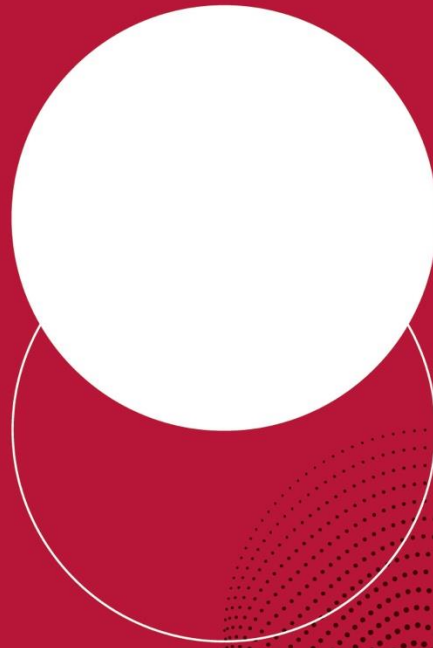




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CHILDHOOD CIRCUMSTANCES,
PERSONALITY TRAITS AND ADULT-LIFE
ECONOMIC OUTCOMES IN DEVELOPING
COUNTRIES: EVIDENCE FROM STEP

Michał Brzeziński



CHILDHOOD CIRCUMSTANCES, PERSONALITY TRAITS AND ADULT-LIFE ECONOMIC OUTCOMES IN DEVELOPING COUNTRIES: EVIDENCE FROM STEP*

Michał Brzeziński♦

Abstract

This paper studies the associations between childhood circumstances (e.g. parental background, early-life socio-economic status, negative economic shocks during childhood, etc.), personality traits (the Big Five, grit) and adult-life economic outcomes (educational attainment, employment opportunity, wages, life satisfaction, and obesity) in nine developing countries. The data come from the World Bank's STEP Skills Measurement Survey conducted over 2012-2013. Our results show that childhood circumstances are associated more strongly than personality traits with educational attainment. However, personality is related as much as early-life conditions to employment and wages. While childhood circumstances are more strongly related to life satisfaction, some personality dimensions like agreeableness and neuroticism are strong correlates of life satisfaction. Grit is not significantly related to adult-life outcomes, when other personality traits are controlled for. Obesity is positively associated with extraversion and neuroticism, while childhood circumstances do not predict it.

Keywords: childhood circumstances, personality, grit, education, employment, life satisfaction, obesity, developing countries, STEP

JEL: A12, I20, I31, J24, J31, O12

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1. Introduction

The fact that early-life conditions and childhood circumstances affect adult-life outcomes (educational attainment, life satisfaction, employment, wages, etc.) has been established in a large empirical literature (Almond and Currie 2011a, b; Currie and Vogl 2013; Flores and Kalwij 2014; Almond et al. 2017). The most influential childhood conditions and circumstances include parental background, early-life household financial situation, childhood socio-economic status, family psychosocial environment, and others. Another strand of literature has shown that childhood conditions and circumstances have effect on both cognitive and non-cognitive skills of individuals (Cuhna and Heckman 2008; Cunha et al. 2010). In turn, both types of skills are associated with socio-economic outcomes in adulthood such as wages, employment, life satisfaction, etc. (Heckman et al. 2006; Borghans et al. 2008; Frijters et al. 2014).

Disentangling the interrelationships between childhood circumstances, cognitive and non-cognitive skills and adult-life outcomes is a difficult theoretical and empirical task. An easier, but still interesting question, is whether early-life conditions are associated with socio-economic outcomes in adulthood, when non-cognitive skills (such as personality traits) are controlled for. Such an analysis helps to identify if individuals' life outcomes are determined by their childhood and family background or by individuals' personality traits. From another perspective, the analysis checks whether there is a direct association between childhood conditions and adult-life outcomes, when personality traits are controlled for, or if the personality traits are the mediators of the associations. The existing empirical studies devoted to this problem have argued that parental background is equally or more strongly than personality associated with adult-life wages or income (Furnham and Cheng 2013; Kajounis and Carlander 2017). On the other hand, personality traits seem to be related more strongly to life satisfaction than childhood circumstances (Cheng and Furnham 2014; Kajonius and Carlander 2017). However, the previous studies have used data exclusively for the rich countries, such as Sweden or the United Kingdom, and their results may not generalize to other populations.

This paper contributes to the literature by studying the associations between childhood conditions and circumstances (measured at ages 0-15), personality, and adult-life outcomes in the context of low- and middle-income developing countries. We exploit data from the World Bank's STEP (Skills Towards Employability and Productivity) Skills Measurement Program (Pierre et al. 2014). This data set allows to construct a relatively large sample of urban adults (aged 30-64) surveyed in nine developing countries (Armenia, Bolivia, Colombia, Georgia, Ghana, Kenya, Macedonia, Ukraine, and Vietnam) over the 2012-2013 period. The unique feature of the STEP data set, not available in other large-scale surveys for developing countries, is the assessment of non-cognitive skills. In particular, we construct variables measuring the Big Five personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism). In addition, we also study another personality trait, grit, which is defined as passion and perseverance for long-term goals (Duckworth et al. 2007). In some studies, grit has shown greater predictive power with respect to some outcomes (such as educational achievements) than the Big Five (Duckworth and Eskreis-Winkler 2015). Grit has not been previously analysed as a possible mediator between childhood circumstances and adult-life outcomes.

The present paper extends the existing literature by exploiting a relatively large set of variables describing childhood conditions and circumstances. We include proxy variables for childhood health, parental educational attainment, indicators for economic shocks during childhood, and childhood socioeconomic

status. This allows to study whether a rich set of childhood circumstances is jointly associated with adult-life outcomes. The latter are expressed in terms of five key life outcomes: educational attainment, employment status, wages, life satisfaction, and body weight (obesity status). The paper tests whether the associations between childhood circumstances and adult-life outcomes in developing countries are mediated by adult educational attainment, adult health, and personality traits. By this, it provides insights into the possible transmission mechanisms from childhood circumstances to outcomes in later life. Following Flores and Kalwij (2014), if the relationship between childhood circumstances and a given adult outcome is still present after controlling for education, adult health, and personality, we interpret it as evidence in favour of the possible direct transmission of the effects of circumstances to adult life.

The remainder of this paper is organised as follows. Section 2 presents a short overview of the literature on the relationship between early-life conditions, personality traits and adult-life outcomes. Section 3 describes the data set that we use and the main variables for analysis. Empirical results are presented in Section 4, while Section 5 summarizes the main findings, discusses the limitations, and concludes the paper.

2. Background

The theoretical research has described several channels through which childhood circumstances can have negative impact on later-life socio-economic outcomes. The Fetal Origins Hypothesis (FOH) argues that events occurring during the prenatal period or in early-life period can significantly shape adult health and economic outcomes like earnings or educational attainment (Almond and Currie 2011a, Almond et al. 2017). Life course approaches suggest that unfavourable factors occur both in childhood and in later periods of life (adolescence or young adulthood) and that they can accumulate deteriorating adult health and limiting adult outcomes like education or employment (Kuh and Wadsworth 1993). A version of the life course approach, known as the pathway model, argues that negative childhood circumstances may not affect adult health directly, but rather indirectly through the impact on adult circumstances such as socio-economic status (SES) (Marmot et al. 2001). Recent evidence for European countries shows that higher childhood socio-economic status (SES) is associated with higher educational attainment, which in turn is protective of later life health (Flores and Kalwij 2014). On the other hand, most of the association between early-life conditions and adult-life employment in Europe is transmitted through education and adult-life health. Empirical research has also confirmed that childhood circumstances may be an important determinant of life satisfaction in adulthood (Frijters et al. 2014).

