly modeling

individual heterogeneity: since individual heterogeneity also partially captures individuals' cognitive abilities it biases the coefficients in the pooled cross-sectional models if it is not accounted for.

Substantially, most of the first findings from above are reinforced. Openness to experience is associated to earnings with premiums of 3% (RE) to 5% (HT-IV) for a one standard deviation increase. There further are wage penalties for agreeableness of about 2% for males (Table 2, columns 5-8) and more than 3% for females (Table 2, columns 1-4). Neuroticism remains related to only females' wages indicating a penalty of roughly 3%.

[Table 2 about here]

Extraversion is again unrelated to females' or males' wages. The evidence for conscientiousness however is less convincing: there are wage premiums of about 1% for both males and females in the random effects models (Table 1, columns 1-2 and 5-6) but the coefficients then are not different from zero in the HT-IV estimations.

Non-linearities The findings so far are in line with prior expectations inasmuch as openness to experience is positively associated to wages whereas there are wage disadvantages for agreeableness and, for females, neuroticism. To further investigate non-linearities in the relationship between the FFM dimensions and earnings, Table 3 provides the estimates from regressions that include dummies on whether the individual scored in either the bottom or top quartile of the respective trait.

The results from these additional models however reinforce the linear relation between openness to experience and wages of both males and females: compared to the middle 50%, there are wage penalties of scoring in the bottom 25% of 5-8% and wage benefits of about 2-5% for scoring in the top 25% (Table 3).

Taken by the signs of the coefficients, there also is an inverse linear relationship between females' wages and neuroticism. The association is however statistically significant

only in the RE models (Table 3, column 1-2). There is some further support for an inverse relationship between wages and agreeableness: there are wage disadvantages for women of about 8% in the RE and 11% in the HT-IV models (Table 3, columns 1-4), and 5-6% for males respectively for scoring in the top 25%.

[Table 3 about here]

Linearity is less evident for conscientiousness and extraversion. There rather is evidence in favor of hump-shaped gradients between these traits and both females' and males' wages. In contrast to the positive linear link shown above (and in contrast to Mueller and Plug (2006) who find overall monotonic patterns), the panel estimates now imply penalties of about 4-6% for scoring low in conscientiousness. Scoring high in conscientiousness is associated to wage penalties of 5-8% for women and between 3-6% for men. While the wage differential in the lower quartile appears plausible, for example as a consequence of doing sloppy work, the differential for scoring in the top 25% might at first glance appear counterintuitive. However, it might well be that a 'too high' standard in getting things done, for example, slows down decision processes and/or job performance which might eventually result in lower job productivity.

Assuming linearity as above might also not be adequate for extraversion. Similar to conscientiousness, the coefficients again suggest that scoring either very low or very high is negatively associated to wages. The findings are statistically significant only in the RE models, indicating males' wage differentials of about 3% for scoring either low or high in extraversion and for females who score in the bottom 25% of extraversion, i.e. who are more introverted.

Tenure effects As outlined above, it might be the case that a worker's personality becomes evident to the employer over time only, i.e. with tenure (Nyhus and Pons, 2005). Table 4 provides results from additional regressions that include terms interacting workers' tenure

and their personality trait scores. The estimates mainly show no joint effect of tenure and conscientiousness, or agreeableness, or neuroticism. There is a positive and statistically significant coefficient in the RE model for the term that interacts females' openness to experience and tenure indicating that openness pays over time (Table 4, columns 1 and 2). This finding is however not confirmed by the HT-IV results.

[Table 4 about here]

There is a similar inconclusive finding for males inasmuch as there is a positive and significant tenure effect for extraversion in the HT-IV model (Table 4, columns 7 and 8). This result would indicate that the (statistically insignificant) negative main effect of extraversion would be opposed with increasing tenure. However, there is no equivalent result from the random effects estimations.

Past personality and current earnings Finally, a sub-sample has been used to match workers' 2005 FFM traits to their characteristics as measured in 2006. This will to some extent solve for reverse causality that might be present in cross-sections. The shortcoming however is that sample size reduces substantially. The findings from Table 5 mainly correspond to those above in Table 1. For women, there is a wage advantage for increases in conscientiousness but a wage disadvantage for agreeableness in both OLS and EIV regressions. In contrast to the results above, there is no persistent penalty for neuroticism inasmuch as the coefficient is not different from zero in the full specification (Table 5, columns 2 and 4).

