The role of education, time preference, risk attitude, and personality factors in health

A study of Armenia, Georgia, and the Ukraine

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Abstract

The thesis presents some evidence that being future oriented is an important health-supporting asset for people with low levels of education compared to the highly educated. Using econometric methods on internationally well-known survey data, in three comparable countries (Armenia, Georgia, and the Ukraine), time preference's and risk attitude's effects appear to be predominant in predicting satisfaction with life. Among the personality factors, only emotional stability is a general health-enhancing factor. For agreeableness, openness, conscientiousness, and extraversion, the effects are less consistent, or they are important predictors in few cases only. In consensus with previous results in the literature, the studied independent variables explain little or nothing from the education gradient, though I found substantial decrease in the education coefficient in the regressions predicting satisfaction with life. I also found considerable evidence for the importance of personality factors in improving self-assessed health indicators.

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Introduction

Past research already attempted to describe the breakdown of the education gradient when studying health. Family background, income, insurance, knowledge, and cognitive factors account for over half of the variance explained by education, but time preference, risk attitude, and personality were found not to be part of the education gradient by one study (Cutler & Lleras-Muney, 2010). Another study provided some evidence that these non-cognitive factors do decrease education's effect when also entered into the regression models (Van Der Pol, 2011). Since these studies included three developed countries (the United States, the United Kingdom, and Denmark), I revisited these variables with three developing countries: Armenia, Georgia, and the Ukraine.

In my thesis, I hypothesized that time preference would be a more important asset in terms of better health outcomes for those who have lower education. I further expected to find time preference, risk attitude, and some personality factors as significant predictors for the health outcome variables. I also hypothesized that emotional stability and conscientiousness would be important health promoting factors. Furthermore, I anticipated that these non-cognitive factors would not explain substantial part of the education gradient.

For my thesis, I used the World Bank's Skills Towards Employability and Productivity (STEP) datasets collected between 2012 and 2014 which include self-reported cross-sectional data. I examined the following health outcome variables: Body Mass Index, obesity, living with any chronic illnesses, satisfaction with life, and missed days from work due to illness. The main independent variables were: time preference, risk attitude, and the Big Five personality factors. Control variables were also included in the models.

I ran OLS regressions for the continuous and probit models for the dichotomic health outcome variables. Two types of models were tested. First, I used a basic model with a continuous

education variable with only linear terms. I tested for the best fitting restricted model, and I also tested a model with only education and control variables so the coefficients on the education term could be compared between the models. Second, I tested an extended model that also included squared terms to account for nonlinearities in the relationships. This second model contained interaction terms between education and time preferences as well.

The thesis is divided into four main chapters. The first part describes relevant economic theory, previous findings, different approaches about studying and interpreting the relationships between the observed variables, and information about the countries. The second chapter presents the data and the employed models. The third chapter describes the results. The final chapter discusses the findings, the implications, and the limitations.

Chapter 1: Literature review

This chapter first considers the main theoretical points about studying the relationship between health and education. The first part also explains the main variables involved in this thesis. Then, I write about some of the previous findings regarding the variables of my analysis. After that, I describe the possible directions of causality and some other methodological considerations that are important when we think about the interplay between the studied variables. Finally, I present some facts about the economic and health care related properties of the countries appearing in this analysis.

1.1 Theory

There are two main approaches to explaining the relationship between education and health. On the one hand, education can be considered as part of the health production function as described by Grossman (2000) in the human capital theory. People have their own demands for health investments, like education, which increase the efficiency of health production: becoming and staying healthy. Health has its own utility, and it also affects a person's income. A reverse causal direction is also possible where health influences education as better health provides the opportunity for extended education.

The other possibility is that a third factor is behind both education and health (Fuchs, 1982). According to this theory, a difference in time preferences can influence how much one invests in education and in health compared to another. But it is also possible that all of these mechanisms work simultaneously; with education, an individual learns to put more emphasis on the future and less on the present making longer time investments. This mechanism is shown in the paper by Becker and Mulligan (1997) as well.

The notion of a third variable behind both health and education can be extended to risk attitude; an individual can be risk seeking or risk averse. Personality factors can also influence both education and health.

Time preference means that an individual who is future oriented is more willing to lower present utility for increased future utility than a present oriented person. In relation to health behavior, this means that a future oriented individual is more able to take actions in the present that are less enjoyable, like participating in health check-ups, so that he or she becomes potentially healthier in the future.

Risk seeking people are more willing to choose an uncertain outcome over a certain one. Usually, in economic theories, we talk about financial risks: a risk seeking individual will choose a higher but more uncertain gain over a lover but more certain one, while a risk averse person will prefer the more certain outcome. Translated into decisions concerning health behavior, a risk seeking individual can put less emphasis on the adverse effects of smoking for example.

One widely studied and comprehensive personality model is the five-factor model or the Big Five personality traits (Costa & McCrae, 1992). Neuroticism or emotional stability relates to the amount of psychological distress experienced by the individual, it relates to being depressed and/or being anxious. Extraversion involves being sociable and actively searching for positive emotions. Individuals with high levels of openness have a complex emotional life, and they are more imaginative and less conventional in their thinking. People who are agreeable tend to be cooperative and trusting, while those with low levels on this dimension are more antagonistic and cynical. The last factor is consciousness; people with high levels on this dimension are more diligent and well-organized.

1.2 Previous findings

Cutler and Lleras-Muney (2010) did an extensive study with multiple cross-sectional data sets from the United States and the United Kingdom. They looked at various health behaviors, and they examined how much of the education gradient they can explain using a wide array of explanatory variables. Income and other wealth indicators as well as health insurance explained between 11 and 32 percent. Cognitive abilities were responsible for about 30 percent, from which approximately 12 percent was specific knowledge. They did not find that time preference or risk attitude accounted for any of the variation explained by education. However, risk attitude was a significant predictor for BMI (Body Mass Index) and obesity, and time preference was a significant predictor of obesity. Their psychological factors included depression, anxiety, stress, sense of control, and self-esteem, which are proxies for measuring personality factors. These factors also did not account for any of the variation that education explained. They were significant predictors, however, for BMI and obesity besides other health outcomes. Social integration explained 10 percent from the education gradient.

Van Der Pol's (2011) paper used Danish data which applied the stated preferences method for measuring discounting, although they only had data on educational attainment and not number of years in education. They looked at self-assessed health, BMI, obesity, smoking, and long-term illnesses. They found that time preference and risk attitude were significant predictors of the health indicators even in many of the models involving more independent variables, and they also decreased the effect of education when entered into the regression. Education's effect decreased with increasing educational attainment. The largest decrease in the coefficient for education occurred when income was entered into the model. A possible explanation is that education raises income which in turn raises health.

In their study, Anderson and Mellor (2008) used an experimental method with real payments to measure risk preference. The participants represented an American, non-student sample, and

according to the choices made during the experiment, the coefficients of relative risk aversion were estimated. Being averse toward risk was associated with less smoking, less heavy drinking, lower probability of being obese, and more seat belt use.

In a study using a US representative sample, Goodwin & Friedman (2006) analyzed the role of the big five personality factors in different health outcomes. In the 90s, most studies focused on the health effects of anger, aggression, or anxiety, only later did researchers turn to more systematic personality concepts. In their study, they examined various mental and physical disorders (e.g. depression, anxiety, smoking, diabetes, high blood pressure). Lower conscientiousness levels were associated with higher levels of mental and physical illnesses. Extraversion was found to be more important for mental and not physical illnesses, higher levels of extraversion were associated with fewer mental problems. Openness showed no clear pattern with either mental or physical disorders. They found the same for agreeableness. High neuroticism (low emotional stability) was associated with higher levels of mental disorders and physical illnesses.

The previous findings are summarized in table 1.

