

Supplement to “Bullying among adolescents: The role of skills”

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APPENDIX A: THE CONSTRUCTION OF THE NONCOGNITIVE MEASURES

We construct the locus of control scale as the sum of three questions (Linkert scales):

1. I have confidence in my own decision
2. I believe that I can deal with my problems by myself
3. I am taking full responsibility of my own life

Likewise, for the self-esteem index we use:

1. I think that I have a good character
2. I think that I am a competent person
3. I think that I am a worthy person
4. Sometimes I think that I am a worthless person (the negative of)
5. Sometimes I think that I am a bad person (the negative of)
6. I generally feel that I am a failure in life (the negative of)
7. If I do something wrong, people around me will blame me much (the negative of)
8. If I do something wrong, I will be put to shame by people around me (the negative of)

Finally, we construct a scale capturing the impossibility to carry forward an assigned task to a successful conclusion. We label it “Irresponsibility scale.” Interestingly, students with low levels of responsibility tend to favor short-term rewards and that hampers their ability to exert effort for extended period of time in order to achieve longer-term goals. In fact, this ability of exerting effort is often linked with “energetic, conscientious, dutiful, and responsible” people (Duckworth, Peterson, Matthews, and Kelly (2007), p. 1098).

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Thus, this scale might relate negatively to perseverance and grit, that is, the ability to overcome obstacles and giving proportionally greater value to large future rewards over smaller immediate ones (Duckworth and Seligman (2005)). We construct the irresponsibility score by adding:

1. I jump into exciting things even if I have to take an examination tomorrow
2. I abandon a task once it becomes hard and laborious to do
3. I am apt to enjoy risky activities

APPENDIX B: IDENTIFICATION OF LATENT SKILLS AT AGE 14 (τ_0)

The identification of the joint distribution of latent cognitive and noncognitive skills follows the argument in Hansen, Heckman, and Mullen (2004) and Sarzosa (2015). In what follows, we describe its logic.

Consider the measurement system (5). We acknowledge the possible existence of reverse causality between test scores \mathbf{T}_{τ_0} and bullying at τ_0 because the former were measured when bullying may already have happened. To account for this, we use instruments \mathbf{Z}_{τ_0} in equation (6) that determines bullying at τ_0 . Hansen, Heckman, and Mullen (2004) show that under general conditions (exclusion restrictions and “variation-free”) one can identify the joint distribution of the compound error terms $\mathbf{U}_{\tau_0} = (\mathbf{U}_{D_{\tau_0}=1}, \mathbf{U}_{D_{\tau_0}=0}) = ((\Lambda_{D_{\tau_0}=1}\Theta'_{\tau_0} + \mathbf{e}_{D_{\tau_0}=1}^T), (\Lambda_{D_{\tau_0}=0}\Theta'_{\tau_0} + \mathbf{e}_{D_{\tau_0}=0}^T))$ in measurement system (5) (see Theorem 1 in Hansen, Heckman, and Mullen (2004)). From this joint distribution, one then can identify the distribution of the latent factor using the following logic.

Suppose that we stack \mathbf{U}_{τ_0} so that the first three rows are the noncognitive measures and the last three rows are the academic achievement test scores. If we consider that the first three rows represent “pure” noncognitive measures, $\alpha^{T,C} = 0$ for $r = \{1, 2, 3\}$. Then the conditional covariance between any of the tests in the first three rows—call it test A —and one of the tests in the last three rows—call it test B —is given by $\text{COV}(U^A, U^B) = \alpha^{(A,N)}\alpha^{(B,N)}\sigma_{\theta^N}^2 + \alpha^{(A,N)}\alpha^{(B,C)}\sigma_{\theta^N, \theta^C}$, where we drop the time subscript for simplicity. Having two terms adding up is problematic. Carneiro, Hansen, and Heckman (2003) get rid of the latter by assuming $\theta^C \perp \theta^N$. Instead, our analysis allows for correlated latent skills. Following Sarzosa (2015), we assume $\alpha^{(B,N)} = 0$. That is, noncognitive skills should not load on at least one test in the bottom three rows of \mathbf{U}_{τ_0} . Then, if we assume U^3 and U^6 are the numeraires for the first and second factor, respectively, $\text{COV}(U^3, U^6) = \sigma_{\theta^C, \theta^N}$. Then, following Carneiro, Hansen, and Heckman (2003), we use the conditional covariances of test scores in a sequential procedure to secure the identification of all the loadings and variances of the measurement system. Having identified all the loadings and variances, we rely on the argument put forth by Freyberger (2017) and applied by Heckman, Humphries, and Veramendi (2016) to nonparametrically identify $F_{\theta^C, \theta^N}(\cdot, \cdot)$ from \mathbf{U}_{τ_0} .

