Self-confidence and Earning Inequalities: A Test on Hungarian Data*

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Abstract: It is easy to see that highly fatalistic, inefficient persons believe that their actions have little outcome. Because greater fatalism lowers an employee's effort level, it may result in lower wages, while the anti-fatalistic attitude translates into more effective work that in turn may be rewarded with a higher salary. In this article the author tests a self-confidence scale that is similar to the most widely used Rotter locus of control scale. People with high self-confidence have determination, feel they have an influence on their future, and are optimistic. In the analysis the author investigates the predictive power of self-confidence in wage equations using Hungarian data.

Keywords: personality traits, self-confidence, locus of control, earning inequalities, labour market, Hungary

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Introduction

There is considerable consensus among scholars of wage inequalities that the main determinant of earnings distribution is human capital [Mincer 1974]. However, using human capital variables such as education, cognitive performance, and job-specific training and skills, a surprisingly large portion of the variance in earnings is unexplained [Kertesi and Köllő 1997]. Recently a new paradigm has emerged in the social sciences where personal characteristics are thought to account for differences in economic success [Bowles, Gines and Osborne 2001a, 2001b]. However, there is other evidence for the importance of non-cognitive skills in the labour market. Looking through the wording of job advertisements makes obvious the need for these skills ('strongly motivated', 'good team-player', 'good sense of humour'). Furthermore, surveys among human resource managers reveal that in labour force recruitment the importance of an applicant's non-cognitive skills exceeds the weight of cognitive ones [Zemsky and Iannozzi 1995; Cox 1989]. In this article, I examine the wage impact of non-cognitive personal traits using multivariable statistical models.

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Previous studies

There are many studies that have outlined the correlations between economic success and the non-cognitive characteristics that are important in the labour market. Beauty [Hamermesh and Biddle 1993], height [Case, Paxson and Islam 2008], and whether the respondent has a clean household [Duncan and Dunifon 1998] all seem to have a positive impact on wages, while organisational skills and motivation seem to have an impact on social stratification [Titma and Trapido 2002]. As predictors of the ability to work productively, personal characteristics that might be an indicator of work performance are at the centre of interest in social and economic research.

According to Bowles, Gintis and Osborne [2001a], we can assume that the amount of labour services an employee supplies to a firm is the product of two factors: the number of hours worked and the level of effort. An employer can prescribe the number of working hours in a contract, but the level of effort cannot be contracted. Employers can only assume that a higher wage may induce more effort. The personal characteristics which lead an employee to work harder, keeping everything else constant, may have an impact on wages. It is easy to see that highly fatalistic, inefficient people believe that their actions have little impact on the outcome. Given that a fatalistic attitude reduces the effort an employee puts into his/her work, it may result in lower wages, while an anti-fatalistic attitude translates into more effective work that in turn may be rewarded with a higher salary.

One of the most widely used personality variables in sociological and economic research is the Rotter locus of control scale[1] [Rotter 1966], which measures the degree of control individuals have over their lives. People who have 'external control' believe that hard work and effort are not rewarded, while those who have 'internal control' believe that future success is mostly shaped by their own efforts. Another frequently used measure of personal traits is the self-esteem scale[2] developed by Rosenberg [1965] to assess perceptions of self-worth. A person's place

[1] The abbreviated, four-item version contains the following questions: (1) What happens to me is my own doing (internal response) / Sometimes I feel that I don't have enough control over the direction my life is taking (external response); (2) When I make plans, I am almost certain that I can make them work (internal response) / It is not always wise to plan too far ahead, because many things turn out to be a matter of good or bad fortune anyhow (external response); (3) In my case, getting what I want has little or nothing to do with luck (internal response) / Many times we might just as well decide what to do by flipping a coin (external response); (4) It is impossible for me to believe that chance or luck plays an important role in my life (internal response) / Many times I feel that I have little influence over the things that happen to me (external response)

[2] (1) On the whole, I am satisfied with myself; (2*) At times, I think I am no good at all; (3) I feel that I have a number of good qualities; (4) I am able to do things as well as most other people; (5*) I feel I do not have much to be proud of; (6*) I certainly feel useless at times; (7) I feel that I'm a person of worth, at least on an equal plane with others; (8*) I wish I could have more respect for myself; (9*) All in all, I am inclined to feel that I am a failure; (10) I take a positive attitude toward myself. (Items with an asterisk are reverse scored.)

on the scale is measured with ten questions (each one has four response options) ranging from low to high self-worth statements. In previous studies, traits related to self-control have usually been measured with the Rotter or Rosenberg scale or their equivalent [Dunifon and Duncan 1998]. However, Heckman, Stixrud and Urzua [2006] used a vector containing both the Rotter and the Rosenberg items. Almost every research analysing the wage impact of these traits works with a data set from the United States (National Longitudinal Survey (NLS) or Panel Survey of Income Dynamics (PSID)), but there also exists a study that used cross-sectional Russian data [Semykina and Linz 2005].[3]

Since personal traits like self-control, self-confidence, and self-worth are probably shaped by success or failure in the labour market, researchers investigating the earning-impact of these qualities try to determine the exogeneity of personality on wages. Previous researches used two econometric techniques to avoid endogeneity. The simplest and easiest way to maintain the exogeneity of personality variables on wages is when the wage in time t is explained with a personality variable measured at $t–1$ [Andrisani and Nestel 1976; Andrisani 1977; Dunifon and Duncan 1998], or by regressing wages on early childhood personality versus personality prior to any work experience [Murnane et al. 2001; Osborne Groves 2005a; Heckman, Stixrud and Urzua 2006], where the personality variable is *par excellence* exogenous to wages.[4] Another econometric technique is to create an instrument that is independent of wages yet highly correlated with adult personality. The great difficulty of this technique is finding the appropriate instrumental variables [Goldsmith, Veum and Darity 1997, 2000]. A quite similar technique (used by Osborne Groves [2005a]) is to regress the adult personality on exogenous variables and wages from the previous year to remove the influence of past wages on adult personality, and to substitute the exogenous adult personality (the unstandardised residual) in the original OLS equation. As Keller [2010] pointed out, differences in the estimated parameters using various kinds of econometric techniques are not larger than the 95% confidence interval of the estimated parameters. In Table 1, I summarise the main findings of previous studies using the Rotter or the Rosenberg scales. According to the results, the wage impact of these personal characteristics are low or moderate, but still they have a significant impact on earnings, when a wide range of variables is controlled for.

