The effects of personality on earnings

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Abstract

The purpose of this paper is to investigate the influence of personality dimensions on wage settings. The study was inspired by the model proposed by Bowles, Gintis, and Osborne [American Economic Review 91 (2001) 155], which shows how psychological characteristics may be rewarded or punished in the labour market due to a so-called incentive-enhancing property. Additionally, two meta-studies show that there are robust relationships between some personality dimensions and productivity [Barrick & Mount, Personnel Psychology 44 (1991) 1; Salgado, Journal of Applied Psychology 82 (1997) 30]. We used data from the DNB Household Survey (DHS) to test the extent to which certain personality dimensions are rewarded in the labour market and, therefore, contribute towards explaining the large unexplained variance in earnings. We also consider the possibility of gender-specific returns for personality in the wage setting. The DHS provides individual labour market details as well as measures of the Big Five personality factors ('extraversion', 'agreeableness', 'conscientiousness', 'emotional stability' and 'autonomy') from a large sample of the Dutch population. We find that emotional stability is positively associated with the wage of both women and men, while agreeableness is significantly associated with lower wages for women. Men are rewarded for autonomy as tenure increases, while conscientiousness tends to be rewarded at the beginning of an employment relationship. Finally, we find that the economic returns of the personality factors in wage determination vary between educational groups. The implications of this study are discussed.
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1. Introduction

The purpose of this paper is to explore the contribution of personality towards explaining differences in wages and labour market success. Revealing more about the factors that improve individuals' ability to succeed in the labour market is of interest for (i) the employees who want to increase their own welfare and (ii) policy makers who have a special responsibility for low-income families and for future employees with respect to their choice of occupation. Such knowledge may also prove useful when searching for the reasons underlying the lower earnings of females. Previous empirical studies of wage determination have typically focused on human capital and job-specific training variables. These have been found to significantly affect wage settings, but more than half of the variance in wages remains unexplained. [1] For this reason, economists have started to consider the effects of individual traits that may be important for the employer, but which are difficult to specify in a contract. Possible determinants for variability in earning among individuals who are similar with respect to age, education, labour market experience, and parents' characteristics have been explored.

In a recent paper, Bowles, Gintis, and Osborne (2001a) made an extensive review of the wage determination literature and concluded that the standard demographic and human capital variables explain little of the variance in earnings. In addition, they found several indications of other variables that are important for labour market success. Success in the labour market has been culturally transmitted from parents to children, but the advantages of such children go beyond the benefits of superior education, inheritance of wealth, and genetic inheritance of cognitive ability. Successful parents must pass something else on to their children that gives them advantages in the labour market. We still need to identify what this is. For example, Duncan and Dunifon (1998) argue that families pass on certain 'soft' skills, such as motivation and discipline that are ultimately observed by employers and rewarded. Dale (2002) argues that it is also important to consider *in-the-home-training*, which refers to the learning of different kinds of household skills that increase productivity in various household tasks. Parents invest quantities of time and effort in order to teach their children skills, and this may influence the child's choice of schooling and occupation. Another possibility is that children inherit personality traits that are advantageous in the labour market (Osborne, 2000). A large part of personality is heritable. Additionally, early childhood, upbringing and neighbourhood effects –

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[1] For example, while the explained variance of wages was 0.26 in the data from the Dutch Brabant survey, it was 0.35 when the Dutch OSA Survey was examined (Levin & Plug, 1999). Hartog and Oosterbeek (1993) found the explained variance of wages to be 0.22 for the public sector and 0.39 for the private sector.

all partly in the control of the parents – play a role in personality development (Loehlin, 1993; Plomin, Fulker, Corley, & DeFries, 1997).

Moreover, Bowles et al. report results from empirical studies that have demonstrated the reward of personal characteristics that one might think irrelevant in the labour market. For example, beauty, height, obesity, and domestic cleanliness have been found to be robust predictors of earnings. Within some occupations, these factors may be important for productivity. But there is also a possibility that some of these variables are used by employers as indicators of traits they think may influence work performance, such as self-control and conscientiousness. Finally, Bowles et al. report findings from a number of empirical studies that show wage-related reward for certain psychological variables in the labour market. Some of these are reviewed below.

A common assumption among labour economists has been that anything rewarded in a competitive labour market must be a skill. This, in addition to the lack of suitable data, [2] has reduced interest in the search for other possible wage determinants. However, Bowles et al.'s review showed that the findings in empirical studies of wage determination suggest that factors other than skills must be rewarded. They therefore proposed a behavioural model of earnings in which they incorporate preferences that are likely to be incentive-enhancing. Their model is based on the notion that the worker's effort is endogenous and that there are incentive problems in the employer–employee relationship similar to those studied in modern principal-agent models. Employers therefore need to use incentives to increase effort. Certain employee characteristics may enable the employers to elicit effort at a lower cost, in particular where employees have different individual characteristics that lead them to react differently to incentives. If this is the case, the employer is likely to reward such traits through wage setting. Bowles et al. (2001a) proposed three traits that may enhance incentives: (1) degree of future orientation, (2) personal efficacy (measured by the Rotter scale [3]) and (3) the difference between a worker's marginal utility derived from work and marginal disutility of effort. Such personality traits may be rewarded (or punished) in the labour market independently of traditional human capital and job-specific training variables.

Bowles et al. specified a contingent renewal model of the employment relationship where the employee supply is determined by the product of hours worked and an effort level that is not verifiable. The employer, who has an imperfect measure of effort,

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[2] There are many reasons for the scarcity of datasets that include psychological traits. In general, economists have been reluctant to use subjective data due to concerns about measurement error. A lack of familiarity with psychological scales may have added to this reluctance. In addition, psychological scales are often long and adding them to a questionnaire increases costs and harms response rates. In the past decades, economists have become less sceptical towards subjective data (e.g. Alessie & Kapteyn, 2001; Dominitz & Manski, 1997) which may increase the frequency of datasets including psychological characteristics.