With respect to the normalizations, in practice we normalize to one the loadings associated with self-esteem (for $D_{\tau_0} = 1$) and class score. We also let class scores to

TABLE B.1. Estimated parameters of measurement system (expression (5))—age 14.

	Locus Control		Irresponsibility		Self-Esteem		Language-SocStudies		Math-Sci		ClassScore	
	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1	-	D=0	D=1	
Age in Months	0.012 (0.007)	-0.009 (0.011)	0.024 (0.010)	0.013 (0.006)	-0.006 (0.011)	-0.016 (0.005)	-0.007 (0.007)	-0.009 (0.004)	-0.017 (0.006)	-0.012 (0.003)		
Male	0.250 (0.052)	0.200 (0.079)	-0.081 (0.076)	-0.057 (0.040)	0.319 (0.078)	0.163 (0.039)	-0.041 (0.054)	0.312 (0.032)	0.008 (0.043)	-0.050 (0.022)		
Older Siblings	-0.029 (0.047)	0.019 (0.069)	0.026 (0.066)	-0.016 (0.037)	-0.026 (0.067)	-0.017 (0.036)	-0.109 (0.047)	-0.024 (0.026)	0.022 (0.030)	-0.002 (0.023)		
Young siblings	-0.058 (0.050)	-0.057 (0.074)	0.036 (0.038)	0.037 (0.038)	0.051 (0.073)	-0.014 (0.037)	0.051 (0.050)	0.088 (0.027)	0.047 (0.042)	0.089 (0.023)		
(ln) Monthly Income	-0.057 (0.047)	0.071 (0.068)	0.076 (0.065)	0.088 (0.037)	0.061 (0.066)	0.002 (0.036)	0.093 (0.046)	0.171 (0.026)	0.160 (0.037)	0.114 (0.022)		
Urban	-0.013 (0.079)	0.052 (0.059)	0.207 (0.111)	-0.090 (0.059)	0.034 (0.113)	0.080 (0.057)	0.274 (0.078)	0.057 (0.041)	0.068 (0.046)	-0.028 (0.032)		
Lives BothParents	-0.247 (0.138)	0.179 (0.191)	0.232 (0.118)	-0.240 (0.118)	0.304 (0.186)	0.206 (0.116)	0.234 (0.129)	0.374 (0.083)	0.255 (0.097)	0.216 (0.077)		
Lives Only Mother	-0.173 (0.186)	0.593 (0.262)	0.243 (0.156)	-0.144 (0.156)	0.858 (0.256)	0.232 (0.152)	0.071 (0.178)	0.370 (0.109)	0.347 (0.123)	0.056 (0.095)		
Father's Educ: 2yColl	0.038 (0.102)	0.275 (0.155)	0.083 (0.148)	-0.153 (0.079)	0.198 (0.151)	-0.092 (0.077)	0.261 (0.105)	0.196 (0.055)	0.225 (0.082)	0.195 (0.044)		
Father's Educ: 4yColl	-0.006 (0.062)	0.087 (0.094)	0.156 (0.090)	-0.138 (0.047)	0.025 (0.091)	0.104 (0.046)	0.342 (0.063)	0.312 (0.033)	0.189 (0.038)	0.261 (0.027)		
Father's Educ: GS	0.124 (0.107)	0.068 (0.153)	0.325 (0.085)	-0.421 (0.085)	0.055 (0.149)	0.204 (0.082)	0.587 (0.104)	0.426 (0.059)	0.289 (0.065)	0.340 (0.044)		
Leavers τ_{-1}	-1.919 (0.866)											
Dropouts τ_{-1}	4.063 (2.522)											
Noncognitive Skills	-0.041 (0.193)	1.260 (0.142)	1.151 (0.090)	-1.192 (0.096)	1.166 (0.171)	1 ■	0.749 (0.134)	0.754 (0.097)	0.836 (0.111)	1 ■		
Cognitive Skills	-0.038 (0.056)						0.562 (0.041)	0.549 (0.026)	0.520 (0.027)	1 ■		
Constant	-0.415 (0.246)	-0.552 (0.334)	-0.834 (0.200)	0.721 (0.200)	-1.076 (0.326)	-0.142 (0.196)	-0.823 (0.227)	-1.271 (0.141)	-1.280 (0.160)	-0.966 (0.178)		
Observations												