For men, there is even less evidence for statistically significant findings: similar to the results provided in Table 1, openness is rewarded in the base specification (Table 5, columns 5 and 7), but the full specification again renders the coefficient insignificant. This may once more be interpreted in light of selection into jobs that offset the effects of certain personality traits. While there are no further statistically significant coefficients for males the results here differ from the results of the pooled cross-sections as shown in Table 1 only for

agreeableness. This may have different reasons: a) there might be no causal effect of personality of earnings, b) the sample size is too small, or c) there might not be enough variation in the change of males' earnings between 2005 and 2006.

[Table 5 about here]

If one is willing to believe that this last specification is a valid approach for detecting causality, the evidence would in sum indicate stronger effects of individuals' personality on earnings for females than for males.

Concluding remarks

The impact of cognitive abilities has long been of interest for economists in explaining individuals' social and economic outcomes. In contrast, individuals' personality and its effect on labor market success as measured by wages was not considered particularly relevant. This however started to change in recent years and there is a growing literature that explores whether personality explains part of the variation in wages. This study contributes to this yet rather small economic literature using BHPS data for the UK for the first time on this issue. The analysis is based on the Five Factor Model as a comprehensive framework of individuals' personality including the dimensions openness to experience, conscientiousness, agreeableness, extraversion and neuroticism.

In line with prior research for other countries and with the few economic studies that are based on the FFM, the results from both cross-sectional and longitudinal models suggest that personality traits matter on the labor market, yet with small effects. In particular, the results indicate that agreeableness and, for females, neuroticism are penalized, openness to experience on the other hand is rewarded. Additional regressions suggest a hump-shaped relationship between conscientiousness and earnings and somewhat weaker though between extraversion and earnings.

Additional models that examine the interplay between tenure and individuals' personality mainly show no changes for the effects of individuals' personality with increasing tenure. Another model attempts to exclude reverse causality issues by regressing current earnings on past personality measures. While there is no convincing evidence for males in this setting, there is a persistent wage penalty for agreeableness for females but also a wage benefit for conscientiousness. That is, being nice seems not to pay particularly for women, but working hard however does.

There are no straightforward policy implications from this analysis. However, both Heckman and Rubinstein (2001, p. 149) as well as Mueller and Plug (2006, p. 19) point out that there is too little understood yet so that exploratory studies like this have its own value and improve the understanding of the role of personality in the labor market. And despite the rather small quantitative effects of personality traits, it becomes clear from the growing literature on the relationship between individuals' personality and earnings that focusing on advancing cognitive abilities only might take too narrow a view. Future research with at best longitudinal data on individuals' personality traits is justified and needed to further the understanding of the effects of non-cognitive abilities on labor market outcomes.

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Table 1: Log-hourly wage estimates, regressed on 'residualized' FFM personality trait scores, pooled OLS and EIV

	Females OLS		Females EIV		Males OLS		Males EIV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness	0.014**	0.007	0.023*	0.012	0.018**	0.010	0.033**	0.019
	(0.006)	(0.005)	(0.013)	(0.011)	(0.008)	(0.007)	(0.013)	(0.012)
Conscientiousness	0.015**	0.007*	0.050***	0.026*	0.006	0.006	0.018	0.019
	(0.007)	(0.004)	(0.017)	(0.014)	(0.008)	(0.007)	(0.018)	(0.016)
Extraversion	0.011*	0.011**	0.018	0.018	0.010	0.007	0.013	0.010
	(0.007)	(0.005)	(0.014)	(0.011)	(0.007)	(0.006)	(0.013)	(0.011)
Agreeableness	-0.028***	-0.019***	-0.076***	-0.049***	-0.020***	-0.018***	-0.049***	-0.043***
	(0.007)	(0.005)	(0.019)	(0.015)	(0.007)	(0.006)	(0.018)	(0.016)
Neuroticism	-0.025***	-0.022***	-0.034***	-0.030***	-0.004	-0.007	-0.003	-0.007
	(0.006)	(0.005)	(0.011)	(0.009)	(0.007)	(0.006)	(0.010)	(0.009)
Soc.-dem./job controls	+	+	+	+	+	+	+	+
SIC/SOC	–	+	–	+	–	+	–	+
F-Test (FFM = 0)	9.18***	8.37***	41.61***	39.93***	3.14***	2.58**	16.14***	11.43**
(OLS: adj.) R^2	0.36	0.48	0.36	0.49	0.36	0.45	0.37	0.46

Notes: (EIV: Bootstrapped) Standard errors in parentheses, adjusted for individual clusters by time; *** p<0.01, ** p<0.05, * p<0.1;

EIV: Reliability ratios imposed are: openness 0.68; conscientiousness 0.65, extraversion 0.69, agreeableness 0.61, and neuroticism 0.69.