Table 1
Previous findings in the literature

	Data	Main findings	Notes
Cutler and Lleras-Muney (2010)	various surveys in the UK and the US	time preference, risk attitude, and personality significant predictors of health behaviors they did not explain any of the education gradient	no comprehensive personality measure
Van Der Pol (2011)	representative household survey in the Netherlands	time preference and risk attitude significant predictors of self-assessed health they explained part of the education gradient	risk measured using a one-item self-reflecting statement about risk aversiveness
Anderson and Mellor (2008)	experiment for measuring risk preference and survey about health behaviors on US sample	risk aversiveness significant predictor of obesity	
Goodwin & Friedman (2006)	representative US survey data	conscientiousness associated with improved mental and physical health neuroticism associated with poorer mental and physical health	

1.3 Methodological considerations

Present study used self-reported measures, so the variables are not objectively quantified. On the one hand, there are variables that could be known objectively. Examples for this are possession of certain assets, age, or even education level. These variables can be misreported because of not remembering the exact value or amount. In some instances, the researchers might even need to consider that the respondent is biased and gives answers that are more in line with what he or she believes are more socially accepted. On the other hand, there are the variables that require self-reflection and judgement. Judging one's own qualities or making a decision about a hypothetical scenario might not reflect the truth entirely. In case of a hypothetical situation, a better validation would be to do an experiment, but in case of the personality factors, it is not necessarily straight forward what a more precise method could be since those are rather abstract constructs that involve feelings and mental states.

This study is also cross-sectional. This implies more uncertainty about the direction of causality. There is reason to believe that the main independent variables in this study, at least partially, cause the health outcome variables. Considering time preferences, being healthy often requires that we need to postpone enjoyment or experience something negative in the present so we can be healthier in the future, for example, going to an uncomfortable check-up. But a feedback loop can also be a realistic notion, better health outcomes preceded by certain health promoting behaviors can reinforce those behaviors thus increasing our preference for the future through good experience. There is considerable evidence that the ability to delay gratification develops early in life, and it might include genetic factors as well as early experiences. Those who are better at postponing their fulfilment at age 4 perform better later academically and show higher social competence (Mischel, Shoda, & Rodriguez; 1989). However, it has also been shown that there are underlying processes connected to this ability that might suggest that this skill can be improved through exercise. It is also important to note that the generally used questions about

intertemporal decisions are of a financial nature, and it is not straight forward that this quality can be generalized to non-financial decisions.

Risk seeking can have adverse effects on health by increasing the chance of getting sick or injured. It is not certain that heavy smoking causes lung cancer, but it does increase the probability of it occurring. The same is true for skipping check-ups and screenings. The opposite direction of causality might occur if a person's exceptional health gives way to taking higher risks. Overconfidence in one's health could lead to taking higher risks and not taking care of oneself so well.

Personality's role in better health can be due to more participation in screenings (Goodwin & Friedman, 2006), or lower emotional stability can damage health through increased stress, for example. Personality is considered fairly stable that needs longer time and significant life events to change. The stability of the big five personality factors was studied by Cobb-Clark and Schurer (2012). They looked at how much the traits changed in four years, and they found that changes remained within a narrow bound, and the deviations happened due to age and significant life events. Age only played a role in the changes in conscientiousness and agreeableness. Negative life events related to employment and income had the most effect in decreasing emotional stability and increasing openness to experience. Health and family related events had less impact on the personality factors. The changes were less significant economically when they examined their effects on wages. The conclusion of the study was that personality can be considered a stable input into models.

Among the variables used as controls in different studies, financial situation's role is particularly diverse. Better financial situation certainly can mean better opportunities for health care services, higher quality food products, and more chances of health promoting activities (e.g. regular exercise). And worse financial situation can cause less access to health care, lower quality food, and more stress with less activities contributing to health. But the other direction

of causality is also possible. Bad health due to other factors (e.g. genetics, accidents, or other uncontrollable life events) can place a huge financial burden on the individual and on the ones around him or her. It is also a possibility that someone's exceptionally good health leads to high income (e.g. professional athletes).

Having a voluntary health or life insurance can be a safeguard against later health problems, however, it can also be a consequence of health issues or the expectation of those occurring in later life (e.g. knowledge about chronic illnesses in the family).

Health outcome variables usually involve information about the actual level of health (e.g. self-rated health or whether the individual suffers from a chronic illness), or proxies are used that are believed to represent the state of health (e.g. number of missed days from work due to illness). BMI's role as a dependent variable is not straight forward. BMI and obesity can be proxies for other health issues like diabetes or cardiovascular diseases, because excess weight can contribute to these illnesses. In this sense, BMI could also work as an independent variable if we know in detail what kinds of diseases an individual has. However, in many studies, BMI is chosen as a health outcome variable describing health in a more general way. It is also important to note that BMI is linked to health problems in the two extremes while an in-between range is considered to be the normal and healthy weight. However, more commonly, the problem is with being overweight or obese, and having a BMI above the normal range can be linked to a wider array of health problems. It is also true that the higher BMI someone has, the higher the health risk, so having it as a continuous variable in our models can carry additional useful information.

1.4 The countries

In my thesis, I will look at three countries: Armenia, Georgia, and the Ukraine, all former members of the Soviet Union. Their geographical, economical, and historical closeness makes them interesting candidates to compare, and their combined analysis can also strengthen the validity of the results. The countries' descriptions are shown in table 2.

Table 2
Description of countries

	GDP per cap.	Gini index	Urban pop.	Fertility rate	Human Dev. Ind.	Life exp. at birth	Glob. Gender Gap Ind.	Percent of GDP spent on h. c. by gov. *
Armenia	$5,400	30	64%	1.38	0.716	73.5	84/135	1.9%
Georgia	$5,400	40	53%	1.50	0.733	77.3	86/135	1.7%
Ukraine	$7,200	27	69%	1.30	0.729	68.7	64/135	3.7%

Source: Boslaugh (2013); * World Health Organization (2011)

Armenia's GDP per capita was 5,400 dollars in 2011 with a Gini index of 31 in 2008 (Boslaugh, 2013). The Gini index is a measure of equality, the hypothetical perfect equality would be 0, and perfect inequality would be 100. 64 percent of the population live in urban areas (2010 data). The country has a particularly low fertility rate of 1.38 (2012 data), which means that women on average have 1.38 children during their lifetime. Armenia has a high Human Development Index of 0.716. This measure is a number between 0 and 1 where 0 means low, and 1 means high development. Life expectancy at birth in 2012 was 73.5 years. In the World Economic Forum's Global Gender Gap Index, Armenia ranked 84 from 135 in 2011; higher rank means higher gender equality. The index focuses on the differences between men and women, and it considers economic opportunities (e.g. wage levels and workforce participation), education (literacy levels and enrollment ratios), health (e.g. life expectancy), and political empowerment (e.g. number of seats in parliament; World Economic Forum, 2016). Every resident is covered for basic health services. The employed and self-employed both receive sickness and maternity benefits. The health care system is financed by tax money and employer contributions. Using the health services and purchasing drugs require copayments. In Armenia,

unofficial cash payments to doctors for services are generally present. The Armenian government only spends 2 percent of its GDP on health care which is very low compared to other countries.

Georgia's GDP per capita was 5,400 in 2011 (Boslaugh, 2013). The Gini index in 2008 was 41. Only about half of the population (53 percent) live in urban areas (2010 data). The fertility rate in Georgia is highest among the three countries examined in this paper, but is still low (1.50; 2012 data). The Human Development Index is fairly high, 0.733 (2011 data). Life expectancy at birth is highest among the three countries, 77.3 years (2012 data). The Global Gender Gap Index ranks Georgia 86th out of 135 countries (2011 data). The state social insurance system provides sickness benefits to the employed and sickness and maternity benefits to the employed and self-employed. People need to pay 25 percent of their taxable income into the system which provides subsidies for those in need. Georgian government spends only 2 percent of its GDP on health care.