In recent years, a research program by James Heckman and his co-authors has shown that childhood conditions (such as parental background and parental investments in children) have effect on both cognitive and non-cognitive skills of individuals (Cunha and Heckman 2008; Cunha et al. 2010). The noncognitive skills studied included self-control, time preference, self-esteem, sociability, and others. Those skills, together with cognitive skills, are associated with socio-economic outcomes in adulthood such as wages, employment, life satisfaction, and others (Heckman et al. 2006; Borghans et al. 2008).

A small literature in economics and psychology has attempted to quantify whether noncognitive skills measured in terms of the Five Factor Model of personality (Costa and McCrae 1992), often referred to as the Big Five, are associated with adult-life outcomes, when childhood circumstances and other characteristics are controlled for. The Big Five model includes five general personality traits, which summarize several more

specific characteristics of personality. The five personality traits are: (1) extraversion, (2) neuroticism (lack of emotional stability), (3) openness to experience (intellect), (4) conscientiousness, and (5) agreeableness. These traits have been shown to be relatively stable over time during adulthood (Terracciano et al. 2006). They are also robust measures of personality across cultures, age groups and world regions (Schmitt et al. 2007). Both economic and psychological literature have found that the Big Five traits are significantly correlated with several key life outcomes such as mortality, divorce, life satisfaction, employment, earnings, and obesity (Nyhus and Pons 2005; Roberts et al. 2007; Palifka 2009; Fletcher 2013; Cheng and Furnham 2014; Gerlach et al. 2015). The literature linking childhood circumstances, personality traits and adult-life outcomes has in general found that childhood SES is equally or more strongly than personality associated with adult-life wages or income (Furnham and Cheng 2013; Kajonius and Carlander 2017). On the other hand, personality traits (especially neuroticism and extraversion) seem to be more strongly related to life satisfaction than childhood SES (Cheng and Furnham 2014; Kajonius and Carlander 2017). All of the existing studies measuring associations between early-life circumstances, personality and adult-life outcomes were using data for the rich countries such as Sweden, the United Kingdom, and the United States.

3. Data from STEP

The data used in this paper come from the STEP Skills Measurement Program (Pierre et al. 2014).¹ The survey is unique in measuring skills (including cognitive and socio-emotional ones) of working-age populations in low- and middle-income countries. The data were collected in 2012 for Ukraine, Vietnam, Bolivia and Colombia, while in 2013 – for Armenia, Georgia, Macedonia, Ghana and Kenya.² The STEP survey was primarily designed to measure cognitive and noncognitive skills of individuals in developing countries, but fortunately for our purposes it covers also a wide range of information concerning childhood circumstances of individuals. It delivers also extensive information about education, health, and employment history of participants, as well as socio-demographic characteristics of respondents' households. The STEP data uses nationally representative samples of urban adults between 15 and 64 years old. We further restrict sample to individuals aged 30 and older as the literature shows that personality traits are largely unchanged after the age of 30 (Terracciano et al. 2006; Kajonius and Carlander 2017). The pooled sample of nine countries has 17,253 observations.

3.1. Dependent variables

We use five dependent variables describing adult-life socio-economic outcomes: the level of educational attainment, employment status, life satisfaction, hourly wage rate, and body weight (obesity status). All dependent variables are measured in adulthood (at 30 years of age and later). The definitions of all variables used in the analysis are presented in Table 1.

¹ Tognatta et al (2016) use the STEP data to analyse the contribution of cognitive and noncognitive skills to the gender wage gap in low- and middle-income countries.

² The survey was also conducted in Azerbaijan, China, Lao PDR and Sri Lanka. However, we do not use these data as in Azerbaijan only employers were surveyed, the China sample covers only the Yunnan province, while data for the other two countries include both urban and rural workers.

Table 1. Definitions of dependent and independent variables

Variable	Definition
Dependent variables	
Education	Education is categorized into three levels using the International Standard Classification of Education 1997 (ISCED 1997): low education (pre-primary, primary and lower secondary education levels or ISCED 0-2), medium education (upper secondary and post-secondary non-tertiary education or ISCED 3-4), and high education (tertiary education or ISCED 5-6).
Employed	Equal to 1 if respondent is employed, 0 – if otherwise. Following Maestas (2010) and Flores and Kalwij (2014), being employed is defined as self-reporting either employment or self-employment and also reporting positive number of hours worked last week in respondent’s main occupation.
Log of hourly wages	Logarithm of hourly wages for employees and self-employed between (in 2011 PPP-adjusted U.S. dollars).
Life satisfaction	Self-rated life satisfaction measured on a scale from 1 (completely dissatisfied) to 10 (completely satisfied).
Obesity	Equal to 1 if the respondent is obese (Body Mass Index ≥ 30), 0 – if otherwise.
Childhood circumstances	
Mother’s education	Mother’s education is self-reported by respondents and defined using four categories: low education (pre-primary and primary education levels or ISCED 0-1), medium education (lower secondary education or ISCED 2), high education (at least upper secondary education or ISCED4 and higher), unknown (respondent does not know mother’s education).
Father’s education	Defined analogously to mother’s education.
Socioeconomic status (SES) at age 15	Based on responses to the question: “Imagine a 10-step stairs where on the bottom, the FIRST step, stand the poorest people, and on the highest step, the TENTH, stand the richest. On which step, do you think your family was when you were 15 years old?”. Responses 1-3 are coded as low SES, 4-6 as medium SES, and 7-10 as high SES.
Economic shocks during childhood	Defined as “no shocks” if respondent did not suffer from economic shocks during childhood, as “one shock” – if he or she experienced one shock, and “two of more shocks” – if the number of shocks was greater than one. Economic shocks are defined as instances of significant worsening of respondent’s household financial situation during childhood due to death or illness of a household member, family breakup, alcohol or drug problem, loss of employment, bankruptcy, loss of crops, natural catastrophe, violence or theft, forced displacement, social unrest or other factors.
Personality traits	
Grit	Equal to 1 if the respondent’s score is in the top quartile of the grit scale, 0 – if otherwise. Grit scale is constructed using the three following items: “Do you finish whatever you begin?”, “Do you work very hard?”, “Do you enjoy working on things that take a very long time (at least several months) to complete?”. A score of 4 is assigned to signify “almost always,” 3 to signify “most of the time,” 2 to signify “some of the time,” and 1 to signify “almost never.” The grit scale is obtained by summing the scores over the three items.
Openness	Equal to 1 if the respondent’s score is in the top quartile of the openness scale, 0 – if otherwise. The openness scale is constructed analogously to the grit scale. The items are: “Do you come up with ideas other people haven’t thought of before?”, “Are you very interested in learning new things?”, “Do you enjoy beautiful things, like nature, art and music?”. See definition of grit for details about scores and construction of scales.
Conscientiousness	Equal to 1 if the respondent’s score is in the top quartile of the conscientiousness scale, 0 – if otherwise. The conscientiousness scale is constructed analogously to the grit scale. The items are: “When doing a task, are you very careful?”, “Do you prefer relaxation more than hard work?”, “Do you work very well and quickly?”. See definition of grit for details about scores and construction of scales.
Extraversion	Equal to 1 if the respondent’s score is in the top quartile of the extraversion scale, 0 – if otherwise. The extraversion scale is constructed analogously to the grit scale. The items are: “Are you talkative?”, “Do you like to keep your opinions to yourself? Do you prefer to keep quiet when you have an opinion?”, “Are you outgoing and sociable, for example, do you make friends very easily?”. See definition of grit for details about scores and construction of scales.