N = 27,311 (females) / 24,671 (males)

Source: BHPS, 1991-2005.

Table 2: Panel estimates; random effects and Hausman-Taylor IV estimation

	Females RE		Females HT-IV		Males RE		Males HT-IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness	0.032***	0.025***	0.057***	0.052***	0.036***	0.029***	0.049***	0.047***
	(0.006)	(0.005)	(0.013)	(0.012)	(0.007)	(0.006)	(0.014)	(0.013)
Conscientiousness	0.014**	0.009*	0.016	0.012	0.014**	0.012*	0.009	0.007
	(0.006)	(0.005)	(0.014)	(0.013)	(0.007)	(0.006)	(0.014)	(0.014)
Extraversion	0.008	0.008	-0.004	-0.003	0.001	0.003	-0.008	-0.007
	(0.006)	(0.005)	(0.013)	(0.013)	(0.007)	(0.006)	(0.013)	(0.013)
Agreeableness	-0.035***	-0.029***	-0.038***	-0.035***	-0.018***	-0.018***	-0.022*	-0.021*
	(0.006)	(0.005)	(0.014)	(0.013)	(0.007)	(0.006)	(0.013)	(0.012)
Neuroticism	-0.026***	-0.025***	-0.033***	-0.032***	-0.007	-0.008	-0.002	-0.002
	(0.005)	(0.005)	(0.012)	(0.012)	(0.006)	(0.006)	(0.012)	(0.012)
Soc.-dem./job controls	+	+	+	+	+	+	+	+
SIC/SOC	–	+	–	+	–	+	–	+
Chi^2 (FFM = 0)	87.73***	82.91***	33.84***	31.42***	41.17***	37.36***	15.38***	14.41***
R^2	0.32	0.44	–	–	0.33	0.40	–	–

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; N = 27,311 (females) / 24,671 (males)

Source: BHPS, 1991-2005.

Table 3: Panel estimates, accounting for non-linearity

	Females RE		Females HT-IV		Males RE		Males HT-IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness:								
Bottom 25%	-0.056***	-0.052***	-0.084***	-0.080***	-0.058***	-0.051***	-0.067**	-0.064**
	(0.012)	(0.011)	(0.028)	(0.027)	(0.014)	(0.013)	(0.029)	(0.028)
Top 25%	0.026**	0.016	0.057**	0.051*	0.026*	0.022*	0.048*	0.048*
	(0.012)	(0.011)	(0.028)	(0.027)	(0.014)	(0.013)	(0.029)	(0.029)
Conscientiousness:								
Bottom 25%	-0.043***	-0.035***	-0.062**	-0.055*	-0.049***	-0.043***	-0.065**	-0.059**
	(0.013)	(0.012)	(0.029)	(0.028)	(0.014)	(0.013)	(0.029)	(0.029)
Top 25%	-0.052***	-0.047***	-0.082***	-0.077***	-0.026*	-0.023*	-0.059**	-0.058**
	(0.012)	(0.011)	(0.028)	(0.027)	(0.014)	(0.013)	(0.028)	(0.028)
Extraversion:								
Bottom 25%	-0.023*	-0.021*	-0.011	-0.011	-0.035**	-0.034***	-0.021	-0.022
	(0.013)	(0.011)	(0.029)	(0.028)	(0.014)	(0.013)	(0.028)	(0.028)
Top 25%	-0.007	-0.006	-0.018	-0.017	-0.030**	-0.026*	-0.035	-0.034
	(0.012)	(0.011)	(0.028)	(0.027)	(0.014)	(0.013)	(0.029)	(0.029)
Agreeableness:								
Bottom 25%	0.010	0.011	-0.003	-0.001	-0.001	0.002	-0.001	-0.001
	(0.012)	(0.011)	(0.028)	(0.027)	(0.014)	(0.013)	(0.029)	(0.028)
Top 25%	-0.085***	-0.074***	-0.117***	-0.108***	-0.049***	-0.046***	-0.061**	-0.057**
	(0.013)	(0.012)	(0.030)	(0.029)	(0.014)	(0.013)	(0.027)	(0.027)
Neuroticism:								
Bottom 25%	0.019	0.024**	0.020	0.024	-0.019	-0.017	-0.041	-0.042
	(0.012)	(0.011)	(0.027)	(0.026)	(0.014)	(0.013)	(0.028)	(0.027)
Top 25%	-0.035***	-0.029***	-0.041	-0.038	-0.034**	-0.031**	-0.040	-0.038
	(0.012)	(0.011)	(0.028)	(0.027)	(0.014)	(0.013)	(0.028)	(0.028)
Soc.-dem./job controls	+	+	+	+	+	+	+	+
SIC/SOC	–	+	–	+	–	+	–	+
Chi^2 (FFM = 0)	91.66***	82.91***	57.32***	53.24***	149.25***	139.23***	31.51***	29.89***
R^2	0.36	0.44	–	–	0.36	0.44	–	–