Ukraine's GDP per capita is the highest among the three countries, 7,200 dollars (2011 data), but its Gini index is the lowest (27; 2008 data; Boslaugh, 2013). 69 percent of the population live in urban areas. Ukraine also has a low fertility rate (1.30; 2012 data). The Human Development Index is 0.729 (2011 data). Life expectancy at birth is 68.74 years (2012). The Global Gender Gap Index places Ukraine to the 64th place from 135 counties. The health care system covers every resident. The social insurance system provides sickness and maternity benefits, and additional voluntary medical insurance can be bought. The insurance covers health care expenses, but some copayments are needed. Subsidies for medication are provided on a social basis; the system even provides free medication for pensioners living on minimum pensions. The system is financed by tax and employer payments. Among the three countries, the Ukrainian government spends the most of its GDP on health care, 4 percent.

Chapter 2: Methods

2.1 Data and variables

I used the World Bank's Skills Towards Employability and Productivity (STEP) datasets that were collected between 2012 and 2014 in lower- and middle-income countries (Pierre, Puerta, Valerio, & Rajadel, 2014). The collected data included a household survey that focused on the skillsets of workers.

The health outcome variables in the regression models were the following: Body Mass Index (BMI) and obesity (H_{1A} and H_{1B}), presence of chronic illness (H_2), satisfaction with life (H_3), and number of missed days due to illness (H_4). BMI represents the weight and height ratio. Obesity is calculated from BMI; an individual is considered obese if the BMI is over 30. The database included data on whether the individual suffers from any chronic illnesses. Satisfaction with life was measured by a single question ranging from 1 to 10. The number of missed days from work due to illness in the past four weeks was also included in the analysis.

The models looked at the effect of the main independent variables. Time preference was measured with stated preference questions for imaginary situations that were summed up into one variable ranging from 1 to 4; higher value indicates higher preference for the future. Risk was also measured by hypothetical situations where the individual needs to decide how much he or she is willing to lose or gain when the outcome is uncertain. A higher value indicates a positive attitude towards taking risks. Education was measured in two ways. There was a continuous variable with the number of years spent in education, and there were categorical variables representing the finished level of schooling. These are approximated from ISCED (International Standard Classification of Education) categories. The first level corresponds to the elementary level generally around eight years of education. The next level is around a high

school level education taking about 12 years to complete. The third level requires a type of higher education: a bachelor's or a master's degree. The dataset also had data on the Big Five personality traits measured by a shorth three-item per trait questionnaire (short Big Five Inventory; Pierre, Puerta, Valerio, & Rajadel, 2014). Emotional stability (neuroticism), agreeableness, openness, conscientiousness, and extraversion are represented on a scale from 1 to 4.

The following control variables were used in the models. Besides age and gender, I used the asset index, a tangible wealth indicator, because only hourly wage was available in the dataset, not income. The asset index provides a better proxy to income than hourly wage, and it can also capture an individual's living circumstances with higher precision than income. Another problem with using wage as a control variable was that there were a lot of missing values. Furthermore, I included whether the individual had a spouse. Information on having additional life or health insurance as well as mother's and father's education were also used in the models.

In the paper by Cutler and Lleras-Muney (2010), variables for cognitive factors and social integration were also included which I do not have in the World Bank STEP dataset, but in this study, it will be possible to examine the role of a broader set of personality variables.

2.2 Models

Two types of regression methods were used for the analysis. For the continuous outcome variables (BMI, satisfaction with life, number of lost days due to illness), OLS regression models were tested. For the dichotomic dependent variables (obesity and chronic illness), probit regression models were run. I started with the models involving all independent variables that I considered to be important.

There were two directions I followed for the models. The first approach was to find the best model involving only linear terms of the independent variables. I used this method so the results would be comparable to what was found in earlier research (Cutler and Lleras-Muney, 2010; Van Der Pol, 2011). This approach used the continuous education variable. The unrestricted model in this case with the variable $Health_i$ indicating any of the five dependent variables (from H_{1A} to H_4) would be:

$$Health_i = \beta_0 + \beta_1 Discount_i + \beta_2 Educ_i + \beta_3 Risk_i + \beta_4 Age_i + \beta_5 Gender_i + \beta_6 AssetIndex_i + \beta_7 Spouse_i + \beta_8 MotherEduc_i + \beta_9 FatherEduc_i + \beta_{10} Insurance_i + \beta_{11} Stability_i + \beta_{12} Agreeableness_i + \beta_{13} Openness_i + \beta_{14} Conscientiousness_i + \beta_{15} Extraversion_i + \varepsilon_i$$

The second approach considered nonlinearities by including squared terms of some of the independent variables. In this case, I also used the categorical education variables with added interaction terms to test for some variables' potentially different behavior for individuals with different educational attainment. The above model was thus extended with the squared terms of time preference and attitude towards risk as well as age and asset index. The interaction terms involved the basic and medium level of education and time preference, the baseline was the highest education level. In this second approach, I also did the analysis for the merged sample of the three countries.

After running the unrestricted models for both approaches, I looked at variables that could be dropped by testing whether they were jointly insignificant. I will present the results for both the unrestricted and the restricted models for the linear models, and I will present only the restricted models for the second approach with added non-linear and interaction terms.

The coefficients in the final restricted models can be biased because of missing variables. Cognitive skills correlate with education and time preference as well (Cutler and Lleras-Muney, 2010; Mischel, Shoda, & Rodriguez, 1989), so adding them into the regressions would decrease

the found effects. The control variables used in this study are applied generally in other research, but still there can be some important variables missing. Income is probably a better correlate of education than asset index, having income in the regressions as well could also decrease the found effects.

Table 3
Descriptive statistics

Armenia	BMI	Obesity	Chronic illness	Life sat.	Days Missed	Time preference	Years of education	Risk	Age	Gender	Asset index	Has spouse	Mother education	Father education	Insurance	Stability	Agreeab.	Openness	Conscient.	Extrav.
N	2947	2992	2992	2990	2992	2981	2948	2981	2992	2992	2992	2992	2992	2992	2992	2986	2986	2986	2987	2987
Mean	24.98	0.15	0.19	5.47	1.57	1.55	12.94	1.59	39.51	0.72	0.01	0.61	2.49	3.73	0.12	2.32	3.25	3.24	3.24	3.03
Std. Dev.	6.04	0.35	0.39	2.47	4.66	0.84	3.13	1.07	14.19	0.45	0.96	0.49	0.64	0.66	0.33	0.64	0.54	0.48	0.50	0.59
Min	11.4	0	0	1	0	1	0	1	15	0	-1.9	0	1	1	0	1	1.3	1.3	1.3	1
Max	177.8	1	1	10	28	4	21	4	64	1	1.8	1	4	4	1	4	4	4	4	4
Georgia																				
N	2984	2996	2994	2992	2994	2947	2992	2946	2996	2996	2996	2995	2996	2996	2996	2953	2950	2952	2954	2954
Mean	25.69	0.19	0.19	5.73	1.16	1.74	14.36	1.68	39.54	0.67	-0.22	0.59	2.52	2.56	0.64	2.57	3.16	3.01	3.13	2.56
Std. Dev.	5.47	0.40	0.40	2.54	4.11	1.05	3.15	1.15	14.03	0.47	1.02	0.49	0.64	0.64	0.48	0.70	0.53	0.52	0.56	0.54
Min	14	0	-3	1	-3	1	0	1	15	0	-3.4	0	0	0	0	1	1	1	1	1
Max	65.4	1	1	10	30	4	21	4	64	1	1.3	1	4	4	1	4	4	4	4	4
Ukraine																				
N	2312	2389	2383	2363	2297	2251	2387	2237	2389	2389	2389	2389	2389	2389	2389	2387	2388	2388	2388	2389
Mean	25.95	0.20	0.41	5.70	1.54	1.49	12.90	1.68	41.97	0.66	-0.14	0.71	2.20	2.38	0.12	2.54	2.92	3.08	3.01	2.67
Std. Dev.	5.18	0.40	0.49	2.45	4.80	0.91	2.26	1.16	14.50	0.47	1.00	0.45	0.80	0.87	0.32	0.65	0.57	0.54	0.50	0.62
Min	15.1	0	0	0	0	1	0	1	15	0	-2.6	0	0	0	0	1	1	1	1	1
Max	56.8	1	1	10	28	4	22	4	64	1	1.5	1	4	4	1	4	4	4	4	4

Chapter 3: Results

3.1 Descriptive statistics

The descriptive statistics are shown in table 3. The mean values and standard deviations for the three countries are fairly close to each other except the percentage of people with insurance in Georgia and the percentage of people living with chronic illnesses in the Ukraine. The difference in declaring whether one has insurance might have resulted from alternate interpretations of the question in Georgia, because the health care and health insurance systems are very similar in all three countries. The same explanation might be true for the Ukraine, because the descriptive statistics for the rest of the variables are close to the other countries'; it is less probable that in the Ukraine, the number of people living with chronic illnesses is double that of the other two countries.