Agreeableness	Equal to 1 if the respondent's score is in the top quartile of the agreeableness scale, 0 – if otherwise. The agreeableness scale is constructed analogously to the grit scale. The items are: "Do you forgive other people easily?", "Are you very polite to other people?", "Are you generous to other people with your time or money?". See definition of grit for details about scores and construction of scales.
Neuroticism	Equal to 1 if the respondent's score is in the top quartile of the neuroticism scale, 0 – if otherwise. The neuroticism scale is constructed analogously to the grit scale. The items are: "Are you relaxed during stressful situations?", "Do you tend to worry?", "Do you get nervous easily?". See definition of grit for details about scores and construction of scales.
Control variables	
Age	Age in years.
Female	Equal to 1 if the respondent is woman, 0 – if otherwise.
Height	Adult self-reported height of respondent.
Chronically ill	Equal to 1 if respondent reports that he or she is chronically ill at present time, 0 – if otherwise.
Adult health	Adult health is measured on three levels using responses to the question: "How many days during the last 4 weeks have you been unable to carry out your usual daily activities because of sudden illness, accident, chronic illness, or any other health problem?". Reporting more than 7 days is coded as "bad adult health", between 1 and 6 days – "medium adult health", and 0 days as "good adult health".
Married	Equal to 1 if respondent is married, 0 – otherwise.
Number of children	Number of respondent's children.
Self-employed	Equal to 1 if respondent is self-employed, 0 – if otherwise.
Potential experience	Calculated as: age – years of education – 6.
Occupation type	Categorical variable with the following levels: 1 – military personnel, 2 – highly skilled white collar, 3 – low skilled white collar, 4 – crafts and trade workers, 5 – elementary occupations, 6 – skilled agricultural work.
Computer at work	Equal to 1 if respondent uses computer at work, 0 – if otherwise.
Reading proficiency	Scores from reading literacy assessment measured on a scale ranging from 0 to 500. The scale is the same as the assessment in the OECD's Program for the International Assessment of Adult Competencies (PIAAC). See Pierre et al. (2014) for more details.

Source: own elaboration based on STEP Skills Measurement Surveys data.

Specifically, we measure educational attainment on three levels using the International Standard Classification of Education 1997 (ISCED 1997): low education (pre-primary, primary and lower secondary education levels or ISCED 0-2), medium education (upper secondary and post-secondary non-tertiary education or ISCED 3-4), and high education (tertiary education or ISCED 5-6). In our empirical analysis reported in section 4, we study the association between childhood circumstances, personality traits and educational attainment using ordinal probit models and their estimates of marginal effects for the probability of having high level of education.

Employment is defined using a dummy variable equal to 1 if a respondent is employed, and equal to 0 if otherwise. Following Maestas (2010) and Flores and Kalwij (2014), being employed is defined as fulfilling jointly two conditions: 1) self-reporting either employment or self-employment and 2) reporting positive number of hours worked last week in respondent's main occupation. In section 4, we study the association between childhood circumstances and employment using marginal effects from probit models for the probability of being employed.

We measure current earnings using the logarithm of hourly wage rate. The sample consists of wage workers (employed, unemployed and inactive) and self-employed adults between 30 and 64 years old. To eliminate the impact of outliers, we have removed individuals in the top 1% and bottom 1% of the earnings distribution.

Since we observe wages only for the individuals who work, the estimates may suffer from the selection bias. We use Heckman's (1979) method to correct for the selection bias. Following this approach, in the first step of the analysis we estimate a probit model predicting labour force participation. The regressors in the selection equation include childhood circumstances, respondent's education, marital status, gender, number of children and age dummies. The predicted probabilities of employment from the probit model are used to estimate the selectivity parameter, which is incorporated in the final regression for wages as an additional explanatory variable.

Life satisfaction in the STEP study is self-reported as the answer to the following question: "How satisfied are you at present with your life, all things considered? Respond on a scale from 1 (completely dissatisfied) to 10 (completely satisfied)". We assume cardinality of the life satisfaction variable and estimate the relationship between circumstances, personality traits and life satisfaction using the OLS regression. As shown by Ferrer-i- Carbonell and Frijters (2004) and Clark (2016), the choice of the estimation technique (OLS vs. ordered probit/logit models respecting the ordinal nature of life satisfaction data) makes no difference to the estimation results.³

Finally, to measure obesity we use self-reported information on height and weight of respondents. Using this information, we compute the Body Mass Index (BMI), which is next used to build an obesity indicator (BMI of 30 or higher).

3.2. Childhood circumstances, personality traits and control variables

The STEP survey delivers retrospective information allowing to measure childhood circumstances along several dimensions. Parental background of respondents is accounted for by variables measuring mother's and father's education. We also include a measure of respondent's socioeconomic status (SES) at age 15. Another circumstance variable measures the number of economic shocks that occurred in the respondent's household during his or her childhood. The shocks are defined as the self-perceived significant worsening of respondent's household financial situation due to various social, economic, or personal problems (see Table 1 for details).

Noncognitive skills are measured in the STEP study by responses to the questions related to various personality traits and behaviours. Personality traits measured include the Big Five (openness, conscientiousness, extraversion, agreeableness, and neuroticism) and grit, while behaviours include hostile attribution bias and decision making. In this paper, we focus on the Big Five and grit. Each of the Big Five personality dimension is evaluated with 3-item short Big Five Inventory (BFI-S) developed by John and Srivastava (1999) and validated in the large-scale German Socio-Economic Panel survey (Lang et al. 2011). Grit in the STEP survey is assessed using 3 items selected from the grit scale of Duckworth et al. (2007).⁴

For each of the scales describing a given personality trait, in case of positively scored items a score of 4 has been assigned to signify "almost always," 3 to signify "most of the time," 2 to signify "some of the time," and 1

³ We obtain qualitatively similar results with respect to the determinants of life satisfaction when using ordered probit regression. The results are available upon request.

⁴ Table 1 presents the questionnaire items used for each socio-emotional skill that we analyse.

to signify “almost never.” For negatively scored items (such as the extraversion item “Do you like to keep your opinions to yourself?”) a score of 4 is assigned for “almost never,” and so on. The reliability of the scales was evaluated using the Cronbach alpha statistic. The estimated alphas were low ranging from 0.22 (conscientiousness) to 0.44 (openness). This is much lower than the range of 0.50 to 0.65 usually found in research using scales with a small number of items (Lang et al. 2011). Pierre et al. (2014) argue that the low alphas for the scales measuring socio-emotional skills in the STEP survey result collectively from three factors: 1) low literacy of respondents and their unfamiliarity with self-reporting of holistic aspects of personality; 2) the use of reverse-coded items in countries surveyed in 2012; 3) the use of 4-point scales, rather than the 5-point scales used originally. To overcome this problem, we follow Mendolia and Walker (2014) in constructing binary indicators of personality traits defined in the following way. For each of the personality traits, we obtain the scale by summing the scores over the three relevant items. Next, we assign a given personality trait to an individual (e.g. being gritty) if her/his total score is in the top quartile of the personality scale. However, the robustness analysis shows that our results are qualitatively identical when we use measures defined as total scores from the personality scales.