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; N = 27,311 (females) / 24,671 (males)
Source: BHPS, 1991-2005.

Table 4: Wage effects of personality traits, interacted with tenure

	Females RE		Females HT-IV		Males RE		Males HT-IV	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Tenure	0.006***	0.007***	0.004***	0.005***	0.005***	0.006***	0.005***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Tenure^2/100	-0.013***	-0.018***	-0.017***	-0.018***	-0.015***	-0.016***	-0.014***	-0.014***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
FFM: Openness	0.010	0.014**	0.057***	0.045***	0.021***	0.021***	0.047***	0.039***
	(0.006)	(0.006)	(0.013)	(0.013)	(0.008)	(0.007)	(0.014)	(0.014)
IA: Openness*tenure	0.133**	0.096*	0.006	0.004	0.076	0.070	0.030	0.034
	(0.053)	(0.051)	(0.050)	(0.050)	(0.049)	(0.047)	(0.046)	(0.046)
FFM: Conscientiousness	0.018***	0.012**	0.017	0.013	0.010	0.010	0.010	0.010
	(0.007)	(0.006)	(0.014)	(0.013)	(0.008)	(0.007)	(0.014)	(0.014)
IA: Conscientiousness *tenure	-0.072	-0.059	-0.030	-0.027	-0.017	-0.018	-0.025	-0.019
	(0.059)	(0.056)	(0.056)	(0.056)	(0.051)	(0.049)	(0.048)	(0.048)
FFM: Extraversion	0.014**	0.011*	-0.007	-0.002	0.005	0.003	-0.013	-0.008
	(0.006)	(0.006)	(0.013)	(0.013)	(0.007)	(0.007)	(0.013)	(0.013)
IA: Extraversion *tenure	-0.030	-0.011	0.073	0.068	0.020	0.041	0.095**	0.088**
	(0.053)	(0.051)	(0.050)	(0.050)	(0.045)	(0.043)	(0.043)	(0.042)
FFM: Agreeableness	-0.028***	-0.027***	-0.039***	-0.035***	-0.018**	-0.018***	-0.026*	-0.022*
	(0.007)	(0.006)	(0.014)	(0.013)	(0.007)	(0.006)	(0.013)	(0.013)
IA: Agreeableness *tenure	0.059	0.065	0.014	0.025	0.019	0.028	0.073	0.065
	(0.060)	(0.057)	(0.057)	(0.056)	(0.048)	(0.046)	(0.046)	(0.045)
FFM: Neuroticism	-0.022***	-0.022***	-0.031**	-0.029**	-0.001	-0.005	-0.005	-0.008
	(0.006)	(0.005)	(0.012)	(0.012)	(0.007)	(0.006)	(0.012)	(0.012)
IA: Neuroticism *tenure	-0.022	-0.036	-0.043	-0.039	0.018	0.027	0.046	0.044
	(0.049)	(0.047)	(0.047)	(0.046)	(0.043)	(0.041)	(0.040)	(0.040)
Individ. Controls	+	+	+	+	+	+	+	+
Occ. / industry controls	–	+	–	+	–	+	–	+
R^2	0.24	0.39	–	–	0.24	0.35	–	–

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; N = 27,311 (females) / 24,671 (males)

Source: BHPS, 1991-2005.