A different research strategy is employed using the Big Five personality variable developed by Costa and McCrae [1995]. When the Big Five personality traits (extraversion, agreeableness, conscientiousness, emotional stability, and openness) are included in a wage equation, the endogeneity problem is less serious, since these traits are relatively stable during the life course [Costa and McCrae

[3] The estimated parameters are probably overestimated given that the problem of endogeneity is ignored, but no comparison can be made using the data provided by the authors.

[4] A similar technique was used for human capital investment [Coleman and DeLeire 2003].

Table 1. Multivariate OLS results: the correlation between self-control related personal traits and earnings

Author	Dependent variable	Personality variable	Control variables	Size of effect in standardised regression parameter	R^2 change compared to the control variables	Data
Andrisani and Nestel [1976]	Log wages (yearly, 1970)	Rotter scale (1969)	Education, training, health, tenure with current employer, age, marital status, region of residence, city size, and race	–0,10[a]		NLS (men born 1907–1921)
Andrisani [1977]	Log wages (yearly, 1970; 1971)	Rotter scale (1968; 1969)	Education, training, health, tenure with current employer, age, marital status, region of residence, city size, and race	Between – 0,03 and 0,01[b]		NLS (men)
Goldsmith et al. [1997]	Log wage (hourly wage,1980 and 1987)	Predicted Rosenberg Self-Esteem Scale (1980)	Education, experience, tenure, cognitive skills, occupation, industry of employment, unemployment rate, gender, age, race, marital status, number of children, wealth	0,16; 0,15[c]		NLSY (men and women born 1957–1965)
Dunifon and Duncan [1998]	Log wage (hourly wage, average between 1973 and 1977; hourly wage, average between 1988 and 1992)	Personal control scale (1968–1972). It is very similar to the Rotter scale	Age, education, cognitive performance, race, parent's socio-economic status, region, number of siblings, job-related variables	0,09; 0,13		PSID (men born 1943–1951)
Murnane et al. [2001]	Log wage (hourly wage, 1990/1991)	Rosenberg Self-Esteem Scale (1980)	Race and ethnicity, calendar year, academic skills, skill in performing mental tasks rapidly and accurately	0,08[d]	4%[e]	NLSY (27/28 year-old man)

Osborne Groves [2005a]	Log wage (hourly wage, average between 1990 and 1993)	Rotter scale (1970)	Parent's socio-economic status, number of respondent's children, highest grade, work experience, cognitive performance IQ	–0,103; –0,129[f]	1,10% 1,40%	NLSY (women born 1946–1954)
Osborne Groves [2005b]	Log wages (yearly, between 1980 and 1981)	Rotter scale (1968)	Schooling, tenure, IQ, fathers earning (between 1966 and 1968)	–0,200	3,5%	NLS (men born 1942–1952)

Notes:

[a] Internal control is measured with lower values.

[b] Author's calculation from the information provided by Andrisani using the following equation: $Bi = \beta i \times (s_i/s_y)$; see Bring [1994: 210].

[c] Author's calculation from the information provided in Goldsmith et al. [1997].

[d] Author's calculation from the information provided in Murnane et al. [2001].

[e] Compared to models without academic skills.

[f] Author's calculation from information provided by Osborne Groves.

1997]. It is hard to find the exact relationship between the locus of control related traits (such as self-confidence and self-worth) and the Big Five personality typology. Conscientiousness versus lack of direction might have a theoretical connection with self-control, since in the Big Five model conscientiousness means efficiency, self-discipline, and achievement motivation, but, to my best knowledge, no empirical test has been done to measure the correlation between the Rotter scale and the Big Five personality traits.

Previous research's findings about the impact of the Big Five traits on wages are not uniform. Every study conducted has identified the significant positive wage-impact of emotional stability, and many of them have revealed very significant gender differences, which might be a consequence of personality differences between men and women. But the impacts of other personality traits on wages vary according to the sample and the data. Using longitudinal survey data on US high school graduates (Wisconsin Longitudinal Study), Mueller and Plug [2004] showed that while men are rewarded for being antagonistic (the inverse of agreeableness), and, to a lesser extent, open, women enjoy earnings advantages for being more conscientious and open. Using the same data set and examining both genders, Letcher and Niehoff [2004] found that agreeableness is negatively and conscientiousness and openness positively correlated with wages. Analysing data from the Dutch DNB Household Survey, Nyhus and Pons [2005] found that among women agreeableness was associated with lower wages while men received a premium for autonomy (as tenure increases) and for conscientiousness (at the beginning of an employment relationship). While analysing the Dutch Family Survey, Gelissen and de Graaf [2006] established only among men that extraversion is positively and openness negatively connected with wages using a large set of control variables. Working with the British Household Panel Study, Heineck [2007] found for both genders that agreeableness was penalised while openness to experience was rewarded with higher wages in the labour market.

Besides investigating the wage impact of traits related to self-control or the Big Five personality model, other researches used personality traits measured with the Guilford and Zimmerman [Guilford, Zimmerman and Guilford 1976] Temperament Survey [Filer 1981], while Turner and Martinez [1977] analysed the wage impact of the Machiavellian personality. Osborne Groves [2005a] investigated the wage impact of aggression and withdrawal using the British National Child Development Study.