We use several sets of control variables. First, to approximate childhood health we use the current height of the respondent, which is also often treated as a proxy for childhood SES (Case and Paxson 2008., Flores and Kalwij 2014). The second measure of this kind is a dummy variable indicating whether the respondent is chronically ill. Second, we account for adult health by constructing a categorical variable based on self-reported number of days of work missed due to health problems (see Table 1 for details). This variable allows to categorize adult health into bad, medium, and good.⁵ For models estimating the association between childhood circumstances, personality traits and wages of the respondents, we control for self-employment, potential labour market experience (and potential experience squared), cognitive skills (reading proficiency), and using computer at work.

In all models estimated in this paper, we include dummy variables for country, gender, and each age category from 30 to 64 to control for cohort effects. When appropriate, we control also for education of the respondents, their marital status and number of children.

3.3. Descriptive statistics

The descriptive statistics for all variables used are presented in Table 2.⁶ Sample sizes for individual countries range from 1,284 (Bolivia) to 2,955 (Macedonia). The highest level of education (ISCED 5-6) has been attained by 35% of the respondents from the pooled sample. About two thirds of the sample is employed (24% are self-employed), while the average life satisfaction is 6.1 on a 1-10 scale. 18% of the respondents are obese. The average hourly wage rate is 2.7 in 2011 PPP-adjusted US \$. Only 16-18% of respondents have parents with high levels of education. As much as 12-17% of the respondents did not know the level of parental education. High childhood SES has been reported by just 16% of the sample, while 14% reported that they suffered 2 or more economic shocks during childhood.

⁵ Unfortunately, the STEP survey does not contain information on self-reported health status, which is the most popular survey-based measure of health.

⁶ In all our analyses, we use sampling weights provided in the STEP study.

Table 2. Descriptive statistics for dependent and independent variables

	Mean	Standard deviation	Minimum	Maximum	Non-missing observations
Education: low	0.27	0.45	0.00	1.00	17,246
Education: medium	0.38	0.48	0.00	1.00	17,246
Education: high	0.35	0.48	0.00	1.00	17,246
Employed	0.65	0.48	0.00	1.00	17,253
Life satisfaction	6.10	2.36	1.00	10.00	17,231
Obese	0.18	0.38	0.00	1.00	16,371
Log of hourly wage	1.00	0.99	-7.71	7.34	9,838
Mother's education: low	0.38	0.49	0.00	1.00	17,253
Mother's education: medium	0.34	0.48	0.00	1.00	17,253
Mother's education: high	0.16	0.36	0.00	1.00	17,253
Mother's education: unknown	0.12	0.32	0.00	1.00	17,253
Father's education: low	0.31	0.46	0.00	1.00	17,253
Father's education: medium	0.34	0.48	0.00	1.00	17,253
Father's education: high	0.18	0.38	0.00	1.00	17,253
Father's education: unknown	0.17	0.38	0.00	1.00	17,253
Childhood SES: low	0.26	0.44	0.00	1.00	17,178
Childhood SES: medium	0.58	0.49	0.00	1.00	17,178
Childhood SES: high	0.16	0.37	0.00	1.00	17,178
Economic shocks: none	0.68	0.47	0.00	1.00	17,228
Economic shocks: one	0.18	0.38	0.00	1.00	17,228
Economic shocks: 2 or more	0.14	0.35	0.00	1.00	17,228
Grit	0.16	0.37	0.00	1.00	16,248
Openness	0.22	0.42	0.00	1.00	16,246
Conscientiousness	0.09	0.29	0.00	1.00	16,204
Extraversion	0.14	0.34	0.00	1.00	16,251
Agreeableness	0.24	0.43	0.00	1.00	16,242
Neuroticism	0.14	0.34	0.00	1.00	16,162
Age	46.06	10.06	30.00	64.00	17,253
Female	0.65	0.48	0.00	1.00	17,253
Height	164.89	9.55	80.00	220.00	16,718
Chronically ill	0.33	0.47	0.00	1.00	17,253
Bad adult health	0.08	0.27	0.00	1.00	17,249
Medium adult health	0.09	0.28	0.00	1.00	17,249
Good adult health	0.82	0.39	0.00	1.00	17,249
Married	0.71	0.45	0.00	1.00	17,250
Number of children	1.41	1.25	0.00	10.00	17,253
Self-employed	0.24	0.43	0.00	1.00	17,253
Potential experience	28.77	10.98	2.00	58.00	16,803
Occupation: military	0.00	0.07	0.00	1.00	11,335
Occupation: highly skilled	0.32	0.47	0.00	1.00	11,335
Occupation: low skilled	0.31	0.46	0.00	1.00	11,335
Occupation: crafts and trade	0.23	0.42	0.00	1.00	11,335
Occupation: elementary	0.12	0.32	0.00	1.00	11,335
Occupation: skilled agriculture	0.02	0.13	0.00	1.00	11,335
Computer at work	0.32	0.47	0.00	1.00	11,398
Reading proficiency	229.42	76.92	0.00	427.34	14,278

Note: mean sample values for continuous variables and sample proportions for categorical variables. Pooled representative samples of urban adults between 30 and 64 years old from 9 developing countries.

Source: own calculations based on STEP Skills Measurement Surveys data.

Our binary measures indicate that 9-24% of the respondents are characterized by having a given personality trait.⁷ One third of the sample report some sort of chronic illness, but about 82% has at least good current self-reported health. 71% of the sample are married and the average number of children is 1.4. The average age is 46 years old, while the average potential work experience 29 years. Since the STEP sample covers only urban workers, most of the respondents work in either high-skilled (32%) or low-skilled (31%) white collar occupations. 32% of respondents use computer at work.

4. Empirical results

We now present empirical results on the associations between childhood circumstances, personality traits and adult educational attainment, employment probability, life satisfaction, wages, and obesity probability. For models with education level as the dependent variable, we use ordered probit regressions and report average marginal effects for the probability of having high level of education. In case of modelling employment and obesity, we use probit regressions and report average marginal effects of the explanatory variables on the probability of being employed or obese, respectively. Life satisfaction is modelled using the OLS, while models for wages use the Heckman selection correction method. All estimations use sampling weights available in the STEP survey, as well as account for stratification and clustering of the STEP samples. Age and country dummies are included in all regressions.

As mentioned in the Introduction, the estimated coefficients should be interpreted in terms of associations between childhood circumstances or personality traits and adult-life outcomes. The causal interpretation is precluded for at least three reasons (see also a discussion by Flores and Kalwij 2014). First, personality traits and some control variables (such as adult health) could be endogenous for some adult outcomes such as employment status or level of wages through reverse causality. Second, the endogeneity issue could arise also due to the measurement error associated either with retrospectively assessed early-life circumstances or with imprecisely measured personality traits. Third, as many authors argued (e.g. Case et al. 2005; Smith 2009; Flores and Kalwij 2014) the estimated associations may be driven by unobserved “third factors” that influence both early-life circumstances (or personality traits) and adult-life outcomes. We include a large number of childhood circumstances and control variables in order to adjust for these potential confounding factors, but since we cannot rule them out our results should be rather interpreted in terms of associations, not causal relationships.