[3] The concept of 'locus of control' (Rotter, 1966) reflects the individuals' belief about who controls events in their lives: themselves, or external factors such as other people or the 'system'. People who perceive their lives to be controlled by their own actions and abilities have internal locus of control whereas people who perceive their lives to be controlled by external forces have external locus of control.

chooses the hours and the wage to maximise profits, knowing that a higher wage may induce the employee to supply more effort. Then the employee chooses a level of effort to maximise the present value of expected utility. This model defines an employee's best response function. The parameter b in the employee utility function is incentive-enhancing if an increase in b shifts the employee's best response function upward. An increase in incentive-enhancing preferences leads an employee to work harder at every wage rate, holding other factors constant. If otherwise, identical individuals employed by a firm have different levels of some incentive-enhancing preference b and employers can identify this difference, the one with the higher level of b – the 'better worker' – will be paid more in competitive equilibrium than the 'inferior worker'.

These ideas have only been tested to a limited extent using large datasets. Nevertheless, a number of empirical studies support their arguments. Jencks (1979) showed that traits such as industriousness, perseverance and leadership influence earnings independently of parental socio-economic background, cognitive test scores and years of schooling. Duncan and Morgan (1981), using several alternative definitions of earnings and change, found a small significant effect of internal 'locus of control' on earnings, but only in a small number of the many subgroups they studied. On this basis, they concluded that the effect of locus of control on earnings is ambiguous. Filer (1981), estimated earnings equations that included several psychological dimensions. He tested the effects of 10 factors: activity level (energy and vitality), restraint (self-control), sociability (extraversion), desire for ascendance, emotional stability, objectivity, friendliness, thoughtfulness, personal relations skills and masculinity (being hard-boiled, resistant to fear). He showed that sociability, friendliness, thoughtfulness and general activity have an effect on earnings independent of parental background, cognitive ability and schooling. Duncan and Dunifon (1998) analysed the effect of motivational characteristics (such as fear of failure, sense of personal efficacy and degree of trust) and behavioural traits (such as participation in social clubs, television viewing, etc.) measured 15–25 years prior to the observations of the earnings. They found significant effects of these variables on earnings. Goldsmith, Veum, and Darity (1997) used locus of control (considered to be time-invariant and unaffected by earnings later in life) as an instrument of self-esteem (considered reasonably changeable) in the wage equation and found a significant effect of self-esteem on earnings. They reported that an individual's real wage is more sensitive to changes in self-esteem than to comparable alterations in human capital variables. They also found support for their hypothesis that an individual's relative wage (the employee's position in the wage distribution) determines self-esteem. In a more recent study, Goldsmith, Veum, and Darity (2000) conducted a test of the efficiency wage hypothesis. They studied relative wages, and argued that work effort reflects motivation, which, in turn, is governed by locus of control. A structural real wage equation and an effort equation were estimated simultaneously and the results showed that (i) receiving an efficiency wage enhanced a person's effort and (ii) people who invested a greater effort earned higher wages. Feinstein (2000) analysed the effects of 'locus of control', 'self-esteem', 'anti-social attitudes', 'attentiveness to peer relations' and 'extraversion at age 10' on the earnings at age 26. He found these var-

iables to have substantial effects and observed strong gender differences. Osborne (2000), using a female sample, derived exogenous instruments for locus of control (the Rotter scale) from measures of personality prior to labour market experience and from a measure of adult personality for which the effects of past wages were eliminated. She found this personality trait to have a significant influence on the earnings of women and that its inclusion reduced the unexplained variance in earnings. Finally, Osborne (2000) analysed how the returns of personality are influenced by gender and occupational status. Variables labelled 'aggression' and 'withdrawal' measured prior to labour market experience were found to affect both occupational status and earnings. She found that, in the wage setting, women are punished for aggression while men are punished for withdrawal. In high status occupations, men are also punished for aggression.

The objective of this paper is to further analyse the links between personality and earnings. Personality describes central and stable individual differences in the tendency to behave in certain ways. The reason we, as researchers, find personality particularly interesting is the wide use of personality tests by employers for personnel selection. The fact that employers find assessments of personality useful indicates either that personality traits have the incentive-enhancing quality described by Bowles et al. or that they affect productivity directly. Barrick and Mount (1991) and Salgado (1997) have documented robust relationships between some of the Big Five personality factors and productivity. This further supports the notion of a link between personality and earnings.

Within the field of psychology, controversy exists about which personality factors have the greatest importance. Consensus concerning the matter is increasing in favour of a five-dimensional model of personality structure: 'extraversion', 'agreeableness', 'conscientiousness', 'emotional stability' and 'autonomy' (Digman, 1990). We use this five-factor model and attempt to determine those personality characteristics that are rewarded in the labour market. Furthermore, we wish to know if they contribute towards explaining residual inequality in the standard human capital models of wage determination. This is reasonable given the result of Barrick and Mount (1991) and Salgado (1997) meta-analyses on the relationship between the Big Five personality dimensions and job performance. The five factors are defined as follows:

Extraversion encompasses the preference for human contact, attention and the wish to inspire other people; it concerns the individual's gregariousness and assertiveness versus their reservation and timidity. Its effect on earnings may be more ambiguous than other factors and may depend on the occupation under consideration. Extraversion may be beneficial for sales representatives or teachers, but not, for example, for accountants or scientists.

Agreeableness incorporates the willingness to help other people and to act in accordance with other people's interests; it concerns the degree to which an individual is co-operative, warm and agreeable versus cold, disagreeable and antagonistic. The effect of agreeableness on wages is ambiguous. Agreeableness is a trait that employers might wish to reward, since agreeable people are more likely to respond positively to the employer's incentives. Agreeableness can therefore be regarded as

an incentive-enhancing characteristic and, for this reason, we may expect it to be associated with a higher salary. On the other hand, a low score on agreeableness may have something in common with 'Machiavellian intelligence' (the ability to manipulate others in one's own interest), which has been found to have a positive effect on earnings and occupational attainment (Turner & Martinez, 1977). There is also a chance that agreeable people are less likely to claim higher wages. If so, we may expect to find a negative relationship between agreeableness and wages.

Conscientiousness includes a person's preferences for following rules and schedules, for keeping engagements, and the extent to which individuals are hardworking, organised, and dependable, as opposed to lazy, disorganised and unreliable. We expect conscientiousness to be rewarded within the labour market. Barrick and Mount (1991) and Salgado (1997) reported that conscientiousness is positively associated with job performance across occupations. Conscientiousness has also been identified as a strong predictor of occupational success (as cited by Bowles, Gintis, & Osborne, 2001b).