Table 5: Wages in 2006, regressed on FFM traits measured in 2005

	Females OLS		Females EIV		Males OLS		Males EIV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness	0.018	0.012	0.021	0.009	0.026*	0.009	0.053*	0.030
	(0.014)	(0.013)	(0.029)	(0.028)	(0.015)	(0.015)	(0.031)	(0.031)
Conscientiousness	0.048***	0.038***	0.144***	0.119***	0.023	0.025	0.046	0.054
	(0.015)	(0.014)	(0.040)	(0.039)	(0.016)	(0.016)	(0.038)	(0.037)
Extraversion	0.016	0.015	0.024	0.025	-0.002	-0.011	-0.006	-0.026
	(0.013)	(0.012)	(0.027)	(0.025)	(0.015)	(0.014)	(0.031)	(0.029)
Agreeableness	-0.047***	-0.036***	-0.151***	-0.124***	-0.008	0.006	-0.009	0.036
	(0.014)	(0.013)	(0.040)	(0.038)	(0.015)	(0.014)	(0.040)	(0.038)
Neuroticism	-0.021*	-0.010	-0.033*	-0.015	0.003	-0.014	0.001	-0.031
	(0.012)	(0.012)	(0.019)	(0.019)	(0.014)	(0.013)	(0.026)	(0.025)
Soc.-dem./job controls	+	+	+	+	+	+	+	+
SIC/SOC	–	+	–	+	–	+	–	+
F-Test (FFM = 0)	4.78***	3.31***	4.94***	3.40***	0.86	1.39	0.87	1.40
(OLS: adj.) R^2	0.32	0.44	0.36	0.48	0.31	0.45	0.34	0.48

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

EIV: Reliability ratios imposed are: openness 0.68; conscientiousness 0.65, extraversion 0.69, agreeableness 0.61, and neuroticism 0.69.

N = 1,139 (females) / 1,022 (males)

Source: BHPS, 2005-06.

Appendix: Hausman-Taylor IV estimator

The underlying model is as follows:

$$\ln y_{it} = \beta_0 + x'_{1,it}\beta_1 + x'_{2,it}\beta_2 + z'_{1i}\gamma_1 + z'_{2i}\gamma_2 + \alpha_i + u_{it}$$

where $x_{1,it}$ is a vector of time varying variables which are assumed to be uncorrelated with the individual effects α_i, $x_{2,it}$ is a vector of variables that are also time varying but need not be uncorrelated with α_i. z_{1i} and z_{2i} are vectors of time-invariant variables that again are assumed to be uncorrelated or which might be correlated with the individual specific effects, and u_{it} is the remaining stochastic error term. Using the Hausman-Taylor IV estimator comes with at least two strong advantages. There first is no need for model-external instruments since $x_{1,it}$ and z_{1i} serve as their own instruments, $x_{2,it}$ is instrumented by its deviation from individual means, $x_{2,it} - \overline{x}_{2i}$, and z_{2i} is instrumented by the individual average of $x_{1,it}$, $\overline{x}_{1i}$. If the model is identified, the resulting FGLS estimator is consistent and efficient (Greene, 2008). The second advantage is that, as mentioned, this method allows estimating the effects of time-invariant covariates that are correlated with the individual specific effects. In accordance with prior research that employs the HT-IV estimator (Cornwell and Rupert, 1988; Light and Ureta, 1995; Heineck, 2005), belonging to an ethnic minority is assumed to be time-invariant and exogenous as is the vector of the 'residualized' personality indicators as outlined above. Age, age squared and year dummies are assumed to be time-varying and exogenous, all other covariates are assumed to be endogenous since Hausman tests after additional fixed effects regressions on the set of time-varying covariates reject exogeneity.

Appendix Table A1: BHPS-FFM personality trait items used in the analysis

Variable label (Resp. …)	FFM personality trait	Definition (Degree to which a person …)
... is original, comes up with ideas ... values artistic, aesthetic experience ... has an active imagination	Openness to Experience	… needs intellectual stimulation, change, and variety
... does a thorough job ... does things efficiently	Conscientiousness	… comply with conventional rules, norms, and standards
... is talkative ... is outgoing, sociable	Extraversion	… needs attention and social interaction.
... has a forgiving nature ... considerate & kind	Agreeableness	… needs pleasant and harmonious relations with others.
... worries a lot ... gets nervous easily	Neuroticism	… experiences the world as threatening and beyond his/her control.