We investigate the role of various factors as potential mediators between early-life circumstances and adult-life outcomes. This is performed by sequential inclusion of control variables for adult health, educational attainment, and personality traits.⁸ If there is still a statistically significant relationship between circumstances and adult outcomes after controlling for health, education, and personality traits, we treat it as evidence in favour of the direct transmission of early-life conditions to later-life outcomes. On the other hand, if the relationship disappears after inclusion of a given factor we interpret this as evidence of indirect impact

⁷ The measures, based on quartiles of the personality scales, deviate from 0.25 due to the discrete nature of personality scales distributions.

⁸ In models for educational attainment we do not control for adult health, which is measured after the individual has completed his or her education. Models for determinants of wages include also control variables measuring cognitive skills (reading proficiency).

of childhood circumstances on an outcome through the mediator. However, it must be stressed here that since we cannot control for all possible mediator variables (such as lifetime earnings or incomes) the underlying direct and indirect associations between early-life circumstances and adult outcomes may be weaker than those estimated in this paper.

4.1. Educational attainment

Table 3 presents marginal effects of childhood circumstances and personality traits on the probability of having a highest level of education (ISCED 5-6). For all specifications considered, the circumstances taken together are jointly significantly associated with the probability of the highest educational attainment. The fact that the respondent did not know mother's (father's) educational attainment is associated with 17.6-18.2 (16.3-17.6) % point decrease in the probability of having the highest educational level. On the other hand, high levels of parental educational attainment are strongly associated with the increase of the probability of having high education level (9.9-11.1 % points in case of mother's high education and 15.1-16.6 % points in case of father's high education level). Low SES in childhood is associated with about 11 % point decrease in the probability of attaining the highest education level. Finally, economic shocks in the respondent's household during childhood are also significantly associated with his or her educational attainment. These results are consistent with previous research finding strong associations between childhood circumstances and adult educational attainment (see, e.g., Case et al. 2005; Flores and Kalwij 2014; Kajonius and Carlander 2017).

Including variables approximating childhood health (model 2) does not change the estimated relationships. Similar to previous research findings (Case et al. 2005; Flores and Kalwij 2014), we estimate that a 10 cm increase in height is associated with a 5-6 % point increase in the probability of having the highest educational level. The results for the specification including personality traits (model 3) show that for our binary indicators of openness and conscientiousness the associated rise in the probability of having the highest level of education is, respectively, 12, and 5.3 % points. On the other hand, neuroticism is associated with 8.3 % decrease in the relevant probability. Kajonius and Carlander (2017) using data for Sweden have also found that, controlling for childhood SES, there is a positive association between openness and educational attainment. The same applies to the negative relationship between neuroticism and the probability of having the highest level of education. Previous research confirms that among personality traits openness and conscientiousness are particularly strongly associated with high educational attainment (Richardson et al. 2012; Poropat 2014). However, research has usually found that there is only a weak negative correlation between neuroticism and high educational attainment (Poropat 2011). The stronger effect found in the present paper may indicate that the relationship is somewhat more pronounced in developing countries.

It is also worth noting that the indicator variable for grit is not significant, when controlling for other personality traits (model 3). The variable is significant when it is the only personality trait included in a regression (results not reported), but its effect is fully absorbed when controlling for other personality factors.⁹

⁹ Similar results were obtained for life satisfaction and wages. The detailed results are available upon request.

Table 3. The marginal effects of childhood circumstances and personality traits on the probability of having a highest level of education (ISCED 5 or 6)

	(1)	(2)	(3)
Mother's education: low	-0.061***	-0.056**	-0.059**
Mother's education: high	0.111***	0.109***	0.099***
Mother's education: unknown	-0.181***	-0.182***	-0.176***
Father's education: low	-0.098***	-0.102***	-0.103***
Father's education: high	0.162***	0.166***	0.151***
Father's education: unknown	-0.163***	-0.170***	-0.176***
Childhood SES: low	-0.108***	-0.108***	-0.110***
Childhood SES: high	0.030	0.026	0.018
Economic shocks: none	0.054***	0.054***	0.064***
Economic shocks: 2 or more	-0.051**	-0.050**	-0.056**
Female	-0.026*	0.035**	0.065***
Height		0.005***	0.006***
Chronically ill		-0.002	-0.003
Grit			0.022
Openness			0.121***
Conscientiousness			0.053*
Extraversion			0.027
Agreeableness			0.002
Neuroticism			-0.083***
Joint significance of circumstances (p-value)	0.000	0.000	0.000
Joint significance of personality traits (p-value)	-	-	0.000
N	17,212	16,681	15,559
Pseudo R ²	0.224	0.220	0.209

*Note: All estimates are weighted using STEP sampling weights. Standard errors in parentheses account for stratification and clustering in STEP. * p < 0.1, ** p < 0.05, *** p < 0.01. All regressions include age and country dummies. Omitted categories: medium mother's education, medium father's education, medium childhood SES, one economic shock.*

Source: own calculations based on STEP Skills Measurement Surveys data.

Overall, our results in this section suggest that for our STEP sample of developing countries there is a direct association between childhood circumstances and high educational attainment. Some personality traits, especially openness, conscientiousness, and neuroticism, are also directly related to the probability of having a high level of education.

4.2. Employment

Marginal effects of childhood circumstances and personality traits on adult-life employment, conditional on educational attainment, adult health, and other control variables, are presented in Table 4. Model 1 shows that when mediator variables are not accounted for early-life circumstances are jointly significantly associated (at 10% level) with the probability of employment in adulthood. In particular, having mother with high level of education is associated with the rise of employment probability by 8.3 % points.

Table 4. The marginal effects of childhood circumstances and personality traits on the employment probability

	(1)	(2)	(3)	(4)	(5)	(6)
Mother's education: low	0.029	0.038	0.041	0.045	0.045	0.043
Mother's education: high	0.083**	0.086**	0.083**	0.067*	0.066*	0.054
Mother's education: unknown	0.036	0.042	0.048	0.054	0.056	0.038
Father's education: low	-0.070***	-0.072***	-0.076***	-0.069**	-0.068**	-0.083***
Father's education: high	-0.003	-0.009	-0.008	-0.030	-0.030	-0.029
Father's education: unknown	-0.045	-0.056*	-0.054*	-0.039	-0.039	-0.046
Childhood SES: low	-0.033	-0.028	-0.024	-0.016	-0.018	-0.013
Childhood SES: high	0.006	0.009	0.009	0.004	0.003	0.007
Economic shocks: none	-0.011	-0.013	-0.015	-0.022	-0.021	-0.017
Economic shocks: 2 or more	0.002	0.002	0.005	0.009	0.009	0.010
Female	-0.171***	-0.166***	-0.165***	-0.175***	-0.177***	-0.184***
Height		-0.000	-0.000	-0.001	-0.001	-0.001
Chronically ill		-0.076***	-0.043**	-0.043**	-0.043**	-0.042*
Adult health: medium			0.072	0.065	0.067	0.089**
Adult health: good			0.160***	0.158***	0.159***	0.161***
Own education: low				0.014	0.015	0.028
Own education: high				0.126***	0.127***	0.125***
Married					-0.020	-0.023
Number of children					-0.002	-0.002
Grit						0.015
Openness						0.023
Conscientiousness						0.107***
Extraversion						0.004
Agreeableness						-0.022
Neuroticism						-0.065**
Joint significance of circumstances (p-value)	0.076	0.099	0.120	0.340	0.347	0.370
Joint significance of personality traits (p-value)	-	-	-	-	-	0.062
N	17,219	16,688	16,686	16,679	16,676	15,554
Pseudo R2	0.170	0.170	0.174	0.186	0.187	0.185