3096

Note: "Older Siblings" and "Young Siblings" correspond to the number of older and younger siblings the respondent has. "(ln) Monthly Income" corresponds to the natural logarithm of the monthly income per capita. "Both Parents" takes the value of one if the respondent lives in a biparental household. "Only Mother" takes the value of one if the respondent's father is absent from the household. "Father's Educ: 2yColl" takes the value of one if the highest level of education attained by the respondent's father was a 2-year college degree. "Father's Educ: 4yColl" takes the value of one if the highest level of education attained by the respondent's father was a 4-year college degree. "Father's Educ: GS" takes the value of one if the highest level of education attained by the respondent's father was graduate school. "Leavers" captures the fraction of students that move out the district in 2002 (one year earlier than bullying). "Dropouts" captures the proportion of middle school dropouts in the district in 2002. Columns headed as 1 collect the coefficients for those who were bullied at age 14. Columns headed as 0 collect the coefficients for those who were not bullied at age 14. Standard errors in parentheses.

be dedicated measures of cognitive ability. We further impose $\alpha_{D_{\tau_0}=1}^{T_5,A} = \alpha_{D_{\tau_0}=0}^{T_5,A}$ and $\beta_{D_{\tau_0}=0}^{T_5} = \beta_{D_{\tau_0}=1}^{T_5}$ because—in estimations available upon request—we find that they are not statistically different from each other, and such normalizations speed up computation (see Section 5.1).

Table B.1 presents the results from the measurement system. The estimated values for $\beta_{D_{\tau_0}=0}^T$ and $\beta_{D_{\tau_0}=1}^T$ imply that youths with wealthier and more educated parents tend to be more responsible, have higher levels of self-control and are more positive about themselves. These results are consistent with those in Cunha, Heckman, Lochner, and Masterov (2006) and Heckman and Masterov (2007). Our estimates also suggest that family composition plays a big role in fostering desirable personality traits. Individuals with younger siblings and those who live with both parents tend to be more responsible. Interestingly, those who live with their mother have substantially higher levels of self-esteem than those who live only with their father. As with the noncognitive measures, the cognitive scores are higher for individuals coming from wealthier and more educated parents, especially if the mother is present in the family. In addition, the presence of younger (older) siblings is associated with higher (lower) grades. Another notable finding, which is in line with Borghans, Duckworth, Heckman, and Weel (2008), is that younger students are less responsible and have less self-control and self-esteem, even within the same year of age.

APPENDIX C: TEST SCORES/MEASURES, SKILLS AND OUTCOMES WITHOUT BULLYING CONSIDERATIONS

In this section, we abstract from bullying and analyze the association between latent skills, their proxies and outcomes. Thus, its objective is two-fold. First, it shows that academic test scores and noncognitive measures at an early age matter in determining the adult outcomes we use in this paper. To this end, it presents results from regressions of the outcomes at ages 18 and 19 on the measures and test scores obtained at age 14. Second, it presents the relationship between cognitive and noncognitive latent skills on outcomes excluding bullying considerations.

Overall, both sets of results show that test scores/measures and cognitive/noncognitive skills are strong determinants of adult outcomes. These findings are consistent with those in the literature (e.g., Heckman, Stixrud, and Urzua (2006), OECD (2014)).

C.1 Academic test scores, noncognitive measures, and outcomes

Table C.1 shows estimates of OLS regressions of adult outcomes on early test scores. From the table, it is evident that the abilities measured by the scores are strong determinants of later outcomes. In particular, we find that greater scores of irresponsibility by age 14 correlate with higher levels of take-up of risky behaviors like drinking, smoking at age 18. They also correlate with higher levels of mental disorders as measured by incidence of depression and mental health. Locus of control at age 15 correlates with

TABLE C.1. OLS regressions of outcomes on test scores.