Emotional stability encompasses dimensions such as nervous versus relaxed and dependence versus independence, and addresses the degree to which the individual is insecure, anxious, depressed and emotional rather than calm, self-confident and cool. Barrick and Mount (1991) and Salgado (1997) reported that emotional stability has a positive effect on job performance, and found this relationship to be valid across occupations. We therefore expect that emotional stability will be associated with higher wages.

Autonomy indicates a person's propensity to make his or her own decisions and degree of initiative and control. Autonomy is expected to have a positive effect on earnings. This is consistent with the findings of Filer (1981), who reported that men are rewarded for 'ascendance' (defined as the ability to lead and persuade others).

Generally speaking, it is unusual to find clear and strong effects of personality. It is, however, easy to find traces of such effects, meaning that small effects of personality have been found to influence choice of occupation, style of leadership, ability to work in teams, and job performance (Salgado, 1997). We therefore do not expect to find strong effects of personality in our study, but we expect the effects to be large enough to be of practical interest and to contribute to our understanding of variation in success in the labour market.

In this study, we use Dutch data from the DNB Household Survey (DHS). This is one of the few large European datasets that examine both economic and personality variables. In order to do this, we estimated traditional Mincerian wage equations based on the human capital model extended to incorporate the five personality factors. We estimate wage equations for men and women separately to accommodate previously-documented gender differences in traditional wage setting analysis and in personality (e.g. Filer, 1986; Osborne, 2000). Such differences are plausible since men and women dominate different jobs and occupations, each of which may reward a different set of skills and personality characteristics.

The rest of this paper is organised as follows. In Section 2, the data and the personality measures are presented. Section 3 includes a description of the methods used in the empirical study and the wage equation estimation results and, finally, Section 4 concludes.

2. Data and variable measures

2.1. The DNB household survey

We use data from the DNB Household Survey (DHS [4]) that includes, in addition to detailed information on saving and borrowing behaviour, individual labour market details and items designed to tap psychological concepts. [5, 6] The overall sample used for the DHS consists of two sub-samples. One sub-sample is intended to be representative of the Dutch population with respect to certain socio-economic variables (the Representative Panel, or RP). This panel consists of individuals in about 2000 households. The other sub-sample comprises about 900 Dutch high-income households (the High Income Panel, or HIP).

Initial sampling for the RP was carried out using telephone directories as a sampling frame. Researchers used a procedure that gave new and unlisted numbers an equal chance of being selected as listed numbers. Additionally, a stratified sampling procedure was employed in order to obtain a sample that was representative with respect to region and urbanisation. Note that while this sample was not specially recruited for research into economic behaviour, participants had to agree to answer questions on a variety of topics on a regular basis. The members of the HIP were recruited specifically for the DHS because of a wish to study high-income households in more detail. Members of the HIP belong to the upper-income decile of Dutch households in 1993. They were partly drawn from geographical high-income areas and partly using some of the same procedures as the RP. Potential participants were telephoned, asked for background information, and requested to take part in the panel. Those expressing willingness were interviewed and introduced to the computer-aided interviewing technique. Households ultimately agreeing to participate promised to complete questionnaires administered via a PC in return for the use of a computer and a modem.

For the purpose of our study, we pooled the panels. This is because inclusions of individuals from the HIP provides more variation in the dependent variable 'wages' (the variation in individual wage for members of the HIP is much higher than it is for household income), and it increases the sample size significantly, helping to produce more robust results. Pooling is also necessary in order to have enough female

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[4] This survey was formally known as the CentER Saving Survey (CSS).

[5] See Nyhus (1996) for further information about the data collection methods and questionnaires (http://center.kub.nl/pub/vsbpr2.html).

[6] Other studies based on this data set include Alessie and Kapteyn (2001); Donkers and van Soest (1999); Webley and Nyhus (2001) and Euwals, Eymann, and Börsch-Supan (2004).

workers in the sample for an adequate analysis of the female wages. The households in the HIP typically comprise two earners, so the wage level of the majority of the members of the HIP is not in the upper 10% of the distribution of wages. Since we are studying the decisions of employers and not the respondents, any panel effects due to sampling differences is likely to be small. We used wage data from 1996 (collected in 1997) and considered all respondents who filled in the questionnaires used (*Hhi-1996*), work information (*Work-1996 and Work-1997*), health and income details (*Inc-1997 and Agi-1997*) and psychological information (*Prs-1996*). [7]

2.2. Measurement

2.2.1. Wages

The natural log of the hourly wage in 1996 was used as the dependent variable in the wage-setting analysis. The DHS was not specifically designed for labour market analysis, and did not include a direct question about the respondents' weekly or monthly wage that could have facilitated computation of the hourly wage. In order to approximate a measure of wage in 1996 we used information about annual gross salary. Next we divided the annual gross salary by the number of working weeks in the relevant year and then by the number of hours worked each week. Because the information on hours of work (per week) is a general measure that does not concern any employer or period in particular, we excluded employees who had more than one employer or who had more than one period. [8] This ensured that the information about the weekly hours of work was related to annual gross income: [9]

$$\frac{\text{Yearly earnings}}{\text{hours worked}} = \frac{\text{wage} * \text{hours worked}}{\text{hours worked}} = \text{hourly wage}. \tag{1}$$

Because information on number of hours worked is self-reported, there is a possibility that a reporting bias may emerge that interacts with personality. For example, a person with a high level of conscientiousness may report their wages and hours worked more accurately than a less conscientious respondent. A more serious and systematic bias would occur if conscientious individuals underreported annual hours of work (i.e. they do not wish to accept the true extent to which they work). In this case, conscientiousness would be positively correlated with our measure of wages. We do admit to this possibility, but in the following analysis we assume that the measurement error of wage is uncorrelated with personality characteristics. After cleaning, the sample was reduced to 828 workers aged 16–65, of which 539 were men and 291 were women.

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[7] These data, the questionnaires and further information can be downloaded from the website of the CentERdata on request (www.uvt.nl/centerdata/dhs/).