*Note: All estimates are weighted using STEP sampling weights. Standard errors in parentheses account for stratification and clustering in STEP. * p < 0.1, ** p < 0.05, *** p < 0.01. All regressions include age and country dummies. Omitted categories: medium mother's education, medium father's education, medium childhood SES, one economic shock, bad adult health, medium own education.*

Source: own calculations based on STEP Skills Measurement Surveys data.

Models 2-3 extend the analysis by including variables approximating childhood health (model 2) and adult health (model 3). Both types of health variables are highly significant. Having good adult-life health is associated with the increased employment probability by 16 % points (model 3). The direct association between childhood circumstances taken together and employment probability is marginally significant (at 10% level), when childhood health is controlled for. However, they disappear when adult health and education

of respondents are also controlled for (models 3-4). Having high level of education is associated with about 13 % point increase in employment probability. This suggest that the effect of childhood circumstances on employment is indirectly transmitted mainly through health and education. The same result was obtained for developed countries by Flores and Kalwij (2014).

Model 6 adds indicator variables for personality traits. We find that employment probability is positively associated with binary indicator of conscientiousness, and negatively associated with neuroticism. In particular, being conscientious is associated with the rise of employment probability by almost 11 % points, while being neurotic – with the employment probability decreased by 6.5 % points. Overall, personality traits are jointly significant at the 10% level. The results concerning personality traits are in general similar to those of Fletcher (2013), obtained for the US data.

The findings in this section suggest that for our sample of developing countries there is no direct transmission from unfavourable childhood circumstances to employment opportunities. We find evidence that the associations from early-life circumstances are mediated by adult-life education and health. Some personality traits like conscientiousness and neuroticism are directly associated with employment probability.

4.3. Wages

Table 5 presents marginal effects of childhood circumstances and personality traits on log of hourly wages resulting from the Heckman selection model. The circumstances are always jointly significant.¹⁰ Having mother with high level of education is associated with the rise in hourly wages by about 12-13%, while low father's education is related to decreased wage rate by 10-12% (compared to the case of medium father's education). Own high level of educational attainment is also strongly associated with higher wages (model 1). Health variables are not significantly related to wages. There is high premium (about 28%) for using computer at work. The estimated gender wage gap is in the range from 26 to 32%. Comparing model 3 with models 1-2, we can see that for our data set the association between early-life circumstances and wages earned in adulthood is not mediated by personality traits. The circumstances are directly associated with adult-life wages, when controlling for personality traits. Among the personality skills, only openness indicator is significantly associated with wages – being open is related to the wage rate increase of about 11%.

The existing literature linking personality and wages suggest that there is a positive relationship in case of antagonism (inverse of agreeableness) and emotional stability (inverse of neuroticism) (Nyhus and Pons 2005; Mueller and Plug 2006). Some studies suggest also that conscientiousness (Furnham and Cheng 2013) and extraversion (Fletcher 2013) are positively associated with wages. Openness is positively related to wages in some studies (Mueller and Plug 2006; Palifka 2009; Furnham and Cheng 2013), but in others the association is not robust to model specification (Fletcher 2013). Kajonius and Carlander (2017) show that neuroticism is strongly negatively associated with annual income, while for openness there is a positive relationship.

¹⁰ This is consistent with the results of Brunelo et al. (2017), who show that early life conditions (approximated by the number of books at home at age 10) have a substantial effect of lifetime earnings in Europe.

Table 5. The marginal effects of childhood circumstances and personality traits on log of hourly wages

	(1)	(2)	(3)
Mother's education: low	-0.083*	-0.062	-0.048
Mother's education: high	0.130**	0.130**	0.118**
Mother's education: unknown	0.009	0.023	0.017
Father's education: low	-0.101**	-0.112**	-0.123**
Father's education: high	-0.033	-0.035	-0.032
Father's education: unknown	-0.090*	-0.104*	-0.119**
Childhood SES: low	-0.090**	-0.080**	-0.063*
Childhood SES: high	-0.031	-0.023	-0.045
Economic shocks: none	-0.001	-0.003	-0.001
Economic shocks: 2 or more	0.022	0.022	-0.006
Own education: low	-0.037	-0.031	-0.026
Own education: high	0.118**	0.095	0.046
Self-employed	0.050	0.055	0.029
Potential experience	-0.018	-0.023	-0.035**
Potential experience squared	-0.000	-0.000	-0.000
Reading proficiency	0.000	0.000	0.000
Computer at work	0.279***	0.280***	0.270***
Female	-0.324***	-0.321***	-0.264***
Height		-0.001	0.001
Chronically ill		0.010	-0.013
Adult health: medium		0.016	0.051
Adult health: good		0.050	0.052
Grit			0.056
Openness			0.112***
Conscientiousness			-0.015
Extraversion			-0.004
Agreeableness			0.016
Neuroticism			0.013
Constant	1.978***	2.221***	2.034***
Joint significance of circumstances (p-value)	0.001	0.001	0.002
Joint significance of personality traits (p-value)	-	-	0.115
N	15,632	15,252	14,547

*Note: All estimates are weighted using STEP sampling weights. Standard errors in parentheses account for stratification and clustering in STEP. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All regressions include age, occupation type, and country dummies. Omitted categories: medium mother's education, medium father's education, medium childhood SES, one economic shock, bad adult health, medium own education.*

Source: own calculations based on STEP Skills Measurement Surveys data.

For our data set of developing countries, we find a statistically significant relationship only between openness and wages. This is consistent with the results of the study for Mexico (Palifka 2009). The differences between our results and the results of many of the previous papers may be due to the fact that our sample comes from

urban residents of developing countries, while most of the existing research has exploited data coming from high-income countries.

Overall, results indicate that for our data set there is a direct association between childhood circumstances and wages, which is not mediated by education, health or personality traits. We also found that openness may be significantly associated with wages in developing countries.

4.4. Life satisfaction

Results for the associations between early-life circumstances, personality traits and life satisfaction are presented in Table 6. The circumstances are always jointly significant. In particular, high (low) childhood SES is associated with the increase (decrease) in life satisfaction by about 0.54 (0.34-0.48) points on a 1-10 scale. Experiencing no economic shocks during childhood has a protective effect on adult life satisfaction (0.20-0.28 points), compared to individuals who experienced one shock. These results are in line with previous research by Frijters et al. (2014), who have shown that childhood skills and family background are substantially associated with adult life satisfaction.