	(1)	(2)	(3)	(4)	(5)	(6)
	Depression	Smoking	Drinking	Feeling Sick	Mental Health Probs.	Life Satisfaction
Locus of Control	-0.011 (0.019)	0.010 (0.006)	0.007 (0.010)	-0.003 (0.005)	-0.006 (0.004)	0.024 (0.010)
Irresponsibility	0.081 (0.019)	0.036 (0.006)	0.041 (0.010)	0.008 (0.005)	0.013 (0.004)	0.001 (0.010)
Self-Esteem	-0.185 (0.019)	-0.009 (0.006)	-0.027 (0.009)	-0.014 (0.005)	-0.011 (0.004)	0.059 (0.009)
Language and Social Studies	0.018 (0.026)	-0.010 (0.009)	0.008 (0.013)	0.008 (0.007)	0.006 (0.006)	0.009 (0.013)
Math and Science	-0.044 (0.025)	0.003 (0.008)	0.017 (0.013)	0.002 (0.007)	0.006 (0.006)	0.017 (0.013)
Class Grade	0.033 (0.028)	-0.036 (0.009)	-0.029 (0.014)	-0.015 (0.008)	-0.004 (0.006)	0.042 (0.014)
Obs.	2552	3097	3097	2683	2683	3097
	(7)	(8)	(9)	(10)	(11)	(12)
		Stress				
	College	Friends	Parent	School	Poverty	Total
Locus of Control	-0.008 (0.010)	-0.040 (0.021)	-0.048 (0.021)	-0.024 (0.020)	-0.033 (0.020)	-0.047 (0.020)
Irresponsibility	-0.009 (0.010)	0.045 (0.021)	0.031 (0.021)	-0.008 (0.020)	0.100 (0.020)	0.057 (0.020)
Self-Esteem	-0.015 (0.010)	-0.133 (0.021)	-0.094 (0.020)	-0.123 (0.020)	-0.133 (0.020)	-0.178 (0.020)
Language and Social Studies	-0.022 (0.014)	-0.003 (0.029)	0.040 (0.028)	0.036 (0.027)	0.012 (0.028)	0.014 (0.028)
Math and Science	0.040 (0.013)	0.004 (0.028)	0.062 (0.027)	0.036 (0.027)	0.000 (0.027)	0.033 (0.027)
Class Grade	0.059 (0.014)	0.062 (0.030)	0.103 (0.030)	0.237 (0.029)	0.004 (0.030)	0.141 (0.030)
Obs.	2558	2676	2676	2676	2676	2676

Note: This table presents the estimated coefficients of the regressing the outcomes of interest in the test scores used to identify skills as latent abilities. Regressions include controls for gender, parental education, household income, number of younger/older siblings, mono/bi-parental household, urbanity indicator, and age in months. "Depression" corresponds to a standardized index of depression symptoms. "Drinking" takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year. "Smoking" takes the value of 1 if the respondent smoked a cigarette at least once during the last year. "Life Satisfaction" takes the value of 1 if the respondent reports being happy with the way she is leading her life. "Feeling Sick" takes the value of 1 if the respondent reports having felt physically ill during the last year. "Mental Health Problems" takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. Standard errors in parentheses.

higher levels of life satisfaction and lower levels of stress. Self-esteem is negatively associated with the take-up of risky behaviors, the incidence of mental health issues, and stress. Regarding cognitive measures, Table C.1 shows positive relation with college entry, life satisfaction, and stress. They also correlate negatively with the take-up of risky behaviors.

TABLE C.2. Noncognitive and cognitive skills (age 14) on outcomes (18 and 19)—excluding bullying considerations.

	(1) Depression	(2) Drinking	(3) Smoking	(4) Life Satisfaction	(5) Feeling Sick	(6) Mental Health Problems
Noncogn Skills	−0.306 (0.029)	−0.051 (0.014)	−0.035 (0.010)	0.074 (0.015)	−0.025 (0.008)	−0.038 (0.009)
Cognitive Skills	0.027 (0.020)	−0.017 (0.010)	−0.043 (0.007)	0.066 (0.010)	−0.006 (0.006)	0.001 (0.006)
Observations	2446	2881	2881	2881	2571	2781
	(7) College [†]	(8) Stress: Friends	(9) Stress: Parent	(10) Stress: School	(11) Stress: Total	(12) Stress: Poverty
Noncogn Skills	−0.009 (0.014)	−0.229 (0.031)	−0.113 (0.031)	−0.111 (0.030)	−0.267 (0.031)	−0.262 (0.031)
Cognitive Skills	0.072 (0.010)	0.069 (0.022)	0.168 (0.022)	0.299 (0.022)	0.182 (0.022)	0.016 (0.022)
Observations	2449	2564	2564	2564	2564	2564

Note: This table presents the estimated coefficients of the outcome equations $Y_{\tau_2} = \mathbf{X}_Y \beta^Y + \alpha^{Y,A} \theta_{\tau_0}^A + \alpha^{Y,B} \theta_{\tau_0}^B + e_{\tau_2}^Y$. “Depression” corresponds to a standardized index of depression symptoms. “Drinking” takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year. “Smoking” takes the value of 1 if the respondent smoked a cigarette at least once during the last year. “Life Satisfaction” takes the value of 1 if the respondent reports being happy with the way she is leading her life. “Feeling Sick” takes the value of 1 if the respondent reports having felt physically ill during the last year. “Mental Health Problems” takes a value of 1 if the respondent has been diagnosed with psychological or mental problems. “College” takes the value of 1 if the respondent attends college by age 19. The “Stress” variables are standardized indexes that collect stress symptoms triggered by different sources, namely friends, parents, school, and poverty. Stress: Total aggregates the four triggers of stress. Estimates include controls for gender, parental education, household income, number of younger/older siblings, mono/bi-parental household, urbanity indicator, and age in months. Standard errors in parentheses.

