

The Effect of Personality Traits and Biological Factors On Schooling, Earnings and Career Promotion

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Abstract

This paper investigates whether non cognitive skills as indicated by big 5 personality traits and biological factors as measured by birth weight, relative age and height explain the variation in schooling and labor market outcomes using Japanese survey data. Our estimated results show that in case of females, biological factors contribute to schooling whereas as for males, non cognitive skills more strongly influence the schooling, wages and career promotion. Interestingly, facets of big 5 personality traits are differently associated with academic and occupation success and our results suggest the role of personality traits can vary between and within countries. These results are obtained after controlling for a variety of subjective psychological and/or behavioral factors in addition to economic variables.

Keywords: big 5 personality, labor market outcomes, birth weight, relative age effect

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1. Introduction

It has been established that measured cognitive ability is strong predictor of educational outcomes and career success. Heckman (1999) has, however, argued that a serious bias can arise if cognitive skills as measured by test scores or IQ index are only taken into consideration in evaluating accumulated human capital, with exclusion of non cognitive skills such as motivation and social adaptability. As measures of non cognitive skills, this study focuses on personality traits, the Five-Factor Model (FFM), which is a broadly accepted model of personality in the empirical economics literature. FFM model includes the following factors: agreeableness, conscientiousness, emotional stability, extraversion and openness to experience (for details, see Gosling et al., 2003).

Less attention was paid to the role of non cognitive skill in comparison to cognitive skills, but several studies have recently focused on non cognitive skills as an important contributor to school attainment (Borghans et al., 2006; Heckman et al., 2006) and earnings (Heineck and Anger, 2010; Carneiro et al, 2007; Muller and Plug, 2006). Heckman et al. (2006) have found that increase in personality traits—loss of control and self-esteem—from the 25th to the 75th percentile of its distribution with holding cognitive skills constant, increase the probability of being a four year college graduate at age 30 by approximately 25 percentage points. Big 5 personality traits, in particular conscientiousness and openness to experience, proved to be the best personality predictor of educational performance and years of education respectively, although IQ scores remain the single more important factor of success (Borghans et al., 2006). There is a prominent empirical study that elaborates the importance of non cognitive skills that affect the labor market outcomes. Heckman et al. (2001) have argued that those who obtained high school certification through the GED (General Educational Development) in the US have lower wages than high school dropouts, which is mainly because despite a relative higher level of intelligence, the GED recipients lack skills such as discipline, patience or motivation compared to the dropouts.

In addition to the effect of human behavioral characteristics, some biological factors in early life have been known as important determinants for education outcomes at later age. Kohara and Ohtake (2009) has found that birth weight is positively correlated with education performances. Kawaguchi (2011) has argued that relatively older children of both sexes at the school entry than their younger cohorts obtain higher test scores and more education. In this paper, we investigate whether non cognitive skills indicated by big 5 personality traits along with biological factors explain variations in schooling and labor market outcomes. The rest of the paper is organized as follows. Section 2 explains dataset and econometric framework and section 3 reports the estimated results. Implications and limitations of this study are discussed in Section 4.

2. Data and Methodology

2.1 Data

This study is based on the data obtained from a survey conducted by the COE (Center of Excellence) project of Osaka University in February 2012 with 4,588 people from throughout Japan, selected by the double stratified random sampling method. Due to data unavailability measuring cognitive skills at school, this research uses the classical measures of education (years of schooling) and economic performance (hourly

wages and promotion to the management post). As biological factors, birth weight, relative age at the elementary school entry, and height at the time of survey are used to control for some unobserved individual ability inherited from parents and family background factors. Big 5 personality traits are measured based on self-report questionnaire. The questions and variables are constructed following Gosling et al. (2003).

2.2 Econometric Framework

We regress schooling and earnings on i) biological factors ii) personality traits and other behavioral factors in addition to socioeconomic variables, using OLS regression. Probit model is used for career promotion that equals 1 if the respondent is currently working as manager or higher ranking officer. Column (1) at Table 1 through Table 3 only controls for biological factors and column (2) additionally controls for individual and socioeconomic control variables. Column (3) and (4) include personality traits and behavioral factors, and column (5) controls for both biological factors and personality traits. Estimations are carried out separately for males and females.