Data, measurement, and methods

In this article I will use data from the Hungarian Household Panel Study[5] (HHP), which is a longitudinal panel survey that was carried out by TÁRKI Social Research Institute, the Budapest University of Economics, the Central Statistical

[5] http://www.tarki.hu/adatbank-h/panelcd/english/index_e.html.

Office, the National Scientific Research Fund (OTKA), and several other Hungarian institutions between 1992 and 1997. During the project, a nationwide sample of 2600 households was surveyed on a yearly basis. The HHP has the focus on changes in the dynamics of the labour market, income inequalities, the life prospects of various strata of the population, and the changing attitudes of the Hungarian population after the transition. TÁRKI conducted a study to follow up on the Hungarian Household Panel in 2007 with the support of the NKTH Jedlik programme titled the Household Lifecourse Survey Project (HLSP). This study is designed to monitor the labour market, income, wealth, and opinion changes from the original – the 1992 HHP – sample fifteen years after the base survey and ten years after the last wave was conducted with the advantage of being able to complete interviews with almost 2700 individuals (45% response rate, calculating only with living persons from the base sample). In my research I used a merged data set of the HHP and its follow-up research (HLSP). This means that my data set covers the period from 1992 to 2007, but from 1998 to 2006 there are no data because data collection was paused. In the HHP the age limit for inclusion in the sample was 16, so between 1992 and 1997 only data on people this age or older can be analysed. This means that in the matched working file in 2007 everyone is over the age of 30.

In my estimations, the logarithmic net salary measured in the last month (W) served as the dependent variable. The wage could vary depending on the numbers of working hours. Because hourly wages are not available in the data set, I only used data on full-time workers. It is also widely known that it is difficult to determine the wages of the self-employed, partly because there is a greater likelihood of suppressed wages [Elek and Szabó 2008]. I decided to use only the wages of employed persons and omitted from my analysis the self-employed and people working while collecting a pension, on maternity leave, or in compulsory military service.

Analysing wages requires (1) studying people in the labour market and (2) using available earnings data. Being in the labour market is probably connected to the examined personality traits. In addition, the personality variable might have a role in determining the number of worked hours. The sample selection bias was treated with Heckman's [1979] two-step procedures. Heckman's lambda was estimated from the logit equation where the selection criterion (dropping out of the labour market from time t to time $t+1$; coded as 1, otherwise 0) was explained with age, age square, gender, region, education (three binary coded variables, with the reference 'at least elementary school'), a measure of personality traits related to self-control, a dummy variable on whether the respondent is unemployed, and another dummy variable indicating whether the respondent is retired, and the interaction of dummy variables with the personality variable. When the estimated parameter of the Heckman's lambda in the wage equation is negative, we can conclude that people in the sample have higher wages compared to those who quit, while the meaning of the significant positive parameter will be the opposite.

Since there is no Rotter scale in the HHP, I created an index[6] that, theoretically, is very similar to the Rotter scale. I named the index the 'self-confidence scale', since the questions (in Table 2) used to construct the index concerned the respondent's problem-solving skills, determination, efficiency, and optimism. My aim in calculating the self-confidence scale was to maximise the correlation with the original, four-item version of the Rotter scale. I was able to test the correlation between the two indices using data on 1000 respondents from a national representative survey sample from Hungary conducted in the spring of 2009. The Pearson correlation coefficient between the two scales was –0.38, which is different from 0 at a level of significance of 0.01. A negative coefficient indicates that I expect a positive connection between wages and the examined index (the correlation between the original Rotter scale and wages was negative).

The questions employed to calculate the self-control scale were used three times (1993, 1996, 1997) in the panel project. I wanted to create an index that is stable over time without the noise of idiosyncratic, time-varying error, which represents unobserved factors that change over time and could bias the estimation of the dependent variable. The widely applied first difference estimation technique [Wooldridge 2003: 419–426] is not worth using in this case because, according to psychologists, personal traits are stable over the life cycle. I regressed the self-confidence scale measured in 1993 on self-confidence scales that the survey measured later on (1996, 1997). The estimation results are presented in Table 3. From the R-square statistic it is evident that approximately 75% of the self-confidence scale measured in 1993 was noise, which may explain the moderate correlation coefficient between the original Rotter scale and the self-confidence scale calculated from the HHP questions. Later in my research, I will use the symbol *P* to refer to the predicted self-confidence scale.

When using personality variables in any wage equation a very serious problem needs to be solved: personal traits must be endogenous to wages. Personality may be shaped by success or failure in the labour market. Because my measure of personality is not prior to any work experience, I used two types of models to provide slightly imperfect, lower and upper limits in the estimation of self-confidence's impact on wages. In the first type of model (the base model), self-confidence is endogenous to wages because past wages are influenced by past experiences in the labour market (which are highly correlated with wages). Therefore, this technique is likely to overestimate the importance of self-confidence:

$$_{\log 10}W_{i,t} = \alpha + \beta_1 \times Z_{i,t} + \beta_2 \times C_{i,t} + \beta_3 \times H_{i,t} + \beta_4 \times P_i + \varepsilon_{i,t}, \quad (1.)$$

[6] The index was created out of six items. The six questions contain three oppositions; between the opposition pairs the correlation is at least –0.3. The following points were matched to the answer-categories: completely/very true: 3; partly true: 2; rather true: 1; not true at all: 0. I used the following equation to calculate the index: self-confidence scale = (a2–a1)+(b2–b1)+(c2–c1). The Cronbach's alpha is greater than 0.75 between the items.