[†] College attendance is measured at age 19.

C.2 Latent skills and outcomes without treatment effect structure

Table C.2 presents the estimated parameters for the outcome equation:

$$Y_{\tau_2} = \mathbf{X}_Y \beta^Y + \alpha^{Y,A} \theta_{\tau_0}^A + \alpha^{Y,B} \theta_{\tau_0}^B + e_{\tau_2}^Y,$$

that is, without the introduction of a treatment variable.

These results indicate that noncognitive latent skills (age 14) are negatively associated with the likelihood of depression, the incidence of drinking and smoking, the likelihood of being sick, having mental health issues, or feeling stressed about friends and the economic situation at age 18. Furthermore, noncognitive skills have a positive effect on the likelihood of having a positive perception of life. This is linked with the fact that while noncognitive skills reduce the likelihood of depression, and cognitive skills increase it; this is just like what happens with the stress variables. However, the reduction on the likelihood of depression is much larger than the increase in the likelihood of depression caused by cognitive skills. We find no effect of cognitive skills on the incidence of drinking alcohol, feeling sick, or having mental health issues, while we find that cognitive skills are highly rewarded in the selection into college. Finally, our results indicate that both cognitive and noncognitive skills reduce the incidence of smoking.

APPENDIX D: REGRESSION ANALYSIS: INSTRUMENTAL VARIABLES

TABLE D.1. IV first stage.

Variables	(1)		(2)		(3)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
% Peer Violent Fam			-1.119	(0.520)	-1.049	(0.521)
% Peer Violent Fam ²			1.387	(0.692)	1.295	(0.693)
% Peer Bullies	0.179	(0.083)			0.168	(0.083)
Observations	3097		3097		3097	
F-test	14.29		7.205		8.784	
Prob > F	0.000		0.007		0.003	

Note: This table reports the first stage of IV regressions. We only report the coefficients on the instruments. Estimates include controls for gender, parental education, household income, number of younger/older siblings, mono/bi-parental household, urbanity indicator, and age in months. Standard errors in parentheses.

TABLE D.2. IV results: Bullying at age 14 on different outcomes (18 or 19).

	Depression			Smokinhh			Drinking			Feeling Sick		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Bullied (D_{t1})	-0.316 (1.201)	-0.590 (1.331)	-0.443 (0.914)	-0.407 (0.410)	-0.547 (0.427)	-0.477 (0.304)	-0.975 (0.712)	0.015 (0.530)	-0.465 (0.423)	-0.546 (0.475)	-0.289 (0.392)	-0.417 (0.314)
Obs.	2552	2552	2552	3097	3097	3097	3097	3097	3097	2683	2683	2683
Instruments												
Bullies	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y
Troub. Fam.	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
	Mental Health Prob.			Life Satisfaction			College			Stress: Friends		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Bullied (D_{t1})	0.233 (0.296)	-0.049 (0.272)	0.092 (0.199)	-0.541 (0.595)	-0.555 (0.575)	-0.547 (0.426)	0.490 (0.531)	-0.833 (0.620)	-0.132 (0.360)	-0.092 (1.364)	-2.231 (1.884)	-1.138 (1.116)
Obs.	2683	2683	2683	3097	3097	3097	2558	2558	2558	2676	2676	2676
Instruments												
Bullies	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y
Troub. Fam.	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
	Stress: Parents			Stress: School			Stress: Poverty			Stress: Total		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Bullied (D_{t1})	-1.210 (1.538)	-1.985 (1.764)	-1.584 (1.196)	-2.506 (1.986)	-1.364 (1.540)	-1.916 (1.269)	0.594 (1.365)	-1.275 (1.541)	-0.355 (0.993)	-1.309 (1.580)	-2.468 (1.980)	-1.876 (1.285)
Obs.	2676	2676	2676	2676	2676	2676	2676	2676	2676	2676	2676	2676
Instruments												
Bullies	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y
Troub. Fam.	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y

Note: This table reports the second stage of IV regressions. Estimates include controls for gender, parental education, household income, number of younger/older siblings, mono/bi-parental household, urbanity indicator, and age in months. Standard errors in parentheses.