[8] The respondents could mention a maximum of three employers and a maximum of three periods for each of them (the starting day and month and the last day and month for each period).

[9] In order to test if this cleaning may have caused a sample selection bias in our results, we used the two-step Heckman method (Heckman, 1979) to test for the bias. We found that the estimate of Heckman's lambda coefficient in the wage equation was not significant, which indicates that our cleaning did not bias our results.

2.2.2. The personality factors

In 1996, the FFPI (Five-Factor Personality Inventory), developed by Hendriks, Hofstee, De Raad, and Angleitner (1999), was included in the DHS. The FFPI was constructed to facilitate the collection of personality data by using surveys. The FFPI is shorter than most indices of personality and consists of 100 brief and concrete statements. It can, according to Hendriks et al. (1999), be used to assess the Big Five factors of personality. Twenty items represent each factor, half of which are positively phrased and half negatively. All items are comprehensible to respondents with lesser education because they lack conditionals, negatives, convoluted formulations and trait-descriptive adjectives and nouns. The respondents were presented with a list of statements, which they answered using a five-point scale (labelled: 1. Does not apply at all, 2. Applies slightly, 3. Does not apply very well, 4. Largely applies, and 5. Fully applies).

Hendriks et al. tested the FFPI scale in several ways using multiple datasets. Criterion validity was tested by comparing (i) factor scores taken from self-ratings with (ii) factor scores derived from averaged peer scores. Construct validity was tested by comparing the scale with three alternative Big Five measures. A test–retest procedure was carried out in order to assess stability in the assessments. Based on the results, Hendriks et al. conclude that the FFPI is a reliable, valid and efficient Big Five measurement questionnaire.

We followed the instructions provided by the designers of the FFPI when calculating the scores for each factor. The Cronbach's alphas for the five factors were as follows: extraversion: 0.89, agreeableness: 0.84, conscientiousness: 0.86, emotional stability: 0.90, and autonomy: 0.86. This is consistent with results reported by Hendriks et al. and indicates high internal consistency in the answers.

We also considered a potential measurement problem. Although there is a consensus that personality has stable components and, if personality does change, it changes slowly (e.g. Costa & McCrae, 1997), we tested for the effect of age on the personality measures. To avoid mismeasuring the personality variables, the effect of age was removed by regressing the personality variables against age. The predicted residuals were used as measures of the personality traits in the subsequent analyses. In the following, we refer to these age-effect-free personality variables as r-extraversion, r-agreeableness, r-conscientiousness, r-emotional stability and r-autonomy.

2.2.3. Education

All respondents were asked to indicate their highest level of educational achievement in thirteen categories, ranging from primary to university education. Responses were coded as low, medium and high education according to the following procedure: (i) Low education: kinder-garden/primary education, continued primary education (VGLO) or elementary secondary education (LAVO), continued special (low-level) education (MLK, VSO, LOM), secondary education (LAVO), special (low-level) education, vocational training through an apprentice system, or other sort of education/training; (ii) Medium education: pre-university education, senior vocational training, vocational colleges; and (iii) Higher education:

University education. Low education is the omitted dummy variable in the regression analysis.

2.2.4. Potential experience

DHS provides information about the year the workers started their first paid job. We assume that there are no breaks in an employee's work history and compute potential experience by calculating the number of years the worker has been in the labour market. If the current job is also the first job, experience coincides with tenure.

2.2.5. Tenure

Respondents were asked to report the year in which they started their current job. If it was during or after 1990, the worker was also asked which month. In computing the measure of tenure, we only incorporate information about the month if he or she began work in 1994 or later.

2.2.6. Region

To indicate in which region of the Netherlands the respondent lives, five dummy variables are defined as: (i) in one of the three largest cities; (ii) the rest of the Western part of the Netherlands; (iii) North; (iv) East; and (v) South. The omitted category in the regression analyses was 'south'.

3. Wage analysis

Our empirical model is based on that proposed by Bowles et al. (2001a). We test the notion that personality traits may be rewarded (or punished) in the labour market independently of the traditional human capital and job-specific training variables. We specify a semi-logarithmic wage equation that includes as regressors the five personality variables, P, a set of additional variables as education and job training variables, X, that also have an effect on wages, W, and an error term, μ_{it}:

$$\ln W_{it} = \alpha_0 + \alpha_1 P_{it} + \alpha_2 X_{it} + \mu_{it}. \tag{2}$$

As previously noted, the dependent variable used in the wage setting analysis is the natural log of the hourly wage in 1996. As explanatory variables, we include the personality variables and the traditional human capital variables: level of education, experience and experience squared, tenure and tenure squared, and regional dummy variables. Quadratic effects of experience and tenure are used to approximate the well-known concave profile between these variables and earnings found in most empirical studies on earnings. This profile is reflected in the estimates by a positive coefficient for the variable, while the coefficient for the quadratic term is negative. Potential experience and tenure variables are included as proxies for a type of human capital referred to as *on-the-job training*. Potential experience reflects general on-the-job training while tenure reflects firm-specific on-the-job-training. The concave profile is a result of the depreciation of human capital, since parts of the knowl-

edge accumulated through experience and tenure may become outdated. In addition, as age increases (and, typically, experience and tenure) the incentives to invest in on-the-job-training are smaller. Hence, returns to experience and tenure increase with more experience, but at a decreasing rate.

Table 5 shows the sample statistics of the variables of the wage equations for the total, male and female samples respectively. The table shows that men have, on average, higher wages, a higher level of education and more experience and tenure than do women. With respect to the personality variables, we present the standardised values derived from the 100 index items according to Hendriks et al.'s method. Minimum and maximum values in our samples are reported in square brackets. Comparing male and female personality measures, we observe that, overall, men have lower scores for extraversion, agreeableness and conscientiousness than women, but higher scores for emotional stability and autonomy.