Table 2. Items used to construct the self-confidence scale and its distribution in the whole sample

	Completely/very true (3)	Partly true (2)	Rather true (1)	Not true at all (0)	N
a1) I cannot solve my problems					
1993	24.47%	23.82%	42.13%	9.58%	4103
1996	27.48%	24.33%	41.04%	7.15%	3933
1997	27.78%	27.57%	37.19%	7.46%	3840
a2) I achieve all my goals					
1993	3.51%	9.85%	52.61%	34.03%	4099
1996	3.03%	7.71%	54.21%	35.05%	3931
1997	3.08%	9.76%	56.67%	30.50%	3829
b1) I can hardly effect the turns my life takes					
1993	18.20%	24.49%	40.75%	16.57%	4076
1996	21.50%	27.37%	39.16%	11.97%	3900
1997	20.71%	30.31%	38.16%	10.82%	3816
b2) The shaping of my future depends primarily on me					
1993	12.51%	20.81%	40.70%	25.98%	4075
1996	10.95%	15.87%	44.63%	28.55%	3910
1997	8.05%	17.95%	48.37%	25.62%	3802
c1) I can hardly relieve most of my troubles					
1993	22.28%	26.46%	35.64%	15.62%	4078
1996	27.79%	26.69%	33.03%	12.49%	3913
1997	24.43%	30.87%	33.38%	11.31%	3823
c2) I trust my future					
1993	12.25%	14.88%	36.33%	36.54%	4077
1996	10.43%	12.88%	39.87%	36.83%	3900
1997	9.29%	14.09%	45.72%	30.90%	3813

Source: Hungarian Household Panel Study, author's calculations.

Table 3. OLS Estimation results predicting the self-confidence scale measured in 1993

	Unstandardised coefficients	Standardised coefficients
(Constant)	0,689***	
Self-confidence (1996)	0,324***	0,337***
Self-confidence (1997)	0,206***	0,211***
Self confidence (1996×1997)	0,003	0,016
R	0.503	
R-square	0.253	
N (not weighted)	2133	

Notes: Dependent variable: Self-confidence scale measured in 1993.
Coefficients with *** are different from zero at the significance level of 0.01; coefficients with ** are different from zero at the significance level of 0.05; coefficients with * are different from zero at the significance level of 0.1.
The model is significant at the level of 0.001.

where W is the net salary or wage measured in the last month, Z is a vector of demographic variables (gender, age, age square, region, marital status), C is a vector containing the Heckman's lambda correcting the sample selection bias, H is a vector of human capital variables (four binary coded variables according to the highest level of education),[7] and vector P contains the self-confidence scale.

The second type of model (the expanded model) is much like the first, but the wage measured in *t–1* year is also included among the control variables. Because the wage measured in *t–1* year might be also shaped by personality, this model pulls out the explaining-power from the self-confidence scale and as a consequence its impact on wages is underestimated. We should note, however, that because the majority of the control variables are time invariant, the previous year wage probably will pick up all the effects of the variables included as controls. In model-type 2, the formalisations are the same, but $W_{i,t-1}$ refers to wage data measured in *t–1* year:

$$_{\log 10}W_{i,t} = \alpha + \beta_1 \times Z_{i,t} + \beta_2 \times C_{i,t} + \beta_3 \times H_{i,t} + \beta_4 \times {}_{\log 10}W_{i,t-1} + \beta_5 \times P_i + \varepsilon_{it}. \quad (2.)$$

I investigated six models (with both model types): from 1993 to 1997 there were five models, and there was one for the year 2007.

[7] Reference category: at least elementary school.

Results

The wage impact of self-confidence

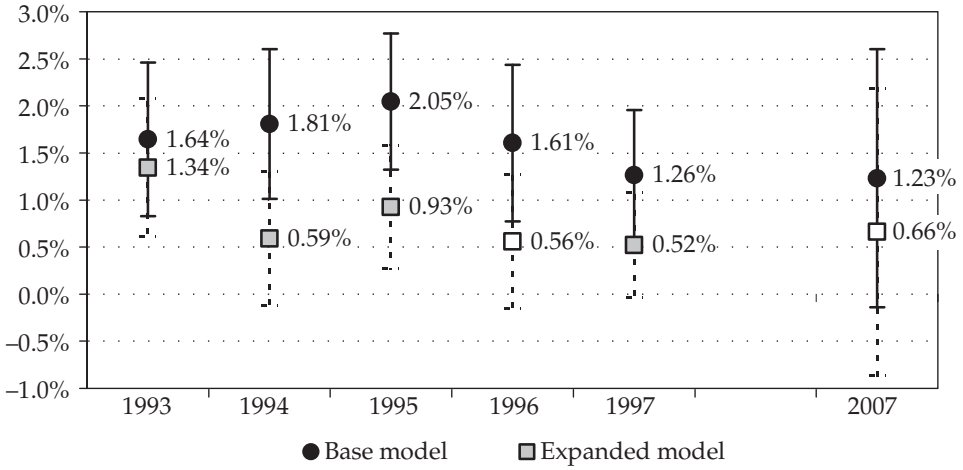
All the OLS regression results are presented in Tables A1 and A2 in the Annex. We can conclude that personal characteristics such as self-confidence have a positive significant impact on wages using multivariable statistical models. This means that people who are determined and are able to control their future earn *ceteris paribus* more. The t-statistics show that the regression parameters of the self-confidence scale are different from zero at a significance level of 1% in seven of the examined twelve models, with the exception of the 2007 model, and every estimated parameter from the basic model behaves this way. In five models the estimated parameter can be distinguished from zero at a significance level of 10%. In two models (belonging to the expanded type) the parameters are not significant at any of the significance levels ordinarily used. In the 1996 expanded model this might be a consequence of the relatively high estimated parameter of wage *t–1*, while in the 2007 expanded model it is a consequence of the restricted sample size. Note that in this later model the 1997 wage was substituted in the equation instead of earning from 2006 (t–1) because of the lack of data.