APPENDIX E: THE “LEVELING POLICY” AND TESTING THE RANDOM ALLOCATION OF STUDENTS TO CLASSROOMS

In 1959, South Korea enacted the Education Act, a law that made full-time education for children from ages 8 to 13 (grades 1–6) mandatory, causing the demand for middle school places to skyrocket and unleashing stiff competition for places in prestigious middle schools. In response, in 1969 the government introduced the *Middle School Leveling Policy* aimed at mitigating the burden on elementary school students due to fierce competition that existed for middle school seats. The policy introduced a lottery system for middle school entrance. It started in Seoul in 1969 and became a national policy 2 years later. As a result, since then all screening procedures have been abolished uniformly across all regions (Korean Ministry of Education (1998)) and middle school enrollment is entirely determined by a lottery directed by the local office of education (Kang (2007)). Although lotteries are supervised at the local level, the procedure is the same throughout the country. A student’s residential address associates her to a school district. The school district defines a list of schools to which the student could be assigned. A draw is made electronically or manually. In the electronic case, a local board runs the lottery in the presence of police and parent representatives. In the manual case, students play the lottery on their own (Gyeonggi-do Office of Education (2019)). The only exception is the case that a district has only one school due to small numbers of students in the area. Any factors such as family background, performance in elementary school, or commute time are not taken into account. The basic structure has not changed since 1969: the biggest change over a half-decade is the introduction of digital draws.

As of 2020, the middle school lottery is considered a fundamental element of Korea’s education system. It is carried out thoroughly to the extent that some children in the same family, who usually graduate from the same primary school, are assigned to different middle schools. In other words, within educational districts, the system randomizes the family background of students. This feature of South Korea’s schooling system facilitates the examination of classroom behavior during adolescence.

E.1 *Testing the random allocation of students to classrooms*

The empirical strategy used in this paper exploits the random allocation of students to classrooms product of the “leveling policy” of 1969. We do so by constructing variables that, while exogenous to students, encapsulate their social interactions and, consequently, affect their chances of being bullied (Sarzoza (2015)). These are the proportion of peers that report being bullies in the class and the proportion of peers in the classroom that come from a violent family. The former uses self-reported bullying, while the latter is obtained after aggregating the Likert scale answers to the following statements: “I always get along well with brothers or sisters,” “I frequently see parents verbally abuse each other,” “I frequently see one of my parents beat the other one,” “I am often verbally abused by parents,” and “I am often severely beaten by parents.” We consider as students coming from a violent family those whose aggregate score is above the overall mean.

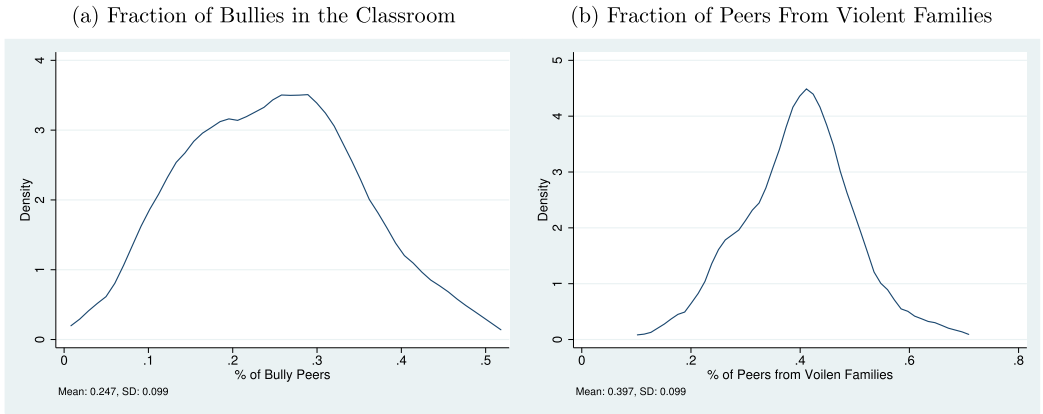


FIGURE E.1. Distributions of the excluded variables. *Note:* Data at the classroom level. % Bully Peers corresponds to the proportion of peers that report being bullies in the respondent's classroom. % of Peers from Violent Families contains the proportion of peers in the respondent's classroom that come from a violent family, where a violent family is defined in Section 3.

Figure E.1 shows the kernel densities for the assembled variables at the classroom level at age 14. We see there is wide dispersion in both of them, providing a valuable source of variation capturing the proclivity of violence across classrooms. A fourth of the students in the average classroom claimed to be bullies. However, there are classrooms where less than 5% of the students claim to be bullies, while in others, half of the students do so. In the same way, in the average classroom at age 14, around 40% of the students come from a violent family. But, while we see some classrooms where less than a fifth of the students come from a violent family, there are others where two-thirds of the students do so.

The extent to which these variables are able to capture relevant information about the classrooms' social interactions relies on whether students were in fact randomly allocated to classrooms or not. Thus, we must test whether the random allocation in fact happened. Given its sampling scheme, we cannot rely exclusively on the KYPS study to empirically prove that students were randomly allocated to classrooms.¹ However, we take advantage of its school-level data, which contain information on the school location at the city/district (i.e., administrative region) level, to merge the KYPS data with administrative records gathered by the Korean Educational Development Institute (KEDI).