3.1. Effect of personality variables

We begin our analysis by estimating the effects of the five personality dimensions on wages without including any control variables other than gender and region. Twin studies in particular have shown that a large part of personality is genetically inherited (e.g. Loehlin, 1993; Plomin et al., 1997; Saudino, Pedersen, Lichtenstein, McClearn, & Plomin, 1997), and therefore present from birth. This implies that personality may affect behaviour and choices throughout childhood and adolescence. It may, therefore, be important for success in the labour market in adulthood because of its impact on other factors, such as educational achievement. [10] Table 1 shows the standardised results for the total, male and female samples respectively when we include the five personality dimensions in the analyses (assuming they have linear effects on wages [11]). When analysing the total sample we include a gender dummy variable (column 2) that equals one if the respondent is a woman, and gender–personality interaction terms, in order to test if there exist gender specific effects of personality (column 3). In addition, we test if the personality variables have different levels of significance in the male and female samples (columns 4 and 5). As a general finding, we observe that all the personality variables have the same signs for all samples, but there are differences with respect to the coefficients' significance. We find that emotional stability has a positive association with wages in all three samples, and that the relationship is stronger for women. This means that this characteristic gives a higher return in the wage determination process for women than for men. This is confirmed by separate analyses of the female and male samples: the coefficient for emotional stability is higher for females than for men. We also detect other

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[10] A more rigorous analysis would estimate a simultaneous model including one equation for wage and another for educational achievement. Unfortunately, we do not have enough information within our dataset to do this adequately.

[11] We also included quadratic terms for each of the five factors in order to test whether personality traits have non-linear effects on wages. These interaction terms were not significant and are therefore not reported here.

Table 1
Wage equation excluding human capital variables

	Total		Men	Women
	B	B	B	B
r-Extraversion	-0.085^{**} (-2.58)	-0.055 (-1.38)	-0.063 (-1.47)	-0.119^{**} (-2.05)
r-Agreeableness	-0.064^{*} (-1.94)	-0.051 (-1.24)	-0.058 (-1.33)	-0.112^{*} (-1.93)
r-Conscientiousness	0.008 (0.25)	0.006 (0.15)	0.007 (0.16)	0.018 (0.32)
r-Emotional stability	0.115^{**} (3.41)	0.070^{*} (1.66)	0.077^{*} (1.77)	0.167^{**} (2.86)
r-Autonomy	0.047 (1.46)	0.036 (0.89)	0.041 (0.95)	0.056 (0.95)
Woman	-0.292^{**} (-8.61)	-0.492^{**} (-7.26)		
r-Extraversion * Woman		-0.039 (-0.96)		
r-Agreeableness * Woman		-0.041 (-1.00)		
r-Conscientiousness * Woman		0.005 (0.14)		
r-Emotional stability * Woman		0.068^{*} (1.64)		
r-Autonomy * Woman		0.010 (0.24)		
Adjusted R^2	0.152	0.163	0.021	0.080
Observations	828	828	539	291

Standardised coefficients and t-values (in parentheses).
Notes: This table reports four OLS regressions of wages on the set of variables listed in the first column. Four regional dummies and gender–regional interaction terms were included in the analyses.
  [*] $p < 0.10$.
  [**] $p < 0.05$.

gender-specific effects. Extraversion and agreeableness are negatively associated with wage in both the total and the female samples. Agreeableness has a negative association with wage, which indicates that helping other people and acting in accordance with others' interests is punished in the labour market. Another explanation may be that agreeable people are poorer wage negotiators and have an egalitarian attitude towards work and pay. Yet another explanation may be that agreeable persons enter occupations typically characterised by low wages, such as services and nursing. Due to the limitations of our dataset, we cannot test this last suggested explanation, but it should be explored further. Extraversion has a negative association with wages for women, and this is more difficult to interpret. There are likely to be occupation-specific differences in the extent to which this variable is incentive-enhancing or not. It may be the case that women select occupations where extraversion does not contribute to higher efficiency and, consequently, result in a negative return for high levels of extraversion. Finally, we observe that personality can explain a small portion of wage variance, and that there are significant gender differences. When we include only the personality variables in the regression analyses, adjusted R^2 is 7.5% for the total sample, 0.7% for the male sample and 5% for the female sample. We consider this to be quite high taking into account that other variables, such as skills, which will influence efficiency more directly, are not included. Moreover, we are unable to control for occupation. Interestingly, the effect of personality on wages is very small for men, which indicates that employers are more sensitive to differences in women's personality than that of males.

We also tested for interaction effects between the personality traits. Witt, Burke, Barrick, and Mount (2002) found an interaction effect between conscientiousness

and agreeableness on job performance. They reported a stronger relationship between conscientiousness and job performance for persons with a high agreeableness score than for persons whose score was low in five of the seven samples they tested. We tested for such an interaction with respect to earnings by comparing the estimates of those scoring high and low on the agreeableness score. We did not find any significant effects of conscientiousness in the two samples we used.

3.2. Model including human capital variables

We continued our analysis by testing whether the observed effects of personality on wages are maintained after controlling for the effects of human capital variables. The second, fourth and sixth columns in Table 2 show the resulting estimations when the effects of only traditional human capital variables (the basic model) were analysed using the wages of the total, male, and female samples respectively. These estimations are consistent with the literature. The medium and university levels of education are positively and significantly associated with higher wages. Potential experience and tenure have a positive influence on wages and have the expected quadratic structure. Next, in columns 3, 5 and 7 of Table 2, we present the estimation results following the inclusion of the personality variables. We looked for interactions between gender and personality variables but did not find any such effects. Still controlling for human capital variables, emotional stability is positively related to wages in all three samples. The gender differences we observed when human capital variables were excluded from our analysis have disappeared. This indicates that parts of the effects of emotional stability among women may be captured by other variables, such as education or tenure. We also found that agreeableness has a negative relationship with wage in the total and the female samples. Additionally, this relationship is robust to the inclusion of human capital variables. We did not find any significant effects of extraversion upon inclusion of the human capital variables, which may indicate that some effects of this variable are explained by the other human capital variables. Inspection of the estimated unstandardised coefficients (not reported in the table) suggests that the effects of extraversion are captured by level of education, because the education coefficients change when the personality variables are included in the model. This means that the effects of education may be overestimated when traditional human capital models are used in analyses of wages. Conscientiousness and autonomy are not significant in any of the analyses, which is surprising, since these were the variables we expected to have the same positive effect on wages across all occupations.