Notes: Definition by Hogan and Hogan (2007), as given in Borghans et al. (2008, p. 136)

Appendix Table A2: Summary statistics

	Females		Males	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Five Factor Model traits, average score				
FFM trait score: Openness to experience*	4.481	(1.086)	4.596	(1.067)
FFM trait score: Conscientiousness*	5.602	(1.036)	5.431	(1.028)
FFM trait score: Extraversion*	4.944	(1.279)	4.568	(1.315)
FFM trait score: Agreeableness*	5.428	(1.027)	5.100	(1.092)
FFM trait score: Neuroticism*	4.059	(0.828)	3.727	(0.825)
Individ./HC/Region				
Log of hourly wage	1.912	(0.470)	2.141	(0.474)
Age (in years)	38.374	(9.483)	38.172	(9.468)
Is married	0.742	(0.437)	0.795	(0.403)
Is smoker	0.258	(0.437)	0.265	(0.441)
Is non-white	0.020	(0.142)	0.022	(0.149)
Education: none or missing	0.096	(0.295)	0.097	(0.332)
Education: below O levels	0.081	(0.273)	0.067	(0.251)
Education: O levels	0.225	(0.418)	0.176	(0.381)
Education: A levels	0.122	(0.327)	0.138	(0.345)
Education: further qualification	0.295	(0.456)	0.330	(0.470)
Education: higher degree	0.173	(0.378)	0.188	(0.391)
Region: Inner/Outer London	0.069	(0.291)	0.060	(0.237)
Region: South East	0.147	(0.354)	0.140	(0.347)
Region: South West	0.062	(0.241)	0.075	(0.263)
Region: East Anglia	0.029	(0.167)	0.033	(0.179)
Region: East Midlands	0.057	(0.232)	0.064	(0.245)
Region: West Midlands	0.059	(0.235)	0.064	(0.246)
Region: North West	0.081	(0.273)	0.081	(0.274)
Region: Yorkshire & Humberside	0.070	(0.256)	0.069	(0.254)
Region: North incl. Tyne & Wear	0.050	(0.218)	0.051	(0.220)
Region: Wales	0.118	(0.323)	0.125	(0.331)
Region: Scotland	0.167	(0.373)	0.149	(0.356)
Region: Northern Ireland	0.086	(0.280)	0.073	(0.261)
Employment attributes				
Experience in current job (in years)	4.461	(5.112)	5.216	(6.103)
Is part-time employed	0.356	(0.478)	0.024	(0.155)

Has non-permanent job	0.058	(0.233)	0.033	(0.179)
Has non-private employer	0.257	(0.437)	0.154	(0.361)
Firm size: 1-24	0.364	(0.481)	0.281	(0.449)
Firm size: 25-199	0.354	(0.478)	0.368	(0.482)
Firm size: 200 or more	0.264	(0.441)	0.339	(0.473)
SOC / SIC				
SOC: Managers & administrators	0.098	(0.297)	0.172	(0.378)
SOC: Professional occ.	0.106	(0.308)	0.103	(0.304)
SOC: Assoc. prof. & technical occ.	0.126	(0.332)	0.102	(0.303)
SOC: Clerical & secretarial occ.	0.250	(0.433)	0.085	(0.279)
SOC: Craft & related occ.	0.021	(0.143)	0.174	(0.379)
SOC: Personal & protective service occ.	0.137	(0.343)	0.055	(0.229)
SOC: Sales occ.	0.082	(0.274)	0.038	(0.191)
SOC: Plant & machine operatives	0.030	(0.172)	0.132	(0.338)
SOC: Other occupations	0.060	(0.238)	0.061	(0.240)
SIC: Manuft. (food, textile, leather)	0.015	(0.123)	0.042	(0.201)
SIC: Manuft. (wood, chemicals, metal.)	0.022	(0.149)	0.088	(0.284)
SIC: Manufacturing (Machinery)	0.035	(0.184)	0.116	(0.320)
SIC: Power/construction	0.042	(0.201)	0.104	(0.306)
SIC: Wholesale/Retail/Hotels	0.082	(0.275)	0.090	(0.287)
SIC: Transport/Financial intermediation	0.140	(0.347)	0.129	(0.336)
SIC: Real estate/Comp./Public Admin.	0.093	(0.291)	0.135	(0.342)
SIC: Education/Health	0.247	(0.431)	0.120	(0.325)
SIC : Service/Private Households	0.298	(0.457)	0.144	(0.351)
Other personal background information				
Number of children	0.775	(0.968)	0.796	(1.032)
Mother was not working when R was 14	0.352	(0.477)	0.393	(0.488)
Father was not working when R was 14	0.033	(0.178)	0.020	(0.141)
Father held higher occ. when R was 14	0.342	(0.474)	0.348	(0.476)