The size of the self-confidence scale's effect can be read from the unstandardised regression parameters (β). In the log-level models (where the dependent variable is in logarithmic form and the independent variables are not logarithmised), β means the percentage change in the dependent variable when one of the independent variables changes one unit, while any other differences are held constant.[8] In Figure 1 the unstandardised regression parameters are expressed with a 95% confidence interval. Since the confidence intervals are very close to each other, I concluded that there are no significant differences between the parameters estimated using different techniques and that a significant decline in the size of the parameter cannot be established. The shrinking slope parameters were more deeply examined using the pooled OLS, but no significant differences between the parameters were observed. When compared to the results of previous researches (for the standardised regression coefficient, see Tables A1 and A2) my results are approximately within the same range, but we must remember that cognitive skills and abilities (these data were not available in the HHP or in the HLSP) were not included in my models.

In the case of the self-confidence scale, it is fairly difficult to interpret what *one unit change* means, because it is hard to be sure whether the change is large or small. However, one standard deviation change in the self-confidence scale can be considered large enough. In Figure 2, instead of β coefficients, I represented $\overline{\beta}_x$ which is $\beta_x \times \sigma_x$ where σ_x is the standard deviation in the self-confidence scale. One standard deviation in the examined index means a 1–3% change in earnings, holding other differences constant. The size of the effect seems to be small, but we

[8] $\%\Delta y=(100\times\beta)\times\Delta x$.

Figure 1. The size of the effect of *one unit change* in the self-confidence scale calculated with two different models



Notes: Parameters indicated in the figure with white squares instead of grey are not significant at any of the levels ordinarily used.

should remember that a very broad number of control variables were included in the estimations.

In Figure 3, I expressed the size of the effect of one standard deviation change in the self-confidence scale in monetary terms. I inflated all the prices to the 2008 level[9] and I calculated using the average net salary.[10] The results show that the impact of one standard deviation change in the self-confidence scale, holding other differences constant, means in Hungary a change of approximately 700–3000 HUF in the average net salary (in 2008 that was 122 047 HUF) depending on the estimation technique. The results are in absolute terms low – the wage impact of one standard deviation change in the respondent's age is six times larger in the base model. In my view, the importance of the findings lies not in the magnitude but in the existence of the impact. We also have to consider that the results are computed for net salary.

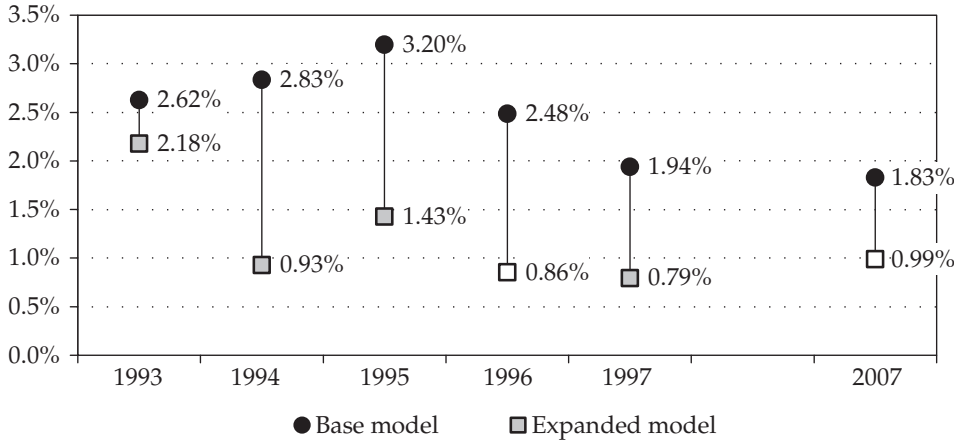
To make my results more comparative, we should take into consideration the exchange rate in 2008 between the Czech Crown (CZK) and the Hungarian Forint (HUF). According to the Eurostat New Cronos database,[11] the CZK/EUR

[9] Source of Consumer Price Index: http://portal.ksh.hu/pls/ksh/docs/hun/xstadat/xstadat_eves/tabl3_06_01i.html (retrieved 26 May 2009).

[10] Source of data on average net salary in Hungary: http://portal.ksh.hu/pls/ksh/docs/hun/xstadat/xstadat_eves/tabl2_01_41i.html (retrieved 26 May 2009).

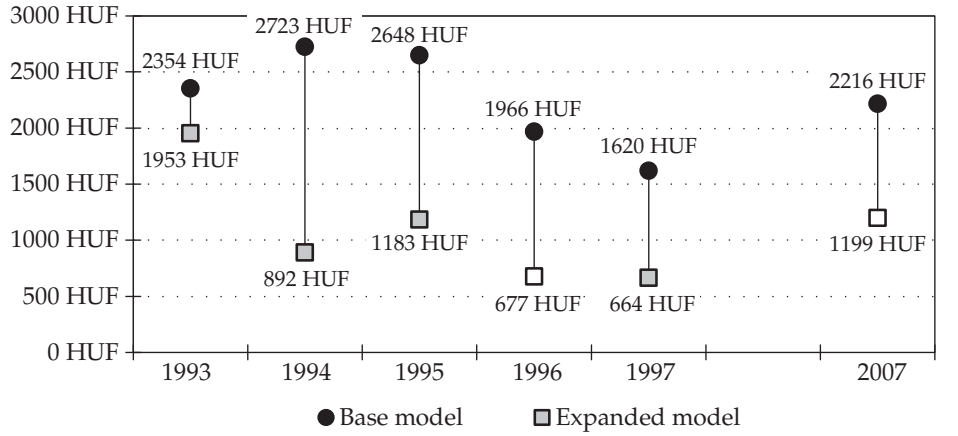
[11] http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database (retrieved 20 February 2010).