3.3. Interaction effects between personality and tenure

One further interesting issue to investigate concerns the existence of interaction effects between the tenure and personality variables. This is likely to be because the personality factors are probably unobservable from the perspective of the employer at the time of employment, but may be observed over time and thus rewarded. If this were the case, personality factors would not be related to wages at the

Table 2
Wage equations including human capital variables

	Total sample		Men		Women	
	Basic model	Extended model	Basic model	Extended model	Basic model	Extended model
	B	B	B	B	B	B
r-Extraversion		−0.031 (−1.07)		−0.014 (−0.39)		−0.067 (−1.25)
r-Agreeableness		−0.068** (−2.36)		−0.055 (−1.45)		−0.097* (−1.83)
r-Conscientiousness		−0.025 (−0.89)		−0.024 (−0.65)		−0.031 (−0.59)
r-Emotional stability		0.094** (3.16)		0.088** (2.34)		0.115** (2.16)
r-Autonomy		0.018 (0.64)		0.013 (0.35)		0.021 (0.40)
Woman	−0.553** (−6.16)	−0.479** (−5.29)				
University	0.326** (10.30)	0.314** (9.94)	0.434** (10.23)	0.423** (9.91)	0.219** (3.99)	0.206** (3.73)
Medium education	0.209** (6.60)	0.194** (6.13)	0.255** (5.95)	0.238** (5.49)	0.178** (3.24)	0.171** (3.11)
Experience (potential)	0.573** (4.52)	0.586** (4.65)	0.661** (3.84)	0.678** (3.96)	0.632** (2.90)	0.638** (2.91)
Experience squared	−0.452** (−3.63)	−0.463** (−3.75)	−0.481** (−2.84)	−0.493** (−2.92)	−0.567** (−2.66)	−0.582** (−2.71)
Tenure	0.399** (3.09)	0.417** (3.25)	0.471** (3.13)	0.491** (3.26)	0.699** (3.87)	0.636** (3.53)
Tenure squared	−0.212* (−1.71)	−0.221* (−1.80)	−0.286** (−1.92)	−0.301** (−2.02)	−0.441** (−2.54)	−0.405** (−2.34)
Tenure * Woman	0.360** (2.18)	0.301* (1.83)				
Tenure squared * Woman	−0.229* (−1.90)	−0.204* (−1.69)				
Adjusted R^2	0.338	0.350	0.264	0.270	0.229	0.247
Observations	828	828	539	539	291	291

Standardised coefficients and *t*-values (in parentheses).

Notes: This table reports six OLS regressions of wages on the set of variables listed in the first column. Four regional dummies and gender–regional interaction terms were included in the analyses.

* $p < 0.10$.
** $p < 0.05$.

beginning of the employment relationship, but their impact would increase as tenure advances. Table 3 shows the results obtained when testing for the existence of interaction effects between tenure and personality. First, we see that there are interaction effects between personality variables and tenure and that such interaction effects are only found in the total and male samples. In both samples, the coefficient for autonomy has changed sign in comparison to the previous results. The coefficient for autonomy is now negative, while the interaction term is positive. This means that at the beginning of the employment period, autonomy has a negative relationship with earnings, while autonomy is rewarded with increased tenure. The sign of the autonomy coefficient in the previous analyses is positive because mean tenure is high and the coefficient in the previous analyses showed the mean effect of autonomy. A smaller interaction effect is found for agreeableness in the total sample. The negative relationship between wages and agreeableness is declining with increased tenure.

Interestingly, we find a negative interaction effect for conscientiousness and tenure, which means that conscientiousness has a negative influence on wages as tenure increases. The sign of the conscientiousness coefficient has changed compared to the previous analyses and is now positive (but insignificant). One interpretation of this

Table 3
Wage equations, including personality and tenure interaction terms

	Total	Men	Women
	B	B	B
r-Extraversion	−0.026 (−0.51)	−0.004 (−0.05)	−0.040 (−0.43)
r-Agreeableness	−0.148** (−2.90)	−0.148** (−2.18)	−0.180* (−1.88)
r-Conscientiousness	0.068 (1.32)	0.089 (1.28)	0.087 (0.88)
r-Emotional stability	0.121** (2.27)	0.086 (1.22)	0.183* (1.94)
r-Autonomy	−0.108** (−2.16)	−0.182** (−2.67)	−0.050 (−0.55)
Woman	−0.494** (−5.26)		
University	0.313** (9.96)	0.416** (9.85)	0.206** (3.70)
Medium education	0.193** (6.13)	0.232** (5.41)	0.172** (3.11)
Experience (potential)	0.555** (4.42)	0.669** (3.95)	0.576** (2.57)
Experience squared	−0.436** (−3.53)	−0.481** (−2.87)	−0.530** (−2.42)
Tenure	0.425** (3.23)	0.466** (3.01)	0.650** (3.49)
Tenure squared	−0.220* (−1.77)	−0.282** (−1.88)	−0.405** (−2.28)
Tenure * Woman	0.299* (1.78)		
Tenure squared * Woman	−0.200* (−1.65)		
r-Extraversion * Tenure	−0.001 (−0.02)	−0.013 (−0.19)	−0.022 (−0.23)
r-Agreeableness * Tenure	0.098* (1.94)	0.110 (1.61)	0.103 (1.07)
r-Conscientiousness * Tenure	−0.115** (−2.25)	−0.137** (−1.96)	−0.147 (−1.50)
r-Emotional stability * Tenure	−0.023 (−0.45)	0.009 (0.13)	−0.073 (−0.77)
r-Autonomy * Tenure	0.155** (3.10)	0.231** (3.37)	0.102 (1.09)
Adjusted R^2	0.361	0.287	0.247
Observations	828	539	291

Standardised coefficients and *t*-values (in parentheses).
Notes: This table reports three OLS regressions of wages on the set of variables listed in the first column. Four regional dummies and gender–regional interaction terms were added when necessary.
* $p < 0.10$.
** $p < 0.5$.

may be that conscientiousness has the incentive-enhancing property described by Bowles et al. (2001a, 2001b). Employers may use other characteristics, such as educational attainment, as signals of this trait, thereby rewarding this trait from the beginning of the employment relationship in order to increase the probability of recruiting the conscientious worker. Once employed, conscientious workers may perform their work satisfactorily without receiving extra pay. Hence, these people may have less inclining income curves than others.