3.2 Model estimations

In this segment, I will first present the results of the basic model for the three countries. Here, I will focus on the continuous education variable as I compare the differences in the coefficients between the best restricted model found during the analysis and the model that only includes the education variable with the controls. More detailed description of the coefficients on the main independent variables will come when I report the results of the extended model, first with the combined sample, then the samples for each country.

Basic model, Armenia sample

The results for the basic model using the Armenia data is shown in the appendix in table 5.

The restricted model included only emotional stability besides the education variable and the controls when predicting BMI. In the restricted model, every additional year of education decreases the BMI by .1 points. Compared to the model with only education and control variables, this is a 7 percent decrease of the coefficient.

The restricted model included stability and agreeableness besides the education variable and the controls when predicting obesity. In the restricted model, every additional year of education decreases the probability of being obese by .5 percent at the average level of education. Compared to the model with only education and control variables, there is no change in the size of the coefficient.

The restricted model included only emotional stability besides the education variable and the controls when predicting chronic illness. In the restricted model, every additional year of education decreases the probability of having a chronic illness by .9 percent at the average level of education. Compared to the model with only education and control variables, this is a 10 percent decrease of the coefficient.

The restricted model included time preference, risk attitude, stability, agreeableness, openness, and conscientiousness besides the education variable and the controls when predicting satisfaction with life. In the restricted model, every additional year of education decreases satisfaction with life by .1 points. Compared to the model with only education and control variables, this is a 13 percent decrease of the coefficient.

The restricted model only included stability besides the education variable and the controls when predicting number of missed days. In the restricted model, every additional year of education decreases missed days by .1. Compared to the model with only education and control variables, this is a 7 percent decrease of the coefficient.

Basic model, Georgia sample

The results for the basic model using the Georgia data is shown in the appendix in table 6.

The restricted model included only extraversion besides the controls when predicting BMI, the education variable was not a significant predictor.

The restricted model included time preference and extraversion besides the controls when predicting obesity, the education variable was not a significant predictor.

The restricted model included risk attitude, stability, and agreeableness besides the education variable and the controls when predicting chronic illness. In the restricted model, every additional year of education decreases the probability of chronic illness by 1 percent at the average level of education. Compared to the model with only education and control variables, this is a 9 percent decrease of the coefficient.

The restricted model included risk attitude, stability, agreeableness, and conscientiousness besides the education variable and the controls when predicting satisfaction with life. In the restricted model, every additional year of education decreases satisfaction with life by .1 points. Compared to the model with only education and control variables, this is an 8 percent decrease of the coefficient.

The restricted model included only stability besides the education variable and the controls when predicting number of missed days. In the restricted model, every additional year of education decreases missed days by .1. Compared to the model with only education and control variables, this is a 4 percent decrease of the coefficient.

Basic model, Ukraine sample

The results for the basic model using the Ukraine data is shown in the appendix in table 7.

The restricted model included only extraversion besides the controls when predicting BMI, the education variable was not a significant predictor.

The restricted model included stability and extraversion besides the controls when predicting obesity, the education variable was not a significant predictor.

The restricted model included only stability besides the controls when predicting obesity, the education variable was not a significant predictor.

The restricted model included time preference, stability, openness, and extraversion besides the education variable and the controls when predicting satisfaction with life. In the restricted model, every additional year of education decreases satisfaction with life by .1 points. Compared to the model with only education and control variables, this is a 23 percent decrease of the coefficient.

The restricted model included only emotional stability besides the controls when predicting number of missed days.

Extended model, combined sample

The following models were extended with squared terms for some variables, and they used education dummies as well as interaction terms between the education and time preference variables. First, I used the combined sample of the three countries, the results are shown in table 4 which only includes the restricted models found by the end of the analysis.

The lowest educated group on average had a 1 point higher BMI than the most highly educated group. Satisfaction with life on average was .5 and .4 points less for the low and medium education levels respectively. Missed days due to illness were .6 and .4 days more for low and medium education levels respectively.

Time preference and risk attitude were only significant predictors for satisfaction with life, both increasing it by about 0.08 points with each one unit increase.

The only significant interaction term was found for BMI. The product term of basic education and time preference means that every one unit increase in the time preference scale predicts .4 points less BMI score for the low educated.

Among the personality factors, emotional stability was a significant predictor for all health measures. All other variables held constant, one point increase in stability decreases BMI by .2 points, decreases the probability of obesity by 2 percent at average stability level, decreases the probability of chronic illness by 6 percent at average stability level, increases satisfaction with life by .3 points, and decreases number of missed days by .6. Agreeableness was a significant predictor for all health variables except for chronic illness. One point increase in agreeableness increases BMI by .2 points, increases the probability of obesity by 3 percent at average agreeableness level, increases satisfaction with life by .2 points, and decreases the number of missed days by .3. Openness was a significant predictor for satisfaction with life. One point increase in openness increases satisfaction with life by .2 points. Conscientiousness was a significant predictor only for satisfaction with life. One point increase in conscientiousness decreases satisfaction with life by .2 points. Extraversion was a significant predictor for BMI, obesity, and satisfaction with life. One point increase in extraversion increases BMI by .3 points, increases the probability of obesity by 2 percent at average extraversion level, and increases satisfaction with life by .1 points.

Extended model, Armenia sample

The results for the extended model using the Armenia data is shown in the appendix in table 8.

The lowest educated group on average had a 1.8 points higher BMI than the most highly educated group (also significant in the combined sample). The probability of obesity is 18 percent higher for the lowest education group. Satisfaction with life on average was .4 points less for the medium education level (same result as in the combined sample).

Time preference was a significant predictor only for satisfaction with life, increasing it about .2 points by each one unit increase. None of the coefficients on risk were significant.

The product term of basic education and time preference was significant for BMI, obesity, and satisfaction with life. For the lowest educated group, every unit increase in the time preference scale predicts .8 points less BMI score, 8 percent less probability of obesity at the average level, and .3 points less on satisfaction with life.

Among the personality factors, emotional stability was a significant predictor for all health measures. The directions of the relationships are the same as in the combined sample with the additional result of -.8 days less missed with every additional level of stability. Agreeableness was again significant in predicting BMI, obesity, and satisfaction with life with the same signs on the coefficients as in the combined sample. Openness was again a positive predictor for satisfaction with life, but in the regression with missed days as the dependent variable, its coefficient was not significant compared to the combined sample. Conscientiousness' effect was again negative in predicting satisfaction with life. Extraversion was not a significant predictor in any of the regressions.

Extended model, Georgia sample

The results for the extended model using the Georgia data is shown in the appendix in table 9.

The lowest educated group on average had .8 points lower satisfaction with life score than the most highly educated group. This relationship was also significant in the combined sample. Satisfaction with life on average was .4 points less for the medium education level (same result in the combined sample).

Time preference was a significant predictor only for obesity, decreasing the probability of being obese by 12 percent with each one unit increase in the level of time preference at the average level of time preference. None of the coefficients on risk attitude were significant.

None of the product terms were significant in this sample.