3. Results

There seems to be a significant difference in determinants for years of education between males and females (Table 1). As for males, completed years of education are clearly correlated with the facets of personality traits—*agreeableness* and *openness to experience*. This is very different from overall body of literature, in particular in the field of psychology, which has demonstrated that *agreeableness* is mostly unassociated with academic performance (O'Connor and Paunone, 2007). In contrast, in case of females, biological factors that are determined at early life affect schooling at later age; birth weight and relative age at the school entry are positively related with the schooling even after current height, personality traits and socioeconomic variables are all held constant. These results are partly consistent with Kawaguchi (2011) and Kohara and Ohtake (2009).

In terms of the labor market outcomes as measured by hourly wages and the probability of getting promoted to the management post (Table 2 and 3), we only focus on males because there are many unobserved factor that affect female wage equations and more importantly, there are only a few samples who are currently hired as higher ranking officer or manger. The results indicate that as a determinant for wages, height and *consciousness* play a significant role whereas when it comes to career promotion, birth weight in addition to height increase the probability of promotion and *openness to experience* are strongly correlated. Interestingly, the impact of height on wages becomes insignificant when personality traits are controlled, which suggests height probably captures in part non cognitive skills. The role of *consciousness* contributing to earnings is consistent with the general finding of studies about personality traits and career success (Judge et al., 1999).

4. Discussion

The estimated results, however, need to be interpreted with caution, because of a possibility of reverse causality and measurement error problems. There is no clear answer to when personality traits are formed and whether they can change during adult life (Carneiro and Heckman, 2003; Boyatzis, 2008), but if personality traits are modified after or influenced by schooling and employment, this causes a reverse causality and the

Table 1 Determinants for schooling by gender

Dependent variable: Years of Education (9-14)										
Regression Model: OLS	<i>Sample restricted to males</i>					<i>Sample restricted to females</i>				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
<i>Biological variables</i>										
Birth Weight	0.6271** (0.292)	0.2874 (0.277)	-	-	0.3995 (0.289)	0.8200*** (0.226)	0.5258** (0.213)	-	-	0.4426* (0.244)
Relative age effect	-0.0103 (0.085)	-0.0076 (0.080)	-	-	0.0063 (0.084)	-0.1349** (0.066)	-0.0646 (0.062)	-	-	-0.1285* (0.071)
Height (at the time of survey)	0.0416*** (0.007)	0.0217*** (0.007)	-	-	0.0222*** (0.007)	0.0329*** (0.005)	0.0104** (0.005)	-	-	0.0120** (0.006)
<i>Big 5 Personality</i>										
Extraversion	-	-	-0.0322 (0.028)	-0.0273 (0.028)	-0.0122 (0.035)	-	-	-0.0247 (0.021)	-0.0235 (0.021)	-0.0506* (0.026)
Agreeableness	-	-	0.1074*** (0.036)	0.1053*** (0.036)	0.1488*** (0.047)	-	-	0.0449 (0.028)	0.0392 (0.028)	0.0673* (0.035)
Conscientiousness	-	-	0.0557* (0.034)	0.0306 (0.034)	-0.0029 (0.042)	-	-	-0.0041 (0.025)	-0.0154 (0.025)	0.0303 (0.031)
Emotional stability	-	-	0.0452 (0.035)	0.0499 (0.035)	0.0138 (0.042)	-	-	-0.0211 (0.026)	-0.0160 (0.026)	-0.0357 (0.032)
Openness_to_experiences	-	-	0.0888*** (0.033)	0.0948*** (0.033)	0.0602 (0.040)	-	-	0.0325 (0.025)	0.0344 (0.025)	0.0238 (0.031)
<i>Behavioral Variables</i>										
Egalitarian (=1)	-	-	-0.1580** (0.064)	-0.1440** (0.064)	-0.0877 (0.080)	-	-	-0.0831 (0.052)	-0.0831 (0.053)	-0.1196* (0.065)
Overconfidence	-	-	0.1045 (0.086)	0.1140 (0.086)	0.2722*** (0.102)	-	-	-0.0572 (0.091)	-0.0508 (0.092)	-0.1388 (0.114)
<i>Preference</i>										
Risk aversion	-	-	-	0.0060*** (0.002)	0.0055*** (0.002)	-	-	-	0.0039*** (0.001)	0.0022 (0.002)
Impatience	-	-	-	-0.0718*** (0.025)	-0.0594* (0.030)	-	-	-	-0.0311 (0.019)	-0.0254 (0.024)
<i>Socio-economic variables</i>										
Age	-	0.0929*** (0.021)	0.1151*** (0.018)	0.1123*** (0.019)	0.1105*** (0.023)	-	0.0418*** (0.016)	0.0464*** (0.015)	0.0469*** (0.015)	0.0225 (0.018)
Age squared	-	-0.0009*** (0.000)	-0.0012*** (0.000)	-0.0012*** (0.000)	-0.0011*** (0.000)	-	-0.0006*** (0.000)	-0.0007*** (0.000)	-0.0007*** (0.000)	-0.0004** (0.000)
Parental education	-	0.6578*** (0.046)	0.6888*** (0.038)	0.6665*** (0.038)	0.6378*** (0.046)	-	0.5288*** (0.036)	0.5589*** (0.033)	0.5546*** (0.033)	0.5244*** (0.041)
Constant	-0.6534 (2.331)	2.2054 (2.379)	6.6806*** (0.501)	6.8236*** (0.529)	-0.1003 (2.536)	-0.4545 (1.738)	3.9237** (1.737)	9.5564*** (0.415)	9.5181*** (0.425)	4.6650** (1.981)
Observations	1,225	1,158	1,669	1,655	1,011	1,512	1,432	1,631	1,617	1,073
R-squared	0.041	0.186	0.196	0.205	0.220	0.049	0.237	0.250	0.255	0.236