The associations between circumstances and life satisfaction are somewhat reduced, when controlling for health (models 2-3) and education (model 4), but remain significant. Health and education variables, as well as being married and employed (models 5-6), are strongly associated with life satisfaction. The fact that circumstances variables remain significant after controlling for health and education suggests that for our data set there is evidence for a direct transmission of early-life conditions into adult life satisfaction. In contrast, Kajonius and Carlander (2017) have found that in Sweden childhood SES is only very weakly associated with life satisfaction, when personality traits are controlled for. The difference may result from the fact that in developing countries early-life conditions could have a much stronger effect on adult life satisfaction than in a rich and egalitarian country such as Sweden.

Model 7 extends the analysis by adding personality skills. The associations between childhood circumstances and life satisfaction remain unaffected, which suggests that personality traits are not mediators in this relationship. Two personality traits are significantly related to life satisfaction – neuroticism is associated with a decline in life satisfaction by about 0.41 points, while agreeableness – with an increase by 0.31 points. These associations are sizable and comparable with those for employment or health. Grit is not significantly correlated with life satisfaction, when other personality skills are controlled for.

Previous research has found that among the Big Five personality dimensions neuroticism was the strongest (negative) predictor for life satisfaction, while conscientiousness and extraversion were the strongest positive correlates of it (DeNeve and Cooper 1998; Steel et al. 2008). Openness and agreeableness were found to be largely irrelevant for life satisfaction. Kajonius and Carlander (2017) found that, controlling for childhood SES, extraversion is strongly positively related to life satisfaction in Sweden, while neuroticism is associated negatively. Our results for neuroticism are similar to those of the previous studies. One somewhat surprising finding is a relatively more pronounced association between agreeableness and life satisfaction in our data set. One possible explanation of this finding is that our sample is restricted to the urban population. For this subgroup, the link between agreeableness and life satisfaction may be stronger because satisfying interpersonal relations (at work and in private life) for urban citizens may require more empathy, cooperation, and kindness.

Table 6. OLS coefficients for the association between childhood circumstances, personality traits and life satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mother's education: low	-0.012	-0.010	0.007	0.044	0.046	0.023	0.064
Mother's education: high	0.011	0.013	0.000	-0.052	-0.004	-0.036	-0.058
Mother's education: unknown	-0.028	-0.049	-0.035	0.076	0.038	0.012	0.131
Father's education: low	-0.062	-0.088	-0.100	-0.033	-0.051	-0.023	-0.054
Father's education: high	0.144	0.138	0.135	0.054	0.047	0.061	0.048
Father's education: unknown	-0.179	-0.210	-0.202	-0.090	-0.082	-0.064	-0.148
Childhood SES: low	-0.482***	-0.441***	-0.429***	-0.366***	-0.341***	-0.337***	-0.340***
Childhood SES: high	0.547***	0.543***	0.545***	0.534***	0.545***	0.544***	0.550***
Economic shocks: none	0.279***	0.249***	0.243***	0.211**	0.203**	0.210**	0.206**
Economic shocks: 2 or more	-0.100	-0.105	-0.092	-0.057	-0.060	-0.063	-0.076
Female	-0.160**	-0.095	-0.076	-0.097	-0.026	0.057	0.091
Height		0.001	0.001	-0.001	-0.001	-0.001	0.000
Chronically ill		-0.315***	-0.178**	-0.177**	-0.173*	-0.150*	-0.142
Adult health: medium			0.093	0.067	0.039	0.009	-0.003
Adult health: good			0.584***	0.565***	0.569***	0.495***	0.433***
Own education: low				-0.316***	-0.320***	-0.328***	-0.262***
Own education: high				0.413***	0.398***	0.343***	0.308***
Married					0.553***	0.567***	0.555***
Number of children					0.022	0.023	0.021
Employed						0.536***	0.495***
Grit							0.103
Openness							0.073
Conscientiousness							0.039
Extraversion							0.158
Agreeableness							0.306***
Neuroticism							-0.409***
Constant	7.576***	7.558***	7.002***	7.354***	6.869***	6.558***	6.361***
Joint significance of circumstances (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Joint significance of personality traits (p-value)	-	-	-	-	-	-	0.000
N	17,137	16,607	16,605	16,598	16,595	16,595	15,484
R2	0.196	0.203	0.210	0.219	0.231	0.240	0.251

*Note: All estimates are weighted using STEP sampling weights. Standard errors in parentheses account for stratification and clustering in STEP. *p < 0.1, **p < 0.05, ***p < 0.01. All regressions include age and country dummies. Omitted categories: medium mother's education, medium father's education, medium Childhood SES, one economic shock, bad adult health, medium own education.*

Source: own calculations based on STEP Skills Measurement Surveys data.

4.5. Obesity

Finally, Table 7 shows marginal effects of childhood circumstances and personality traits on the probability of being obese. For all specifications, the circumstances are jointly insignificant. This is inconsistent with Salmasi and Celidoni (2017), who found a positive relationship between early-life unfavourable conditions and adult-life obesity. However, Salmasi and Celidoni (2017) study the old age (individuals aged 50 and over) population in rich European countries. It is likely that the relation between early-life conditions and obesity is weaker for working-age population in low- and middle-income countries.

Table 7. The marginal effects of childhood circumstances and personality traits on probability of being obese

	(1)	(2)	(3)	(4)	(5)	(6)
Mother's education: low	0.001	-0.005	-0.008	-0.008	-0.008	-0.002
Mother's education: high	-0.010	-0.008	-0.007	-0.004	-0.005	-0.006
Mother's education: unknown	-0.009	-0.010	-0.013	-0.013	-0.014	-0.006
Father's education: low	-0.016	-0.014	-0.012	-0.013	-0.013	-0.022
Father's education: high	-0.028	-0.025	-0.025	-0.022	-0.022	-0.018
Father's education: unknown	-0.024	-0.024	-0.024	-0.027	-0.027	-0.040*
Childhood SES: low	-0.001	-0.007	-0.008	-0.010	-0.010	-0.016
Childhood SES: high	-0.031*	-0.021	-0.020	-0.019	-0.019	-0.016
Economic shocks: none	-0.003	-0.002	-0.001	0.000	0.000	-0.006
Economic shocks: 2 or more	0.010	0.004	0.003	0.002	0.002	0.003
Female	0.073***	0.005	0.004	0.005	0.005	-0.010
Height		-0.006***	-0.006***	-0.006***	-0.006***	-0.006***
Chronically ill		0.065***	0.050***	0.050***	0.050***	0.037***
Adult health: medium			-0.008	-0.007	-0.007	-0.007
Adult health: good			-0.056***	-0.056***	-0.056***	-0.058***
Own education: low				0.006	0.006	0.004
Own education: high				-0.017	-0.018	-0.016
Employed					0.004	0.003
Grit						0.002
Openness						-0.014
Conscientiousness						-0.026
Extraversion						0.051***
Agreeableness						0.030*
Neuroticism						0.061***
Joint significance of circumstances (p-value)	0.460	0.861	0.859	0.852	0.853	0.648
Joint significance of personality traits (p-value)	-	-	-	-	-	0.000
N	16,347	16,347	16,345	16,338	16,338	15,348
Pseudo R2	0.090	0.121	0.122	0.122	0.123	0.122

*Note: All estimates are weighted using STEP sampling weights. Standard errors in parentheses account for stratification and clustering in STEP. *p < 0.1, **p < 0.05, ***p < 0.01. All regressions include age and country dummies. Omitted categories: medium mother's education, medium father's education, medium childhood SES, one economic shock, bad adult health, medium own education.*

Source: own calculations based on STEP Skills Measurement Surveys data.