Among the personality factors, emotional stability showed the same pattern as before, but only for chronic illness, satisfaction with life, and missed days. Agreeableness was again a positive predictor for satisfaction with life, but in this sample, it became a positive predictor of chronic illness also, every one level increase of agreeableness increases the probability of chronic illness by 3 percent at the average level of agreeableness. Openness was not a significant predictor for any of the health outcome variables in this sample. Extraversion showed the effects with the same direction as in the combined sample for BMI and obesity, and the coefficients were not significant in any of the other regressions.

Extended model, Ukraine sample

The results for the extended model using the Ukraine data is shown in the appendix in table 10.

Satisfaction with life on average was .3 points less for the medium education level (same direction as in the combined sample).

The linear time preference and risk attitude terms were not significant in either of the regressions. The squared term of time preference was a negative predictor of missed days due to illness.

None of the product terms were significant in this sample.

Emotional stability was found to be a significant predictor for obesity, chronic illness, satisfaction with life, and missed days with the relationships pointing into the same direction as in the combined sample. Agreeableness was not a significant predictor for any of the health variables. Openness was a significant predictor for satisfaction with life. Conscientiousness was not a significant predictor for any of the health outcome variables. The coefficients on extraversion were significant in the regressions for BMI, obesity, and satisfaction with life with the same direction as the combined sample.

Table 4
Extended model on the entire sample (merged data of Armenia, Georgia, and Ukraine) with categorical education, non-linear terms, and interaction terms (only restricted models shown)

Dependent		Basic education	Medium education	Time preference	Risk attitude	Stability	Agreeab.	Openness	Conscient.	Extrav.	Basic ed. X Time pref.	Age	Gender	Has spouse	Asset index	Mother education	Father education	Insurance	Age squared	Asset index squared	N
BMI	(OLS coefficients)	1.028 (0.465) *	X	X	X	-0.209 (0.0909) *	0.251 (0.098) *	X	X	0.259 (0.099) **	-0.404 (0.197) *	0.299 (0.028) **	-1.006 (0.135) **	0.742 (0.129) **	X	X	-0.370 (0.066) **	X	-0.008 (0.000) **	X	8054
Obesity	(Probit marginal effects)	X	X	X	X	-0.021 (0.006) **	0.029 (0.007) **	X	X	0.025 (0.007) **	X	0.018 (0.002) **	X	0.031 (0.008) **	X	X	-0.026 (0.004) **	X	-0.000 (0.000) **	X	8322
Chronic illness	(Probit marginal effects)	X	X	X	X	-0.060 (0.007) **	X	X	X	X	X	X	0.031 (0.010) **	X	X	-0.02 (0.007) **	-0.048 (0.005) **	-0.073 (0.010) **	0.000 (0.000) **	X	8321
Satisfaction with life	(OLS coefficients)	-0.545 (0.106) **	-0.407 (0.059) **	0.082 (0.027) **	0.082 (0.024) **	0.308 (0.041) **	0.255 (0.051) **	0.252 (0.058) **	-0.219 (0.055) **	0.119 (0.048) *	X	-0.206 (0.014) **	0.144 (0.057) *	0.828 (0.059) **	0.163 (0.029) **	0.113 (0.044) **	-0.152 (0.031) **	0.272 (0.058) **	0.002 (0.000) **	-0.108 (0.025) **	8065
Missed days	(OLS coefficients)	0,629 (0,198) **	0,448 (0,112) **	X	X	-0,581 (0,079) **	0,258 (0,087) **	X	X	X	X	0,054 (0,004) **	X	-0,415 (0,115) **	X	-0,34 (0,091) **	X	-0,219 (0,102) *	0,13 (0,047) **	X	8231

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses

Chapter 4: Discussion

In this chapter, I comment on the results for the extended model on the entire sample to draw the general conclusions about the interplay between the main independent variables, and I also discuss the extended model on the three countries separately. Then, I turn to the basic model. I close this chapter with the implications and the limitations of this study.

The notion that being more future oriented is more important to the low educated than the highly educated gained some support when we look at the factors predicting BMI; for the rest of the outcome variables, this hypothesis was not supported. This result can be explained by the fact that future orientedness develops in early childhood. Being future oriented is able to counteract the negative effects of not having a high education. In the case of BMI, a low-level education compared to a high-level one means higher BMI levels, but if an individual also scores high on future orientedness, he or she is predicted to have a lower BMI score than others with low-level education.

Time preference and risk attitude by themselves were only important for predicting satisfaction with life, and their effects were relatively low.

Concerning the personality factors, the results are partly in line with previous findings (Goodwin & Friedman, 2006). Emotional stability was found to be a general health promoting factor, but conscientiousness had an effect in only one case, and it was a negative predictor of satisfaction with life. Openness had a positive effect on satisfaction with life. Agreeableness was more inconclusive. Extraversion had a positive effect on satisfaction with life, but it had a positive effect on BMI and obesity also.

Some of the control variables are also worth mentioning. Age was positively related to higher BMI or being obese, positively to missed days, and negatively to satisfaction with life, although this negative effect became smaller with increasing age. The same diminishing effect was found

for the asset index: with the increasing quality of living circumstances, satisfaction with life increased but to a lesser and lesser degree. The mother's education was found to be a consistent predictor of positive health, but the effects were lower; the father's education had a more substantial effect, but it was less consistent with being a negative predictor for satisfaction with life. Having a spouse was a strong predictor for higher life satisfaction and lower number of missed days, but it also predicted higher BMI and increased chances of obesity. Women were found more satisfied with their lives and having lower BMI, but they also had a higher probability of having a chronic illness. Insurance was a stronger predictor of better health for all cases except BMI and obesity.

Armenia's and Georgia's gender gap index places them among the countries with less gender equality, while the Ukraine scores in the middle. Women were not consistently healthier or less healthy in this study. This index involves many aspects, access to health care does not seem to be relatively hindered by the countries' lower scores. The health of men and women does not depend on health care affecting them differently, gender inequality and traditional gender values can have negative effects on both men and women as it allows less flexibility in assigning a family's resources; it blocks women from opportunities, but it can also place excess stress on a man by making him the "breadwinner".

The number and quality of assets one possesses are more likely to have their effect on life satisfaction through their relative evaluation comparing them with others' and less by its absolute value (Boyce, Brown, and Moore, 2010). And their effect is only shown for this heath outcome variable which is the most subjective among all of them.

For the two outcome variables: BMI and obesity, I received very similar results since obesity was calculated from BMI, though obesity captures body weight a little differently focusing only on those whose weight is above the normal level. However, the very similar results reinforce

using BMI also, even though BMI's lower end (being underweight) can be linked to other types of health issues than being overweight.

The fact that chronic illness' only non-control predictor was emotional stability might suggest other genetic and environmental factors' main role. And in the case of this personality factor, I would more strongly consider the reverse causal effect as health-related life events can affect personality (Cobb-Clark and Schurer, 2012).

Satisfaction with life is a general indicator for mental and physical health. In this study, all main independent variables and controls were its significant predictors. We can say that life satisfaction increases with being better educated, future oriented, and risk seeking, although these last two effects were very small. All personality factors, except conscientiousness, increase life satisfaction as well. Among the control variables, having a spouse had a very strong positive effect, age had a very negative effect, and the possession of assets was found to be the most important at lower levels of wealth.

The results for the Ukraine showed less significant coefficients than for Armenia and Georgia. It is a possibility that the data for the Ukraine was noisier, but it is important to note that the data collection happened before the 2014 Ukrainian Revolution that might certainly have caused difficulties in the survey.

The basic model showed very similar results to the extended model. Education was a stable predictor for the health outcome variables, and its effect was rarely reduced by more than 10 percent when the main variables of interests were added to the models. For Armenia, there were 10 and 13 percent changes in the coefficient on education in the regressions for chronic illness and life satisfaction respectively; for the Ukraine, there was a 23 percent change. I consider the latter result less reliable, because the Ukrainian model for life satisfaction contained only very few significant predictors compared to the Armenian and Georgian models. These findings are

in line with previous results (Cutler & Lleras-Muney, 2010), non-cognitive factors can be influenced by education less than cognitive factors or actual knowledge can be.