Figure 2. The size of the effect of *one standard deviation change* in the self-control scale calculated with two different models



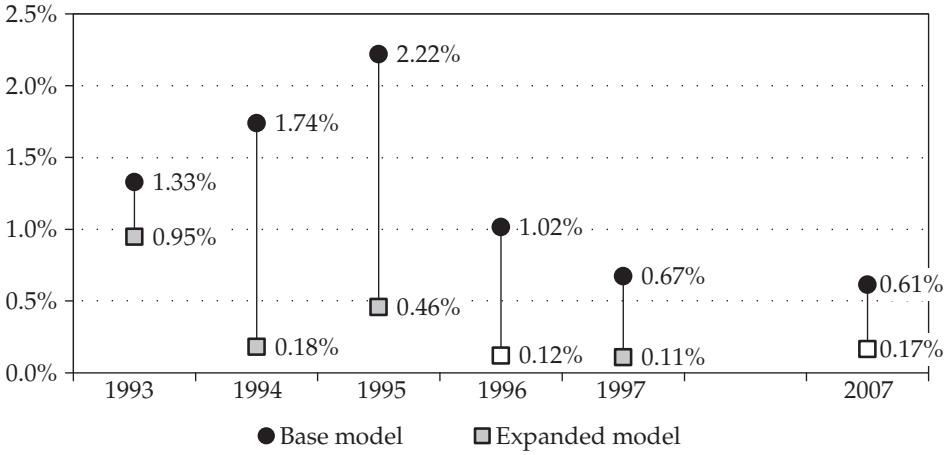
Notes: Parameters indicated in the figure with white squares instead of grey are not significant at any of the levels ordinarily used.
$\overline{\beta}_x = \beta_x \times \sigma_x$ where β_x is the unstandardised regression parameter of the self-control scale and σ_x the standard deviation of self-control scale.

Figure 3. The size of the effect in the case of an average net salary in 2008 prices (calculated with one standard deviation change in the self-confidence scale)



Notes: Parameters indicated in the figure with white squares instead of grey are not significant at any of the levels ordinarily used.
$\overline{\beta}_x \times$ average net earning according to Hungarian Central Statistical Office.

Figure 4. The R-square change assigned to self-control compared to all control variables in the equation



Notes: Parameters indicated in the figure with white squares instead of grey are not significant at any of the levels ordinarily used.

exchange rate is 24.95 and the HUF/EUR rate is 251.51, which means that the CZK/HUF exchange rate is 10.08. To calculate just using the exchange rate might be confusing given that the purchasing power parities of national currencies differ. But according to the Big Mac index for Hungary ($2.92) and the Czech Republic ($3.02) in 2009, the purchasing power parity of the two currencies is quite similar, while in the Eurozone in Germany and France ($4.38) the prices are higher.[12]

Some of the previous researches indicated the ability of the personality variable to enhance the predictive power of the models. According to prior results (see Table 1), the supplement change in the R-square statistics when the personality variable is introduced into the equation is moderate, ranging from 1% to 4% depending on the control variables. Compared to those outcomes, my results show even slighter changes (around 1%). This may be owing to the different sample composition used in my analysis (the samples in prior researches were more homogeneous). In the expanded model the results are small owing to the control variable *t–1* year, but in the base model the R-square change assigned to self-control is also around 1–2%. The R-square change attributed to the self-control scale in the base model is approximately nine times lower than the R-square change generated by the degree, using the same set of control variables.

[12] The source of the Big Mac Index: http://www.up2maps.net/maps/marco%20polo/World/big_mac_index.html (retrieved 11 February 2010).

Self-confidence and earnings mobility

The expanded model gives some hint of an earnings change, since among the control variables the wage measured in *t–1* year is also present. However, it is also possible to analyse earnings mobility directly, by explaining the difference in earnings. So I calculated the differences in earnings between 1993 and 1997 to investigate the question properly. Note that in Equation 3, all explanatory variables are from 1997, every other symbol follows the usual pattern:

$$\log_{10}[W_{97}–W_{93}] = \alpha + \beta_1 \times Z_{i,97} + \beta_2 \times C_{i,97} + \beta_3 \times H_{i,97} + \beta_4 \times P_i + \varepsilon_{i,97}, \quad (3.)$$

Table 4. The change in monthly earnings between 1993 and 1997

	Unstandardised regression coefficient [β] and standardised regression coefficient [B] in the parenthesis
Constant	4,355()***
Male	0,017(0,027)
Age	-0,016(-0,487)*
Age square	0(0,391)
Unmarried/single	0,012(0,015)
Divorced	-0,009(-0,007)
Widow	-0,064(-0,033)
Town	-0,012(-0,018)
Country seat	0,064(0,074)
Budapest	0,133(0,18)***
Heckman's lambda	-0,768(-0,059)
Vocational school	0,118(0,175)**
Secondary school	0,144(0,221)***
Degree	0,274(0,348)***
Self-confidence (predicted value)	0,012(0,059)*
R^2	14,222%
Weighted N	1075
β	1.835%

Notes: Coefficients with *** are different from zero at a significance level of 0.01, coefficients with ** are different from zero at a significance level of 0.05, coefficients with * are different from zero at a significance level of 0.1.
All models are significant at a level of 0.001.

As presented in Table 4, self-confidence has an impact on earnings mobility. The slope of the income dynamics of determined people who feel they have control over their future is *ceteris paribus* steeper than people without this ability. However, when a longer income period was examined (1993–2007) – perhaps due to the small sample size – no similar significant impact of self-confidence could be observed.

Sensitivity analysis

Previous studies revealed significant differences in the effect of personality variables according to occupation [Goldsmith, Veum and Darity 2000] and gender [Semykina and Linz 2005; Mueller and Plug 2004]. In a previous study [Keller 2010] that I did using the same data and analysing a joint sample of employees and self-employed I included four occupational categories of employed persons (industry workers and office workers), the self-employed, and managers in the base model and their interaction with the self-confidence scale. I found that compared to industry workers the size of the effect should be regarded to be the same in the group of managers and self-employed persons. Among office workers, however, the size of the effect is close to zero. A possible interpretation of the results is that self-confidence is only a factor in low- and high-ranking occupations. In low-ranking occupations self-confidence may indicate meticulousness, while in high-ranking occupations it may mean independence. A limitation to the results is that according to education no further differences could be measured in the size of the effect, and the numbers of persons in managerial positions was low. Working with this sample (with just employed persons working full time), I was unable to identify similar heterogeneities within occupational status. The impact of self-confidence is also homogeneous within gender and education. A possible explanation is the relatively small sample size.