Being chronically ill is associated with the rise of obesity probability in the range from 3.7 to 6.5 % points. Good adult health is associated with reduced probability of obesity by about 5-6 % points. In contrast to early-life conditions, personality traits are jointly significant (model 7). In particular, probability of obesity is positively related to neuroticism, extraversion and agreeableness indicators. The strength of these relationships is moderate – having of the relevant personality traits is related to the rise of probability of obesity in the range from 3 to 6.1 % points. Grit is not significantly associated with obesity probability.

Many of the existing studies suggest that among the Big Five traits conscientiousness is protective against obesity, while neuroticism is a risk factor for obesity (Gerlach et al. 2015; Sutin and Terracciano 2016, Kim 2016). Some studies have found extraversion and agreeableness is also a risk factor, but that there is no association between openness and obesity (Sutin and Terracciano 2016). Our results with respect to neuroticism, extraversion and agreeableness are in line with previous research. The major difference with earlier papers is that we do not find evidence for an association between conscientiousness and obesity. The usual explanation for the negative conscientiousness-obesity link is that conscientious individuals make good lifestyle choices (e.g., healthy diet, regular exercise). However, making these choices in low- and middle-income countries is considerably more difficult (higher monetary cost, limited availability of healthy options, etc.) than in rich countries. For this reason, conscientiousness may be less protective against obesity in developing countries.

5. Summary, limitations, and conclusions

In this paper, we used the World Bank's STEP Skills Measurement Program data for nine low- and middle-income countries to study the associations between childhood circumstances (measured at ages 0-15), personality traits and adult outcomes such as educational attainment, employment status, wages, life satisfaction and obesity. It is one of the first studies of this kind for developing countries (see also Palifka 2009). We have found that for educational attainment, wages, and life satisfaction there is a direct association between early-life conditions and adult outcomes, even after controlling for relevant adult-life variables and personality traits. This is consistent with a large literature on the effect of early-life conditions on adult outcomes (Almond et al. 2017; Flores and Kalwij 2014; Almond and Currie 2011a, b; Currie and Vogl 2013), which, however, usually does not control for personality skills. The existing research, which controls for personality traits, has so far been restricted to the rich countries (Furnham and Cheng 2013; Cheng and Furnham 2014; Kajonius and Carlander 2017). In agreement with Furnham and Cheng (2013), we have found that parental background is more strongly associated with wages than personality traits. However, in contrast to Cheng and Furnham (2014) and Kajonius and Carlander (2017), our results show that the relationship between childhood SES and life satisfaction is rather stronger than between personality traits and life satisfaction. This indicates that unfavourable early-life conditions may have a somewhat bigger effect on life satisfaction in adulthood in low- and middle-income countries than in rich countries. Despite that, we have found that neuroticism and agreeableness are substantial correlates of life satisfaction in developing countries.

The relationship between childhood circumstances and employment status is mediated through education in our data set. We did not find any association between childhood circumstances and probability of obesity in our data set. On the other hand, several personality traits (especially extraversion and neuroticism) seem to be

significantly positively related to obesity in developing countries. Depending on the outcome variable studied, either parental education or childhood SES play the most important role as early-life factors associated with the adult outcome.

Summarizing the results for personality traits, we conclude that neuroticism is negatively associated with each of the studied outcomes (educational attainment, employment status, life satisfaction, non-obesity), except for wages. Previous research has found a similar role for neuroticism (Furnham and Cheng 2013; Cheng and Furnham 2014; Kajonius and Carlander 2017). The protective role of low neuroticism can be explained with reference to the ability to regulate emotions, which is associated with higher well-being, income, and socio-economic status (Côté et al. 2010). While for education and employment the associations with neuroticism are relatively weak, the relationship between life satisfaction and neuroticism is rather substantive (comparable to the effect of educational attainment, employment, or health statuses).

Unlike the previous literature (Cheng and Furnham 2014; Kajounis and Carlander 2017), we did not find a link between extraversion and life satisfaction. In contrast to Kajounis and Carlander (2017), we found that conscientiousness is marginally significantly positively associated with educational attainment. Positive relationship between conscientiousness and educational attainment was also found by Richardson et al. (2012) and Poropat (2014). There is also a strong association between conscientiousness and employment probability in our data set. Small positive correlations between conscientiousness and employment status have been also found in some earlier papers (e.g. Fletcher 2013). In the present paper, the association is somewhat stronger than in previous research based on data for developed countries. It might indicate that returns to being organized, responsible and hardworking in terms of employment status are larger in developing than in rich countries.

The positive association between openness and educational attainment, consistent with previous studies (Poropat 2014, Kajounis and Carlander 2017), suggests that in developing countries intellectual curiosity, creativity, and a preference for learning new things is conducive for educational success. Contrary to previous research (Fletcher 2013), openness is also significantly associated with wage rate in our sample. However, this result may reflect the composition of our sample which consists only of urban workers. The size of the association between openness and the outcomes (education attainment and employment status) is similar or slightly lower than in the case of associations between parental education and the outcomes. As mentioned in section 4.4, the composition of the sample may also explain the relatively strong positive association between agreeableness and life satisfaction found in our data.

The paper contributes to the literature in a novel way by checking whether the personality trait of grit is a mediator between early-life conditions and adult-life outcomes. We have found that grit is not associated with the adult-life indicators that we study, when other personality traits are controlled for. Therefore, we do not find evidence for grit being an important correlate of key life outcomes in developing countries. This finding agrees with a recent meta-analysis study, which has shown that grit does not appear to be particularly predictive of academic success and performance and is very strongly correlated with conscientiousness (Credé et al. 2017).

As mentioned in the Introduction and section 4, there are number of limitations to this study. Since the paper is using cross-sectional and nonexperimental data, we cannot make causal inferences about the relationship between childhood circumstances, personality traits, and adult-life outcomes. The estimated associations

could be influenced by reverse causality, measurement error (in retrospectively assessed early-life circumstances, self-reported personality traits or self-reported weight and height) or by the unobserved confounding “third factors” like genetic endowments. To mitigate these concerns, we estimated regression models including several control variables, but despite that the results should be interpreted in terms of associations, not causally. Another limitation is that personality traits in this paper were measured with 3-item short Big Five Inventory, which results in personality scales of rather low reliability. For this reason, our analysis is mainly based on personality indicators, but the results are robust when standard personality scales are used. A final limitation is that our sample consists only of urban workers, so the results may not generalize to full populations of developing countries.

Overall, this paper shows that in developing countries some personality traits are significantly associated with the five life outcome studied. Neuroticism is negatively related to four of them. Openness is relatively strongly associated with educational attainment and wages, while conscientiousness – with employment status. Life satisfaction is strongly associated with agreeableness and neuroticism. The estimated associations should be treated cautiously and more research on the causal mechanism between childhood circumstances, personality traits and adult-life outcomes is needed. However, the paper suggests that there might be a role for policy interventions in developing countries directed at mitigating the possible negative consequences of neuroticism and supporting the possible protective effects of openness, conscientiousness, and agreeableness.

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