Regarding the policy implications, on the one hand, this study highlights the importance of some of the non-cognitive aspects having considerable effect on self-evaluated health: non-cognitive skills and personality. As these qualities require the use of self-assessment, the study draws attention to using subjective measures besides using solely objective sources. On the other hand, these factors might be the hardest to influence through policy making. In consensus with other findings, these non-cognitive factors explain little of the education gradient since they are mostly determined by genetics and early experiences.

The study's main limitation is that we cannot be certain of the causal relationships due to the data sets' cross-sectional nature, though the different possibilities about the direction of causality were considered in this study. A further limitation is the method for measuring time preference and risk attitude; the hypothetical situations might not truly reflect how an individual behaves in real situations. These two variables' financial focus is also worth noting when we try to generalize it to other situations more directly related to health behavior. Questions about time preference and risk attitude along with personality might be especially prone to nuances in the circumstances they are measured in. Measurement error can also be present for some of the other variables. Last, there were only four different types of health outcomes, a broader range could give more detailed results.

Conclusion

The study provided some evidence for the increased importance of time preference for those with low levels of education. Time preference and risk attitude were only important predictors for satisfaction with life. I did not find conscientiousness' dominant role in promoting health that had been found in the literature, but I found emotional stability to be a general health-supporting asset. Only time preference, risk attitude, and personality explained a considerable part of the education gradient for satisfaction with life. For the rest of the health outcome variables, these non-cognitive factors provided only additional explained variance; a result partly in line with previous research.

Present research considered three countries with less attention in previous studies using a database that includes generally accepted measures for the above non-cognitive variables. The combined dataset of the three countries increases the validity of the results. Limitations of the study involve the cross-sectional nature of the data, and a wider range of health variables could have also provided further details about the roles played by these factors.

The implications entail the importance of future orintedness, risk aversion, and personality traits in health; but it is also clear that policy decisions can have very limited effects on these traits because of their independence from education.

References

Anderson, L. R., & Mellor, J. M. (2008). Predicting health behaviors with an experimental measure of risk preference. *Journal of health economics, 27*(5), 1260-1274.

Becker, G. S., & Mulligan, C. B. (1997). The endogenous determination of time preference. *The Quarterly Journal of Economics, 112*(3), 729-758.

Boslaugh, S. E. (2013). *Health care systems around the world: a comparative guide*. Sage Publications.

Boyce, C. J., Brown, G. D. A., & Moore, S. C. (2010). Money and Happiness: Rank of Income, Not Income, Affects Life Satisfaction. *Psychological Science, 21*(4), 471-475.

Cobb-Clark, D. A., & Schurer, S. (2012). The stability of big-five personality traits. *Economics Letters, 115*(1), 11-15.

Costa, P. T., & McCrae, R. R. (1992). Normal personality assessment in clinical practice: The NEO Personality Inventory. *Psychological assessment, 4*(1), 5.

Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of health economics, 29*(1), 1-28.

Fuchs, V. R. (1982). Time preference and health: an exploratory study. In *Economic Aspects of Health* (pp. 1-12). University of Chicago Press.

University of Chicago Press: Chicago Goodwin, R. D., & Friedman, H. S. (2006). Health status and the five-factor personality traits in a nationally representative sample. *Journal of health psychology, 11*(5), 643-654.

Grossman, M. (2000). The human capital model. *Handbook of health economics, 1*, 347-408.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science*, *244*(4907), 933.

Pierre, G., Puerta, M. S., Valerio, A., & Rajadel, T. (2014). STEP skills measurement surveys: innovative tools for assessing skills. *World Bank Social Protection & Labor Discussion Paper*, (1421).

Van Der Pol, M. (2011). Health, education and time preference. *Health economics*, *20*(8), 917-929.

World Economic Forum. (2016). *The Global Gender Gap Report*. World Economic Forum, Geneva, Switzerland.

World Health Organization (2011). *NHA indicators*. Retrieved from http://apps.who.int/nha/database/ViewData/Indicators

Appendix

Table 5
Basic model for Armenia with continuous education

Dependent		Discounting	Education (years)	Risk	Age	Gender	Asset index	Has spouse	Mother education	Father education	Insurance	Stability	Agreeab.	Openness	Conscient.	Extraversion	N
BMI	(OLS coefficients)																
	Unrestricted	0.013 (0.120)	-0.116 (0.034) **	-0.047 (0.122)	0.126 (0.010) **	-0.870 (0.279) **	-0.040 (0.108)	0.865 (0.238) **	-0.344 (0.164) *	0.356 (0.170) *	0.559 (0.245) *	-0.350 (0.170) *	0.341 (0.189)	0.080 (0.209)	0.050 (0.189)	0.252 (0.196)	2891
	Restricted	X	-0.114 (0.033) **	X	0.125 (0.010) **	-0.801 (0.269) **	X	0.869 (0.240) **	-0.377 (0.164) *	0.367 (0.167) *	0.588 (0.244) *	-0.382 (0.165) *	X	X	X	X	2899
	Only education with controls	X	-0.122 (0.034) **	X	0.125 (0.010) **	-0.746 (0.265) **	X	0.895 (0.239) **	-0.346 (0.165) *	0.382 (0.171) *	0.606 (0.244) *	X	X	X	X	X	2904
Obesity	(Probit marginal effects)																
	Unrestricted	-0.013 (0.008)	-0.005 (0.002) *	-0.003 (0.006)	0.006 (0.000) **	-0.012 (0.014)	0.007 (0.006)	0.036 (0.013) **	-0.009 (0.01)	0.014 (0.013)	0.025 (0.021)	-0.019 (0.009) *	0.022 (0.012)	0.007 (0.014)	0.02 (0.013)	0.015 (0.011)	2934
	Restricted	X	-0.005 (0.002) *	X	0.006 (0.000) **	X	X	0.043 (0.012) **	X	X	X	-0.021 (0.009) *	0.034 (0.011) **	X	X	X	2942
	Only education with controls	X	-0.005 (0.002) *	X	0.006 (0.000) *	X	X	0.044 (0.012) *	X	X	X	X	X	X	X	X	2948
Chronic illness	(Probit marginal effects)																
	Unrestricted	-0.004 (0.008)	-0.008 (0.002) **	-0.001 (0.006)	0.010 (0.001) **	0.019 (0.015)	0.001 (0.007)	-0.020 (0.015)	-0.012 (0.01)	0.008 (0.014)	-0.054 (0.017) **	-0.046 (0.010) **	0.020 (0.013)	-0.024 (0.014)	0.022 (0.014)	-0.007 (0.012)	2934
	Restricted	X	-0.009 (0.002) **	X	0.010 (0.00) **	X	X	X	X	X	-0.057 (0.017) **	-0.045 (0.010) **	X	X	X	X	2942
	Only education with controls	X	-0.010 (0.002) *	X	0.010 (0.000) *	X	X	X	X	X	X	X	X	X	X	X	2948
Satisfaction with life	(OLS coefficients)																
	Unrestricted	0.114 (0.047) *	0.067 (0.015) **	0.119 (0.040) **	-0.053 (0.003) **	0.229 (0.095) *	0.215 (0.044) **	0.804 (0.094) **	0.120 (0.070) *	-0.240 (0.073) **	0.601 (0.131) **	0.282 (0.068) **	0.257 (0.086) **	0.322 (0.098) **	-0.430 (0.090) **	0.019 (0.078) *	2932
	Restricted	0.111 (0.047) *	0.074 (0.014) **	0.121 (0.040) **	-0.055 (0.003) **	0.232 (0.095) *	0.219 (0.044) **	0.793 (0.094) **	X	-0.235 (0.072) **	0.612 (0.131) **	0.277 (0.068) **	0.255 (0.084) **	0.329 (0.098) **	-0.433 (0.090) **	X	2932
	Only education with controls	X	0.085 (0.014) *	X	-0.057 (0.003) *	0.207 (0.095) *	0.225 (0.044) *	0.747 (0.095) *	X	-0.251 (0.073) *	0.632 (0.130) *	X	X	X	X	X	2946
Missed days	(OLS coefficients)																
	Unrestricted	-0.138 (0.101)	-0.122 (0.026) **	0.186 (0.093) *	0.060 (0.007) **	0.115 (0.195)	-0.057 (0.090)	-0.695 (0.208) **	-0.224 (0.147)	0.125 (0.120)	-0.293 (0.229)	-0.694 (0.144) **	0.096 (0.157)	0.289 (0.199)	0.112 (0.182)	0.007 (0.157)	2934
	Restricted	X	-0.131 (0.025) **	X	0.063 (0.007) **	X	X	-0.614 (0.191) **	X	X	X	-0.721 (0.142) **	X	X	X	X	2942
	Only education with controls	X	-0.141 (0.025) **	X	0.063 (0.007) *	X	X	-0.567 (0.191) *	X	X	X	X	X	X	X	X	2948