In line with Mueller and Plug [2004], I estimated additional regressions in an attempt to capture nonlinearities in the relationship between self-confidence and wages. These models include dummies showing whether the self-confidence scale is in the top or bottom 25% of the distribution, while the middle 50% of the scores is the omitted category. Using this method of estimation, we are able to check whether the relatively low estimated parameters are a consequence of non-linearity in the personality variable. We can see in Table 5 that not all of the dummies are significantly different from zero. However, we find that many of the individual dummy variables are significant (especially in the base model) and show a consistently monotonic pattern. High self-control is rewarded while low is punished in the labour market. Thus, the linear representation of self-confidence is an accurate representation of the general relationship.

Table 5. Sensitivity analysis on the impact of self-control

Self-control	(1993)	(1994)	(1995)
	Base model		
Top 25%	0,041(0,097)***	0,051(0,118)***	0,042(0,095)***
Bottom 25%	–0,027(–0,053)	–0,026(–0,048)	–0,038(–0,067)**
	Expanded model		
Top 25%	0,026(0,063)**	0,021(0,049)*	0,016(0,039)
Bottom 25%	–0,034(–0,07)**	–0,004(–0,007)	–0,015(–0,027)

Self-control	(1996)	(1997)	(2007)
Top 25%	0,022(0,05)*	0,028(0,065)**	0,021(0,045)
Bottom 25%	–0,047(–0,081)***	–0,019(–0,034)	–0,086(–0,132)***
Top 25%	0,002(0,004)	0,009(0,02)	0,002(0,005)
Bottom 25%	–0,018(–0,032)	–0,01(–0,018)	–0,092(–0,132)

Notes: In the OLS regression all the control variables were usually the same as in the two models above.
Coefficients with *** are different from zero at a significance level of 0.01, coefficients with ** are different from zero at a significance level of 0.05, coefficients with * are different from zero at a significance level of 0.1.
All models are significant at a level of 0.001.

Discussion and conclusion

In this article I made evident the impact of personal characteristics on wages using multivariate statistical models and working with Hungarian panel data. In line with previous studies analysing the wage impact of self-control related variables, I found a low but statistically significant correlation between self-confidence and wages using a wide set of control variables. The direction of the correlation is in line with the hypothesis and shows – in conformity with previous research – that people who are determined and able to control their future *ceteris paribus* earn more. However, I found that the R-square change assigns to self-control lower than the assigned R-square change in prior studies. My results correspond to Andrisani and Nestel [1976], Andrisani [1977], and Duncan and Morgan [1981] in terms of the significant correlation between earnings mobility and the personality variable in the medium-term. Like Mueller and Plug [2004], I also found that the linear representation of the personality variable is adequate. Contrary to previous research [Goldsmith, Veum and Darity 2000; Semykina and

Linz 2005; Mueller and Plug 2004], I found the impact of the personality variable to be homogeneous: no differences were established according to gender, age, occupation, and education.

The research technique I applied is intended to avoid reverse causation. In my measure of self-confidence I eliminated the time-varying standard error, which might be correlated with previous labour market experience. In addition, with my two model-types (with and without the wage data at *t–1*), I set lower and upper limits in the estimation of self-confidence's impact on wages. With the combination of these two techniques (measurement and econometric) I made use of the possibilities provided by my panel data. The applied solution is unique in the literature and can be regarded as a very advanced way of treating the endogeneity.

The limitations to my results are that I was unable to test the correlation between the Rotter scale and the *predicted* self-control scale (which was my personality measure). I could only test the correlation between the self-control scale and the Rotter scale (which was moderate), but by mobilising the advantages of the panel data I found that the self-control scale (created from the questions in the HHP) *per se* is very noisy. Another limitation to my findings is that in the wage equation – owing to a lack of data – I could only include non-cognitive skills, but in the HHP no proxies for cognitive skills were available. From this point of view, the findings of previous research [Osborne Groves 2005a; Heckman 2006] are more robust. I am not sure, however, how cognitive skills would change the predictive power of non-cognitive skills (like self-confidence). So the real importance of my findings is that I have estimated the labour market importance of a non-materialistic, non-cognitive skill.

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Annex

Table A1. Regression results – *Base model* (part one)

	(1993)	(1994)	(1995)
Constant	3,639()***	3,666()***	3,711()***
Male	0,088(0,229)***	0,099(0,254)***	0,087(0,216)***
Age	0,016(0,869)**	0,017(0,856)***	0,02(0,966)***
Age square	0(–0,717)*	0(–0,72)***	0(–0,807)***
Unmarried/single	–0,036(–0,07)*	–0,009(–0,017)	–0,036(–0,07)**
Divorced	0,001(0,001)	0,013(0,018)	–0,002(–0,003)
Widow	–0,002(–0,002)	0,003(0,003)	0,001(0,001)
Town	0,01(0,024)	0,02(0,046)	0(–0,001)
Country seat	0,006(0,011)	0,018(0,032)	0,02(0,034)
Budapest	0,105(0,213)***	0,1(0,203)***	0,102(0,208)***
Heckman's lambda	–0,397(–0,045)	0,273(0,029)	–1,077(–0,119)**
Vocational school	0,074(0,175)***	0,056(0,13)***	0,095(0,215)***
Secondary school	0,126(0,304)***	0,122(0,291)***	0,175(0,397)***
Degree	0,225(0,458)***	0,231(0,462)***	0,25(0,49)***
Self-confidence	0,016(0,137)***	0,018(0,145)***	0,02(0,158)***
R^2	40.287%	36.821%	41.273%
Weighted N	717	735	829
$\bar{\beta}$	2.624%	2.833%	3.195%

Notes: Dependent variable: monthly income (logarithmised).
The table contains the unstandardised regression coefficients [β] and in parentheses the standardised regression coefficients [B].