The KEDI collects detailed information about the universe of educational institutions from kindergarten to high school, including the administrative and educational districts to which they belong. Thus, by combining it with the KYPS through location information, we were able to build a link between administrative and school districts that allowed us to back out the school districts of all KYPS schools and to formally as-

¹KYPS's sampling scheme collects data for an entire course in a sampled school and does not identify the school district to which it belongs. In South Korea, a school district is defined by (a collection of) administrative regions. For instance, Seoul has 25 administrative districts (*Gu* in Korean) grouped in 11 school districts, where each school district contains 2 to 3 administrative districts.

TABLE E.1. Balancing tests.

	Age in Months	Male	Older Siblings	LnMonth Income pc	Lives Both Parents	FatherEdu<Coll
A. School District Fixed-effects: Districts with more than one school						
% Peer Bullies	-0.118 (1.095)	0.147 (0.130)	0.018 (0.143)	-0.312 (0.235)	-0.127 (0.091)	0.245 (0.220)
N	1480	1483	1483	1483	1483	1483
% Peer Violent Fam	-0.676 (1.179)	-0.111 (0.075)	-0.178 (0.195)	0.003 (0.276)	0.047 (0.054)	0.342 (0.257)
N	1961	1965	1965	1965	1965	1965
B. School District Fixed-effects: All Districts						
% Peer Bullies	-0.118 (1.097)	0.147 (0.130)	0.018 (0.144)	-0.312 (0.235)	-0.127 (0.091)	0.245 (0.220)
N	2410	2416	2416	2416	2414	2414
% Peer Violent Fam	-1.005 (1.161)	-0.117 (0.073)	-0.121 (0.193)	0.086 (0.268)	0.076 (0.055)	0.208 (0.247)
N	3200	3208	3208	3208	3208	3208
C. Controlling for School District Characteristics: Districts with more than one school						
% Peer Bullies	0.524 (1.047)	0.353 (0.446)	0.087 (0.161)	-0.208 (0.294)	-0.068 (0.091)	0.189 (0.267)
N	1480	1483	1483	1483	1483	1483
% Peer Violent Fam	-0.184 (1.158)	-0.076 (0.079)	-0.193 (0.132)	-0.342 (0.357)	-0.056 (0.068)	0.496 (0.310)
N	1961	1965	1965	1965	1965	1965

Note: This table presents regressions between the leave-one-out mean of classroom-level characteristics (i.e., % of bullies and % of violent families) and observable characteristics of the students in wave 1. Lives Both Parents takes the value of 1 if the child live in a biparental household and zero otherwise. FatherEdu<Coll takes the value of 1 if the child's father reports high school or less as the highest education level he completed. To avoid double causality, the regressions using the % of bullies exclude those who claim to be bullies. Regressions using % of violent families include school district fixed-effects of control for school district characteristics. Thus we present the results run in the subsample of school districts with more than one school. Standard errors in parentheses.

sess whether the randomization was effective.² In addition, we exploit KEDI's administrative records to construct variables that can capture the variation of bullying prevalence *across districts*. We also attach regional tax revenue to school districts from publicly available government sources.

Random assignment: Test results. Enabled by the link with KEDI's administrative dataset we proceed to empirically test for the random allocation of students to classroom. To do so, and in the spirit of Carrell, Hoekstra, and Kuka (2018) and Santavirta and Sarzosa (2019), we run a balancing test for whether demographic and socioeconomic characteristics are correlated with the proportion of peers who are bullies or the pro-

²Given the sparseness of sampled school in Gyeonggi (one of the 12 regions that comprise South Korea), we combined some geographically contiguous school districts so that we had *districts* with more than one school.

portion of peers that come from violent families. We consider different specifications. Table E.1 presents these results. Its Panel A considers separately regressing the demographic and socioeconomic characteristics on the proportion of peers who are bullies and the proportion of peers that come from violent families in the subset of school districts for which we have multiple schools in the KYPs-JHS sample. We do so because in that subsample we can control for school district fixed-effects. In Panel B, we implement the school district fixed-effect strategy on the entire sample. Finally, in Panel C we run regressions in which we replace the school district fixed-effects with school district-level characteristics obtained from KEDI's administrative dataset. Namely, the yearly fraction of students that move (in) out of the district, the yearly proportion of middle school dropouts, and the 2003 per-capita tax revenue of the school district. This last strategy motivates our empirical strategy for the estimation of nonlinear bullying equations (e.g., expression (2)) as we cannot directly use a fixed-effect strategy in that case. Thus, we examine whether we are able to account for the between-district variation in a different way.