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses

Table 6
Basic model for Georgia with continuous education

Dependent		Discounting	Education (years)	Risk	Age	Gender	Asset index	Has spouse	Mother education	Father education	Insurance	Stability	Agreeab.	Openness	Conscient.	Extraversion	N
BMI	(OLS coefficients)																
	Unrestricted	-0.140 (0.086)	-0.022 (0.033)	-0.012 (0.080)	0.163 (0.008) **	-1.706 (0.199) **	0.117 (0.092)	1.172 (0.195) **	0.045 (0.174)	-0.306 (0.170)	-0.382 (0.192) *	-0.116 (0.136)	0.175 (0.179)	0.084 (0.188)	0.221 (0.169)	0.351 (0.171) *	2924
	Restricted	X	X	X	0.162 (0.007) **	-1.716 (0.195) **	X	1.181 (0.192) **	X	X	X	X	X	X	X	0.374 (0.165) *	2943
	Only education with controls	X	X	X	0.160 (0.007) **	-1.675 (0.192) **	X	1.138 (0.190) **	X	X	X	X	X	X	X	X	2983
Obesity	(Probit marginal effects)																
	Unrestricted	-0.016 (0.007) *	-0.002 (0.003)	0.001 (0.006)	0.008 (0.001) **	-0.059 (0.016) **	0.008 (0.007)	0.061 (0.014) **	0.003 (0.013)	-0.026 (0.013) *	-0.025 (0.015)	-0.021 (0.010) *	0.025 (0.014)	0.007 (0.015)	0.014 (0.014)	0.046 (0.013) **	2934
	Restricted	-0.015 (0.007) *	X	X	0.008 (0.001) **	-0.057 (0.016) **	X	0.063 (0.014) **	X	-0.024 (0.011) *	X	X	X	X	X	0.053 (0.013) **	2945
	Only education with controls	X	X	X	0.008 (0.001) **	-0.053 (0.016) **	X	0.061 (0.014) **	X	-0.022 (0.011) *	X	X	X	X	X	X	2995
Chronic illness	(Probit marginal effects)																
	Unrestricted	0.008 (0.007)	-0.009 (0.003) **	-0.018 (0.007) **	0.010 (0.001) **	0.016 (0.015)	-0.009 (0.007)	-0.038 (0.015) **	-0.001 (0.013)	-0.006 (0.012)	0.005 (0.015)	-0.053 (0.010) **	0.032 (0.014) *	-0.006 (0.015)	0.008 (0.014)	0.018 (0.014)	2934
	Restricted	X	-0.010 (0.002) **	-0.017 (0.006) **	0.010 (0.001) **	X	X	-0.038 (0.015) **	X	X	X	-0.056 (0.010) **	0.034 (0.013) *	X	X	X	2939
	Only education with controls	X	-0.010 (0.002) **	X	0.010 (0.001) **	X	X	-0.036 (0.015) *	X	X	X	X	X	X	X	X	2943
Satisfaction with life	(OLS coefficients)																
	Unrestricted	0.032 (0.042)	0.069 (0.016) **	0.083 (0.040) *	-0.054 (0.004) **	0.188 (0.094) *	0.331 (0.045) **	0.530 (0.094) **	-0.052 (0.087)	0.081 (0.083)	-0.014 (0.093)	0.275 (0.066) **	0.360 (0.087) **	0.109 (0.096)	-0.337 (0.084) **	0.129 (0.085)	2933
	Restricted	X	0.076 (0.015) **	0.094 (0.039) *	-0.055 (0.003) **	0.198 (0.094) *	0.340 (0.044) **	0.516 (0.093) **	X	X	X	0.269 (0.065) **	0.394 (0.085) **	X	-0.311 (0.081) **	X	2938
	Only education with controls	X	0.083 (0.015) **	X	-0.057 (0.003) **	0.147 (0.093)	0.369 (0.043) **	0.476 (0.093) **	X	X	X	X	X	X	X	X	2941
Missed days	(OLS coefficients)																
	Unrestricted	0.017 (0.085)	-0.062 (0.028) *	-0.009 (0.074)	0.034 (0.007) **	-0.302 (0.181)	-0.113 (0.084)	-0.245 (0.167)	-0.245 (0.159)	-0.036 (0.153)	0.178 (0.153)	-0.513 (0.131) **	0.369 (0.172) *	0.047 (0.158)	-0.135 (0.166)	-0.231 (0.141)	2934
	Restricted	X	-0.096 (0.025) **	X	0.040 (0.006) **	X	X	X	X	X	X	-0.471 (0.127) **	X	X	X	X	2951
	Only education with controls	X	-0.100 (0.025) **	X	0.042 (0.006) **	X	X	X	X	X	X	X	X	X	X	X	2992