Table A1. Regression results – *Base model* (part two)

	(1996)	(1997)	(2007)
Constant	3,965()***	3,893()***	5,252()***
Male	0,094(0,232)***	0,055(0,139)***	0,086(0,203)***
Age	0,005(0,236)	0,018(0,879)***	–0,022(–0,802)
Age square	0(–0,074)	0(–0,718)***	0(0,723)
Unmarried/single	–0,003(–0,007)	–0,016(–0,032)	–0,004(–0,007)
Divorced	–0,007(–0,011)	0(–0,001)	0,015(0,024)
Widow	–0,003(–0,003)	–0,049(–0,044)*	0,053(0,045)
Town	0,029(0,066)**	0,011(0,025)	0,011(0,026)
Country seat	0,044(0,078)**	0,052(0,094)**	0,039(0,074)
Budapest	0,118(0,238)***	0,127(0,268)***	0,131(0,238)***
Heckman's lambda	0,521(0,06)	–1,385(–0,165)**	–0,007(–0,002)
Vocational school	0,048(0,11)**	0,127(0,296)***	0,05(0,113)
Secondary school	0,108(0,245)***	0,144(0,344)***	0,157(0,346)***
Degree	0,209(0,408)***	0,29(0,579)***	0,335(0,52)***
Self-confidence	0,016(0,123)***	0,013(0,099)***	0,012(0,087)*
R^2	34.944%	36.809%	34.548%
Weighted N	934	1221	345
$\overline{\beta}$	2.485%	1.939%	1.828%

Notes: Coefficients with *** are different from zero at a significance level of 0.01, coefficients with ** are different from zero at a significance level of 0.05, coefficients with * are different from zero at a significance level of 0.1.
All models are significant at a level of 0.001.
Omitted categories: female, village, married, at least elementary school.

Table A2. Regression results – *expanded model* (part one)

	(1993)	(1994)	(1995)
Constant	2.134()***	1.526()***	2.081()***
Male	0.045(0.121)***	0.042(0.107)***	0.043(0.11)***
Age	0.006(0.334)	0.009(0.429)*	0.009(0.426)*
Age square	0(–0.303)	0(–0.394)*	0(–0.367)
Unmarried/single	–0.026(–0.05)	0.015(0.029)	–0.032(–0.063)**
Divorced	0.003(0.005)	0.006(0.009)	–0.027(–0.041)
Widow	–0.017(–0.015)	–0.004(–0.004)	–0.003(–0.003)
Town	–0.003(–0.007)	0.008(0.019)	0.007(0.017)
Country seat	–0.017(–0.031)	0.013(0.023)	0.012(0.021)
Budapest	0.051(0.107)***	0.036(0.072)*	0.061(0.131)***
Heckman's lambda	0.12(0.014)	0.06(0.006)	–0.505(–0.059)
Wage (t–1 year)	0.435(0.445)***	0.589(0.557)***	0.463(0.48)***
Vocational school	0.04(0.098)**	0.035(0.082)**	0.036(0.084)**
Secondary school	0.077(0.192)***	0.062(0.149)***	0.088(0.21)***
Degree	0.153(0.321)***	0.107(0.216)***	0.135(0.285)***
Self-confidence	0.013(0.117)***	0.006(0.048)*	0.009(0.074)***
R^2	53.932%	54.956%	57.548%
Weighted N	645	666	733
$\overline{\beta}$	2.177%	0.928%	1.427%

Notes: Dependent variable: monthly income (logarithmised)
The table contains unstandardised regression coefficients [β] and in parentheses standardised regression coefficients [B].

Table A2. Regression results – *expanded model* (part two)

	(1996)	(1997)	(2007)
Constant	1.584()***	1.521()***	3.429()***
Male	0.043(0.109)***	0.022(0.055)	0.059(0.131)**
Age	0.001(0.046)	0.002(0.109)	–0.006(–0.22)
Age square	0(0.003)	0(–0.089)	0(0.155)
Unmarried/single	0(0)	0.004(0.008)	–0.005(–0.007)
Divorced	–0.019(–0.028)	–0.004(–0.006)	0.031(0.046)
Widow	0.001(0.001)	–0.036(–0.033)*	0.073(0.058)
Town	0.026(0.061)**	0.006(0.015)	0.006(0.012)
Country seat	0.021(0.037)	–0.009(–0.015)	0.04(0.073)
Budapest	0.051(0.106)***	0.041(0.086)***	0.09(0.159)***
Heckman's lambda	–0.104(–0.012)	–0.206(–0.024)	–0.183(–0.054)
Wage (t–1 year)	0.619(0.624)***	0.646(0.659)***	0.353(0.307)***
Vocational school	0.012(0.028)	0.02(0.047)	0.036(0.078)
Secondary school	0.036(0.083)**	0.046(0.109)***	0.13(0.271)***
Degree	0.072(0.147)***	0.104(0.209)***	0.256(0.403)***
Self-confidence	0.006(0.043)	0.005(0.04)*	0.007(0.044)
R^2	59.805%	65.157%	39.709%
Weighted N	809	1100	282
$\overline{\beta}$	0.855%	0.795%	0.989%

Notes: Coefficients with *** are different from zero at a significance level of 0.01, coefficients with ** are different from zero at a significance level of 0.05, coefficients with * are different from zero at a significance level of 0.1.

All models are significant at a level of 0.001.

Omitted categories: female, village, married, at least elementary school.