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2 Determinants for hourly wages (Males)

Dependent variable: Hourly Wage (Log Form)					
Regression Model: OLS	<i>Sample restricted to males</i>				
	(1)	(2)	(3)	(4)	(5)
<u>Biological variables</u>					
Height (at the time of survey)	0.0059* (0.003)	0.0053* (0.003)	-	-	0.0047 (0.003)
Birth Weight	-0.0664 (0.133)	-0.0646 (0.131)	-	-	-0.0185 (0.138)
Relative age effect	0.0258 (0.042)	-0.0046 (0.043)	-	-	-0.0097 (0.046)
<u>Big 5 Personality</u>					
Extraversion	-	-	0.0177 (0.014)	0.0188 (0.014)	0.0122 (0.016)
Agreeableness	-	-	0.0219 (0.020)	0.0208 (0.021)	0.0371 (0.024)
Conscientiousness	-	-	0.0427** (0.017)	0.0418** (0.017)	0.0389** (0.019)
Emotional_stability	-	-	-0.0021 (0.019)	-0.0012 (0.020)	-0.0086 (0.022)
Openness_to_experiences	-	-	0.0030 (0.017)	0.0047 (0.017)	0.0035 (0.021)
<u>Behavioral Variables</u>					
Egalitarian (=1)	-	-	0.0115 (0.033)	0.0152 (0.034)	0.0033 (0.040)
Overconfidence	-	-	0.0312 (0.049)	0.0295 (0.049)	0.0379 (0.056)
<u>Preference</u>					
Risk aversion	-	-	-	0.0016* (0.001)	0.0013 (0.001)
Impatience	-	-	-	0.0001 (0.013)	0.0046 (0.016)
Observations	892	728	1,049	1,041	663
R-squared	0.004	0.198	0.174	0.175	0.207

Noe: Equations include age, age squared, employment type, parental education, years of employment and size of company

Table 3 Probability of career promotion (Males)

Dependent variable: Manager (=1)					
Regression Model: Probit	<i>Sample restricted to males</i>				
	(1)	(2)	(3)	(4)	(5)
<u>Biological variables</u>					
Height (at the time of survey)	0.0144* (0.008)	0.0218** (0.009)	-	-	0.0206** (0.010)
Birth Weight	0.5248 (0.349)	0.8757** (0.388)	-	-	0.9924** (0.422)
Relative age effect	0.0554 (0.103)	0.0197 (0.107)	-	-	0.0045 (0.115)
<u>Big 5 Personality</u>					
Extraversion	-	-	0.0533 (0.035)	0.0581 (0.035)	0.0608 (0.046)
Agreeableness	-	-	-0.0272 (0.047)	-0.0262 (0.047)	0.0094 (0.062)
Conscientiousness	-	-	0.0839* (0.043)	0.0808* (0.044)	0.0608 (0.053)
Emotional_stability	-	-	0.0556 (0.044)	0.0588 (0.045)	0.0160 (0.055)
Openness_to_experiences	-	-	0.0814** (0.041)	0.0824** (0.042)	0.1081** (0.053)
<u>Behavioral Variables</u>					
Egalitarian (=1)	-	-	-0.0372 (0.080)	-0.0528 (0.081)	-0.0212 (0.104)
Overconfidence	-	-	0.0295 (0.109)	0.0563 (0.111)	-0.0437 (0.143)
<u>Preference</u>					
Risk aversion	-	-	-	0.0051** (0.002)	0.0049* (0.003)
Impatience	-	-	-	0.0222 (0.031)	0.0410 (0.039)
<u>Socio-economic variables</u>					
Age	-	0.2658*** (0.048)	0.2893*** (0.042)	0.2987*** (0.043)	0.2993*** (0.055)
Age squared	-	-0.0024*** (0.000)	-0.0027*** (0.000)	-0.0028*** (0.000)	-0.0027*** (0.001)
Parental education	0.0603 (0.060)	0.1961*** (0.064)	0.1456*** (0.053)	0.1460*** (0.054)	0.1712** (0.069)
Constant	-7.6563*** (2.876)	-19.0404*** (3.545)	-9.5143*** (1.138)	-10.0599*** (1.164)	-21.8714*** (3.994)
Observations	945	945	1,369	1,358	841