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses

Table 7
Basic model for the Ukraine with continuous education

Dependent		Discounting	Education (years)	Risk	Age	Gender	Asset index	Has spouse	Mother education	Father education	Insurance	Stability	Agreeab.	Openness	Conscient.	Extraversion	N
BMI	(OLS coefficients)																
	Unrestricted	-0.062 (0.110)	-0.080 (0.045)	-0.040 (0.092)	0.187 (0.008) **	-0.211 (0.206)	-0.046 (0.101)	0.320 (0.227)	-0.138 (0.168)	0.004 (0.142)	0.507 (0.269)	-0.173 (0.157)	0.047 (0.193)	-0.227 (0.196)	-0.108 (0.238)	0.564 (0.170) **	2117
	Restricted	X	X	X	0.189 (0.006) **	X	X	X	X	X	X	X	X	X	X	0.423 (0.152) **	2312
	Only education with controls	X	X	X	0.188 (0.006) **	X	X	X	X	X	X	X	X	X	X	X	2312
Obesity	(Probit marginal effects)																
	Unrestricted	-0.004 (0.009)	-0.007 (0.004)	-0.004 (0.008)	0.009 (0.001) **	0.054 (0.017) **	0.002 (0.008)	0.020 (0.018)	-0.016 (0.012)	0.008 (0.010)	0.025 (0.027)	-0.031 (0.012) *	0.016 (0.016)	-0.004 (0.016)	0.000 (0.018)	0.044 (0.014) **	2177
	Restricted	X	X	X	0.010 (0.001) **	0.059 (0.016) **	X	X	X	X	X	-0.032 (0.012) **	X	X	X	0.043 (0.013) **	2387
	Only education with controls	X	X	X	0.010 (0.001) **	0.077 (0.015) **	X	X	X	X	X	X	X	X	X	X	2389
Chronic illness	(Probit marginal effects)																
	Unrestricted	0.013 (0.013)	-0.010 (0.005)	-0.007 (0.011)	0.014 (0.001) **	0.021 (0.026)	0.024 (0.012) *	-0.074 (0.027) **	-0.024 (0.017)	-0.002 (0.015)	-0.054 (0.034)	-0.123 (0.018) **	-0.005 (0.022)	0.006 (0.023)	0.008 (0.025)	0.021 (0.020)	2173
	Restricted	X	X	X	0.015 (0.001) **	X	X	-0.083 (0.025) **	X	X	X	-0.120 (0.017) **	X	X	X	X	2382
	Only education with controls	X	X	X	0.015 (0.001) **	X	X	-0.085 (0.025) **	X	X	X	X	X	X	X	X	2383
Satisfaction with life	(OLS coefficients)																
	Unrestricted	0.163 (0.056) **	0.114 (0.023) **	0.007 (0.048)	-0.031 (0.004) **	-0.108 (0.115)	0.08 (0.052)	0.314 (0.115) **	0.071 (0.082)	-0.095 (0.071)	0.470 (0.151) **	0.331 (0.088) **	0.152 (0.104)	0.331 (0.113) **	0.101 (0.123)	0.351 (0.094) **	2153
	Restricted	0.150 (0.053) **	0.115 (0.022) **	X	-0.029 (0.004) **	X	X	0.285 (0.113) *	X	X	0.486 (0.148) **	0.352 (0.082) **	X	0.431 (0.103) **	X	0.380 (0.089) **	2224
	Only education with controls	X	0.149 (0.021) **	X	-0.033 (0.003) **	X	X	0.308 (0.112) **	X	X	0.408 (0.145) **	X	X	X	X	X	2362
Missed days	(OLS coefficients)																
	Unrestricted	-0,222 (0,098)	-0,061 (0,047)	0,181 (0,098) *	0,066 (0,009) **	-0,009 (0,237)	0,173 (0,12)	-0,43 (0,259)	-0,288 (0,208)	-0,068 (0,185)	-0,455 (0,246)	-0,498 (0,169) **	0,321 (0,197)	-0,153 (0,252)	-0,244 (0,266)	0,071 (0,2)	2101
	Restricted	X	X	X	0,067 (0,007) **	X	X	X	X	X	-0,542 (0,223) *	-0,61 (0,151) **	X	X	X	X	2296
	Only education with controls	X	X	X	0.070 (0.007) **	X	X	X	X	X	-0.574 (0.224) **	X	X	X	X	X	2297

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses

Table 8
Extended model for Armenia with categorical education, non-linear terms, and interaction terms (only restricted models shown)

Dependent		Basic education	Medium education	Time preference	Risk attitude	Stability	Agreeab.	Openness	Conscient.	Extrav.	Basic ed. X Time pref.	Age	Gender	Has spouse	Asset index	Mother education	Father education	Insurance	Age squared	Asset index squared	N
BMI	(OLS coefficients)	1.833 (0.953)	X	X	X	-0.416 (0.167) *	0.443 (0.180) *	X	X	X	-0.771 (0.381) *	0.310 (0.051) **	-0.845 (0.274) **	0.714 (0.232) **	X	-0.460 (0.171) **	X	X	-0.002 (0.001) **	X	2935
Obesity	(Probit marginal effects)	0.179 (0.073) **	X	X	X	-0.021 (0.009) **	0.031 (0.011) *	X	X	X	-0.079 (0.029) *	0.0199 (0.003) *	X	X	X	X	X	X	-0.000 (0.000) *	X	2979
Chronic illness	(Probit marginal effects)	X	X	X	X	-0.049 (0.010) **	X	X	X	X	X	0.010 (0.000) **	X	X	X	-0.024 (0.010) *	X	-0.070 (0.015) **	X	X	2986
Satisfaction with life	(OLS coefficients)	X	-0.403 (0.091) **	0.173 (0.046) **	X	0.280 (0.070) **	0.238 (0.082) **	0.310 (0.100) **	-0.376 (0.090) **	X	-0.293 (0.086) **	-0.223 (0.022) **	0.267 (0.094) **	1.030 (0.098) **	0.197 (0.043) **	0.175 (0.068) **	-0.160 (0.070) *	0.679 (0.128) **	0.002 (0.000) **	-0.086 (0.044)	2977
Missed days	(OLS coefficients)	X	X	X	X	-0.764 (0.141) **	X	X	X	X	X	0.058 (0.006) **	X	-0.709 (0.189) **	X	-0.418 (0.144) **	X	-0.530 (0.226) *	X	X	2986

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses

Table 9
Extended model for Georgia with categorical education, non-linear terms, and interaction terms (only restricted models shown)

Dependent		Basic education	Medium education	Time preference	Risk attitude	Stability	Agreeab.	Openness	Conscient.	Extrav.	Time pref. squared	Risk squared	Age	Gender	Has spouse	Asset index	Mother education	Father education	Insurance	Age squared	Asset index squared	N
BMI	(OLS coefficients)	X	X	X	X	X	X	X	X	0.405 (0.165) *	X	X	0.299 (0.040) **	-1.757 (0.195) **	0.986 (0.200) **	X	X	X	X	X	-0.002 (0.000) **	2943
Obesity	(Probit marginal effects)	X	X	-0.125 (0.040) **	X	X	X	X	X	0.054 (0.013) **	0.023 (0.008) **	X	0.008 (0.000) **	-0.055 (0.016) **	0.064 (0.014) **	X	X	-0.024 (0.011) *	X	X	X	2945
Chronic illness	(Probit marginal effects)	X	X	X	X	-0.059 (0.010) **	0.032 (0.013) *	X	X	X	X	-0.004 (0.001) **	X	X	-0.035 (0.015) *	X	X	X	X	0.000 (0.000) **	0.013 (0.004) **	2941
Satisfaction with life	(OLS coefficients)	-0.81 (0.171) **	-0.426 (0.104) **	X	X	0.257 (0.065) **	0.403 (0.084) **	X	-0.256 (0.081) **	X	X	X	-0.205 (0.022) **	0.205 (0.094) *	0.704 (0.096) **	0.337 (0.044) **	X	X	X	0.002 (0) **	X	2948
Missed days	(OLS coefficients)	X	X	X	X	-0.492 (0.108) **	X	X	X	X	X	X	X	X	X	X	X	X	X	0.000 (0.000) **	0.171 (0.051) **	2953

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses

Table 10
Extended model for the Ukraine with categorical education, non-linear terms, and interaction terms (only restricted models shown)

Dependent		Basic education	Medium education	Time preference	Risk attitude	Stability	Agreeab.	Openness	Conscient.	Extrav.	Time pref. squared	Age	Gender	Has spouse	Asset index	Mother education	Father education	Insurance	Age squared	Asset index squared	N
BMI	(OLS coefficients)	X	X	X	X	X	X	X	X	0.434 (0.152) **	X	0.313 (0.040) **	X	X	X	X	X	X	-0.001 (0.000) **	X	2312
Obesity	(Probit marginal effects)	X	X	X	X	-0.031 (0.012) **	X	X	X	0.042 (0.012) **	X	0.025 (0.004) **	0.057 (0.015) **	X	X	X	X	X	-0.000 (0.000) **	X	2387
Chronic illness	(Probit marginal effects)	X	X	X	X	-0.121 (0.017) **	X	X	X	X	X	X	X	X	X	X	X	X	0.000 (0.000) **	X	2382
Satisfaction with life	(OLS coefficients)	X	-0.315 (0.101) **	X	X	0.34 (0.08) **	X	0.469 (0.099) **	X	0.33 (0.086) **	X	-0.182 (0.024) **	X	0.576 (0.115) **	X	X	X	0.54 (0.145) **	0.002 (0) **	-0.25 (0.048) **	2361
Missed days	(OLS coefficients)	X	X	X	X	-0.519 (0.153) **	X	X	X	X	-0.035 (0.017) *	-0.164 (0.045) **	X	X	0.282 (0.123) *	X	X	X	0.003 (0.001) **	0.336 (0.119) **	2170

Notes: * Indicates statistically significant results at the 5% level, ** indicates statistically significant results at the 1% level; robust standard errors are shown in parentheses