Continuing our analysis of these interaction effects, the unstandardised coefficients for the educational dummies change when the interaction terms are included, while the coefficients for the other human capital variables remain the same.

3.4. Occupational status analysis: Education as a proxy

Having established that some traits are generally rewarded in the labour market, a subsequent question centres on whether personality is differentially rewarded across occupational status, which has been reported in previous studies by Turner and Martinez (1977), Filer (1986) and Osborne (2000). It is likely that certain personality traits are appreciated to a greater or lesser extent, depending on the job. Moreover, the structure of power or hierarchy in some occupations may be more sensitive to personality characteristics. Unfortunately, our data do not provide information on occupation or work type from which we can infer occupational status. We therefore use education as a proxy for occupational status. One weakness of this approach is that personality (along with individual and family characteristics) may also affect educational achievement, as postulated in the human capital theory and as indicated by our previously-reported results. It would be possible to control for this selection bias with a switching model, but we lack the necessary information to do so. These limitations must be taken into consideration when interpreting the results in Table 4. The results show that effects of personality on earnings differ with respect to education level. In the total sample, we only observe significant interaction effects for employees with a university degree. Agreeableness and emotional stability are both appreciated to a lesser degree for university-educated employees than for others. When the interaction effects are included, we see that extraversion is again significant, as is the case when the human capital variables were excluded (Table 1). Analysis of the male employees in our sample suggests that extraversion is less punished among higher educated employees and autonomy is less rewarded. In this analysis, the coefficients for extraversion (negative) and autonomy (positive) are significant. This indicates that the effects of these variables interact with education and/or type of work and have, therefore, not been found in the previous analyses.

For women, we only observe a significant and negative effect for emotional stability among the university and medium-educated groups, which means that this characteristic is less rewarded with higher education. The regression estimates confirm, taking into account the limitation of our analysis, the results by Osborne (2000) that effects of personality vary across types of jobs.

Table 4
Wage equations including personality and education interaction variables

	Total	Men	Women
	B	B	B
r-Extraversion	-0.096^{*} (-1.88)	-0.171^{**} (-2.49)	0.005 (0.06)
r-Agreeableness	-0.049 (-0.97)	-0.003 (-0.05)	-0.089 (-1.10)
r-Conscientiousness	-0.010 (-0.21)	-0.069 (-1.03)	0.033 (0.38)
r-Emotional stability	0.169^{**} (3.38)	0.102 (1.62)	0.368^{**} (3.96)
r-Autonomy	0.069 (1.51)	0.142^{**} (2.20)	-0.009 (-0.12)
University	0.311^{**} (8.88)	0.419^{**} (8.64)	0.218^{**} (3.25)
Medium education	0.198^{**} (6.22)	0.262^{**} (5.81)	0.142^{**} (2.46)
r-Extraversion ∗ University	0.012 (0.34)	0.091^{*} (1.86)	-0.047 (-0.75)
r-Agreeableness ∗ University	-0.058^{*} (-1.67)	-0.055 (-1.07)	-0.079 (-1.28)
r-Conscientiousness ∗ University	0.007 (0.22)	0.039 (0.89)	-0.034 (-0.58)
r-Emotional stability ∗ University	-0.065^{**} (-1.91)	0.017 (0.36)	-0.220^{**} (-3.61)
r-Autonomy ∗ University	-0.018 (-0.56)	-0.033 (-0.72)	0.016 (0.27)
r-Extraversion ∗ Medium	0.075 (1.56)	0.158^{**} (2.42)	-0.028 (-0.33)
r-Agreeableness ∗ Medium	0.003 (0.08)	-0.020 (-0.31)	0.022 (0.28)
r-Conscientiousness ∗ Medium	-0.032 (-0.68)	0.031 (0.50)	-0.090 (-1.08)
r-Emotional stability ∗ Medium	-0.076 (-1.61)	-0.020 (-0.33)	-0.239^{**} (-2.73)
r-Autonomy ∗ Medium	-0.065 (-1.53)	-0.155^{**} (-2.59)	0.025 (0.34)
Adjusted R^2	0.354	0.279	0.274
Observations	828	539	291

Standardised coefficients and *t*-values (in parentheses).
Notes: This table reports three OLS regressions of wages on the set of variables listed in the first column. For simplicity, we only present the results obtained for personality, education and their interaction variables. Potential experience and potential experience squared, tenure and tenure squared, a gender (woman) dummy variable, four regional dummy variables and tenure–woman and region–woman interaction variables were included in the analyses.
* $p < 0.10$.
** $p < 0.05$.

4. Discussion

The aim of this study was to establish if and how personality traits influence wage settings. We used one of the few European datasets with this type of information. Traditionally, earnings have been explained with human capital variables, including education, job training and, sometimes, innate cognitive skills. A large and permanent part of earnings has remained unexplained. Recently, however, Goldsmith et al. (1997) and Bowles et al. (2001a, 2001b) presented strong arguments for the inclusion of psychological capital in studies of earnings. Goldsmith et al. showed the error behind the assumption that human capital variables and psychological capital variables are independent. Any analysis of the effect of human capital variables on wages will, therefore, be biased if the psychological capital is not addressed. Our research confirms the conclusion of Goldsmith et al.: we found indications of interaction effects between educational level and personality.

Bowles et al. proposed a behavioural wage model, which includes psychological capital, in light of previous studies of earnings that included psychological variables.

Our findings support the inclusion of personality traits in wage determination models. The results suggest a general pattern of reward for some personality traits across all occupations. It is likely that the reward or punishment of the different personality characteristics is occupation-specific in that they are higher within specific occupations unaddressed by our general analyses. The lack of detailed occupation information may therefore partly explain why the personality variables contribute relatively little towards increasing the explained variance in earnings. Another reason for the low increase in terms of explained variance, is that the labour market in the Netherlands is unionised. A large component of wages is determined by collective bargaining and agreements. Hence, there are limitations, within some sectors, on how much employers can distribute earnings on the basis of personality. The trend towards decentralisation, from collective bargaining to company level authority, may lead to an increased impact of psychological variables on wages.