Notes: N = 51,982; * N = 7,087.

Source: BHPS 2005.

[1] This implicitly assumes that individuals' personality affects behavior.

[2] For references, cf. Judge et al. (1999).

[3] As outlined above, there is an established literature in industrial and organizational psychology on the impact of personality traits on job performance. Summarizing this is beyond the scope of this paper, but see e.g. Tett et al. (1991), Barrick and Mount (1991) and Tokar et al. (1998) for an overview.

[4] This is a limitation of the analysis. Prior research has however shown that the impact of non-cognitive skills on earnings do not change substantially once cognitive abilities are controlled for (cf. Heineck and Anger, 2008, Mueller and Plug, 2006, or Cebi, 2007). Furthermore, the panel estimates should pick up some of the effect by explicitely modeling individual specific heterogeneity.

[5] Note that the full inventory, the NEO PI-R, comprises 240 questions (Costa and McCrae, 1985).

[6] Not all items are used to generate the measures since exploratory analyses showed that a few of the items resulted in low construct validity.

[7] The exclusion restrictions to estimate the IMR are the individual's number of children, whether her parents were not working when she was fourteen years old, and one dummy on whether the father's occupation was managerial, professional or skilled non-manual.

[8] As for the schooling-personality link, one further approach is to regress earnings equations without individuals' schooling indicators. Another approach is to run analyses separately by schooling level. Here, additional analyses by schooling level – which result in imprecisely estimated coefficients – as well as without schooling variables qualitatively yield the same findings as those presented in the paper.

[9] Experiments with additional background variables do not result in substantially different findings.

[10] Adapting the Spearman-Brown formula, Mueller and Plug (2006) show that the reliability ratios increase with an increasing number of items. They in particular show that changes in reliabilities can be computed as $R_1=R_0\cdot((k_0 + \Delta k) / (k_0 + R_0\cdot \Delta k))$, where R_0 is the given reliability and k are the number of items measuring the respective scale. Presume now for example a fixed reliability of 0.61.

If this ratio were obtained with 6 instead of 2 items, like the agreeableness measure here, the ratio would rise to 0.85 and thus clearly break the 0.7 threshold.

[11] Note that there is another approach, the fixed effects vector decomposition, as introduced by Plümper and Tröger (2007). Their estimator is a three-stage procedure in which estimated unit effects from a fixed effects regression are decomposed in an explained and unexplained part. The latter is then included in a final pooled OLS regression that comprises both time-varying and –invariant regressors. They use Monte-Carlo simulations and try do demonstrate that their estimator outperforms the fixed effects, random effects and Hausman-Taylor IV estimators in models that include either time-invariant or almost time-invariant variables that are correlated with unit effects. However, while they claim that their estimator is consistent if the unobserved unit effects are orthogonal to the time-invariant variables they do not provide any theoretical proof about the properties of their estimator so this should be dealt with caution. Experiments with this estimator in any case yield results that are qualitatively similar to the ones presented.

[12] Results from another specification that employs individuals' socio-demographic characteristics only do not substantially differ from the one that includes the vector of job characteristics.

[13] Additional regressions by occupation are estimated to further examine this. There are only a few non-trivial findings, quite likely because of sample size restrictions. Where statistically significant, the results however correspond to the findings presented.

[14] Since the results for controls are as expected only the FFM covariates are presented and discussed, again in order to save space. Full estimation results are available upon request.

[15] Across all models, tests for random effects indicate clear rejections of the null, implying that ignoring unit-specific residuals is incorrect.