independent variables to be endogenous variables. In addition, since personality traits are measured by self-report questionnaire, measurements may differ based on individual perceptions of personality facets.

Despite some limitations, our estimated results suggest that personality traits are significantly correlated with schooling, earnings and career promotion. The facets of big 5 personality traits are differently associated with academic and occupation success. More interestingly, the role of personality traits can vary between and within countries. For example, agreeableness is known as least important factor for educational outcomes but in Japan, it has a strong significant effect on male schooling. Woessmann et al. (2009) has argued that personality traits of students may be determined by school principals, such as autonomy and degree of accountability and Rockoff et al. (2008) emphasize teacher's influence on the development of students' non cognitive skills. If this holds true, the characteristics of teaching style and school's educational philosophy in Japan may contribute to unique variance in personality traits affecting the educational outcomes.

References

- Borghans, L., Meijers, F. and B. ter Weel, 2006. The Role of noncognitive skills in explaining cognitive test scores. *Economic Inquiry* 46 (1), 2-12.
- Borghans, L., Duckworth, A., Heckman, J. and B. ter Weel, 2008. The Economics and Psychology of personality traits. *Journal of Human Resources*, 43(4), 972-1059.
- Carneiro, P., Crawford, C. and A. Goodman, 2007. The Impact of early cognitive and non-cognitive skills on later outcomes. CEE Discussion Paper 0092.
- Carneiro, P. and Heckman, J., 2003. Human capital policy. IZA Discussion Paper 821.
- Gosling SD, Peter J. Rentfrow, and William B. Swann Jr., 2003. A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, 37, 504-528.
- Heckman J, 1999. Policies to foster human Capital. NBER Working Paper 7288
- Heckman, J., Stixrud, N. and S. Urzua, 2006. The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics* 24 (3), 411-482.
- Heckman, J., Hsee, J. and Y. Rubinstein, 2001. The GED is a mixed signal: the effect of cognitive and noncognitive skills on human capital and labor market outcomes. The University of Chicago.
- Heineck, G. and Anger, S., 2010. The returns to cognitive abilities and personality traits in Germany. *Labour Economics* 17 (3), 535-546.
- Judge, T.A., Higgins, C.A., Thoresen, C.J., and Barrick, M.R., 1999. The big five personality traits, general mental ability, and career success across the life span. *Personnel Psychology*, 52, 621-652.
- Kawaguchi, D. 2011, Actual age at school entry, educational outcomes, and earnings. *Journal of Japanese and International Economics*, 25,64-80.
- Kohara, M and Ohtake, F., 2009. Determinants for children's educational outcomes. *The monthly journal of the Japan Institute of Labour* ,588, 67-84.
- O'Connor, M.C. and Paunonen, S.V., 2007. Big Five personality predictors of post-secondary academic performance. *Personality and Individual Differences*, 43, 971-990.
- Rockoff, J.E., Jacob, B.A., Kane, T.J. and D.O. Staiger, 2010. The impact of entrepreneurship education on entrepreneurship skills and motivation, NBER Working Paper 14485.
- Woessmann, E., Luedemann, E, Schuetz, G., and M. R. West, 2007. School Accountability, Autonomy, Choice and the Level of Student Achievement: International Evidence from PISA 2003. OECD Education Working Paper 13.