The results also confirm Mincer's model of productivity. The meta-studies of Barrick and Mount (1991) and Salgado (1997) showed that emotional stability has a positive relationship with productivity, and it is therefore congruent with this theory and the efficiency wage hypothesis that we find a positive association between emotional stability and wages. It is more puzzling that we did not find a significant relationship between conscientiousness and wages, given that the meta-studies showed a general and robust relationship between conscientiousness and work performance. One possible explanation for this is the presence of sample selection. It may be that only conscientious people become panel members and filled in the questionnaire properly, although the statistics showed in Table 5 do not suggest such a bias. The variance for conscientiousness in our sample is just as large as for the other personality factors. Due to the interaction effect found between tenure and conscientiousness (see Table 3), a more likely explanation would be that employers observe this trait when hiring a new employee and offer a relatively high salary in order to obtain that worker. If conscientiousness is an incentive-enhancing factor, the employer will need to use fewer incentives in order to make this employee work satisfactorily. Hence, conscientious workers have a less inclining earnings profile than others.

Finally, we extend our analysis to ask whether personality effects could vary with tenure and educational attainment. The results show that, for men, conscientiousness is less rewarded as tenure increases, which indicates that observable factors, such as personal appearance or educational attainment, may be acting as a sign of this trait at the point of employment. Autonomy is rewarded as tenure increases, indicating that this trait is difficult to observe in the personnel selection process. We also find that agreeableness has a positive interaction with tenure in the total sample, which means that this trait is rewarded with increased tenure. Personality and education interaction analyses show that there exist different personality effects by education.

The results support the ideas put forward by Bowles et al. (2001a, 2001b) that the relation between personality and wages is not universal, and differs by gender. Personality traits have different labour market rewards for men and women. The reasons for this are either that employers hold different preferences for male versus female employees, or that males and females dominate different occupations that each favour specific personality traits. For example, women tend to dominate occu-

Table 5
Sample statistics

	Total	Men	Women
Hourly Wage	33.519 (16.821)	36.671 (15.874)	27.712 (19.957)
Extraversion	−0.017 (1.026) [−3.30, 2.94]	−0.143 (1.015) [−3.30, 2.59]	0.211 (1.007) [−3.13, 2.94]
Agreeableness	−0.084 (0.946) [−3.58, 2.45]	−0.177 (0.927) [−3.58, 2.45]	0.091 (0.956) [−3.45, 2.34]
Conscientiousness	0.053 (0.934) [−3.71, 2.38]	0.019 (0.929) [−3.71, 2.38]	0.122 (0.942) [−3.07, 2.36]
Emotional stability	0.157 (0.939) [−3.34, 2.54]	0.338 (0.892) [−2.99, 2.54]	−0.187 (0.931) [−3.34, 2.34]
Autonomy	0.076 (0.941) [−3.29, 2.74]	0.156 (0.906) [−2.26, 2.74]	−0.071 (0.986) [−3.29, 2.16]
Woman	0.349		
Low education	0.326	0.296	0.381
Medium education	0.572	0.578	0.556
University	0.101	0.124	0.061
Experience	23.071 (10.659)	24.225 (10.237)	20.951 (11.076)
Tenure	14.338 (9.80)	16.005 (10.294)	11.204 (7.912)
Observations	828	539	291

Notes: The table includes sample statistics for individuals from whom it is possible to obtain an accurate measure of wages in 1996. Standard deviations are presented in parentheses. Minimum and maximum values are presented in square brackets.

pations that involve care for other people in addition to a relatively low wage, and agreeableness may be an important attribute in performing these types of duties satisfactorily.

Just as human capital is a function of many different variables (education, health and experience), psychological capital is a product of many psychological variables. In this study, we have focused on personality at the exclusion of other potential variables. More and better data are needed to increase our understanding of the contribution of psychological capital to labour market outcomes. Future research should also explore new (and hitherto untested) candidate variables that may reduce the unexplained variance in earnings, such as curiosity, ability to delay gratification, and work ethics, which may be added to some of the variables already proposed, such as self-esteem and personal efficacy. Much more research is needed in order to determine how these interact with each other and the extent of their relative contribution towards explaining individual differences in labour market success.

Greater knowledge of which psychological variables are important for labour market success may increase our understanding of the documented intergenerational transmission of earning. For example, previous research has shown that there is a link between family background and the length of education (Solon, Page, & Duncan, 2000), neighbourhood and wages (Ginther, Haveman, & Wolfe, 2000), and between parent characteristics and their children's social and economic outcomes (e.g. Plotnick & Hoffman, 1999). These findings indicate that there is something about the environment in which children grow up and the way parents raise their children that

influence their educational attainment and their choice of occupation. Parents may foster certain 'soft skills' such as discipline and work ethic, which influence their children's labour market success. Some psychological traits may also be inherited. The characteristics of the children's neighbourhood may influence factors such as locus of control, trust and self-esteem. By focusing on the psychological factors that are important for labour market success, we may better understand intergenerational transmission of earnings. We have shown that personality may be a candidate explanation for characteristics that are passed from parents to children. Research by Osborne (2000) suggests that also self-efficacy is passed from parents to children and can explain intergenerational transfer of wages.

The results of this study, along with results from the studies reviewed in the introduction, may have implications for the design of worker training programmes that usually focus on the improvement of cognitive skills. These programmes could be improved by including focus on behavioural and social skills that are known to augment productivity. Guidance about choice of occupation may also be improved by addressing personality. The widespread use of personality tests by companies in their recruitment of new staff suggests that personality traits influence the probability of getting a job. Our research indicates that personality may influence success, as judged by earnings, in different occupations. These reflections could also be related to the general discussion on formal versus informal schooling. Schools should not only include academic skills but also promote personality traits that are rewarded in the labour market (Heckman, 2000). Students may learn to control emotions and to be more independent. However, this policy should be implemented with caution. As Bowles et al. (2001b) note, some of the personality traits that were found to increase earnings, like for example, machiavellianism (which corresponds to low scores for agreeableness), could be considered character flaws rather than traits to be promoted.

Acknowledgement

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