Overall, the results provide no evidence of correlations between demographic or socioeconomic characteristics and the proportion of peers who are bullies or the proportion of peers that come from violent families. We cannot find systematic selection of students to particular classrooms on the bases of month of birth, parental income or socioeconomic status. As a consequence, we find strong empirical evidence attesting to the random allocation of students to classrooms. In addition, Panel C confirms that our combination of school district-level characteristics are able to capture the between-district differences that may correlate with violence in schools. This validates the specification of equations (2) and (6).

APPENDIX F: ROBUSTNESS OF THE RESULTS IN LOW-MEAN OUTCOMES

Relatively few people in the sample develop mental health problems or report not being in good health by age 18. Table 3 shows that only 9.7% of the sample report having mental health issues and only 7% report not being in good health. Such low means can pose difficulties for linear probability models. Especially if we consider that our empirical strategy estimates two linear equations (one for each bullying status) per outcome, thus further splitting the samples. For instance, only 6.2% of the nonvictims report not being in good health by age 18. In order to test whether our results may be affected by these low means, we ran an alternate model in which the outcome equations are nonlinear. In particular, we estimate the outcome equations as probit models. Here, we present the main findings. The complete set of results is available upon request.

Table E.1 shows that the model with nonlinear outcome equations fits the data very well.

Table E.2 and Figures E.1 show the ATE of being bullied at age 15 on the incidence of not being in good health and having mental health issues by age 18 using the nonlinear functions in the outcome equations of the model. If we compare them with Table 8 and Figure 3(c) and (d)—estimates using linear functions in the outcome equations—we see very little difference. If anything, the effects of bullying estimated using the nonlinear functions on not being in good health are slightly larger. Especially at lower levels

TABLE F.1. Assessing the fit of the model with nonlinear outcome equations.

	Sick		Mental Health	
	Data	Model	Data	Model
$E[Y_0 D = 0]$	0.0639 (0.245)	0.0637 (0.244)	0.0874 (0.282)	0.0874 (0.282)
$E[Y_1 D = 1]$	0.1187 (0.324)	0.1318 (0.337)	0.1851 (0.389)	0.1627 (0.368)

Note: The mean simulated outcomes (i.e., Model) were calculated using 40,000 observations generated from the estimated model. The Data columns contain the outcomes' mean at age 18 obtained from the KYPS. Sick takes the value of 1 if the respondent reports having felt physically ill during the last year. Mental Health takes the value of 1 if the respondent has been diagnosed with psychological or mental problems.

TABLE F.2. Treatment effects: outcomes at age 18 (τ_2) of being bullied at age 15 (τ_1)—nonlinear outcome equations).

	Sick	Mental Health
ATE	0.0811 (0.0242)	0.0717 (0.0270)
TTE	0.0694 (0.0208)	0.0747 (0.0264)

Note: Standard errors in parenthesis. This table presents the estimated treatment parameters: The variable Sick takes the value of 1 if the respondent reports having felt physically ill during the last year. Mental Health takes the value of 1 if the respondent has been diagnosed with psychological or mental problems by age 18.

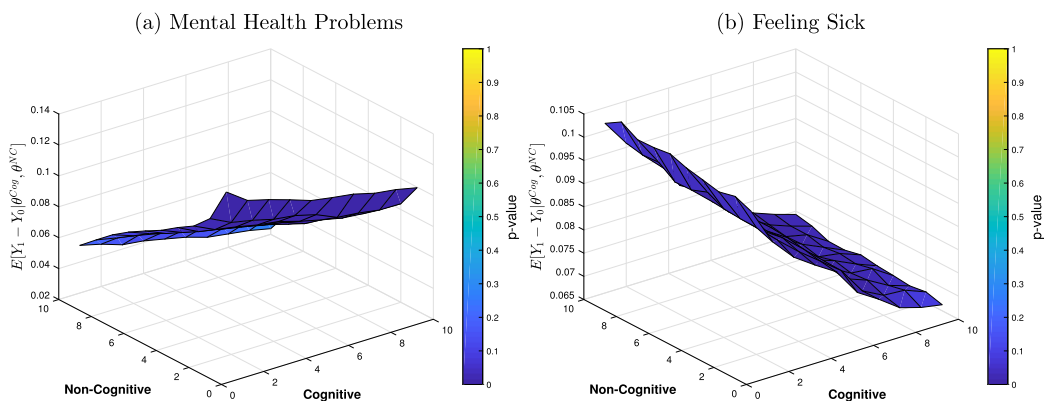


FIGURE F.1. Being bullied at 15 on health outcomes at 18—nonlinear outcome equations. *Note:* All panels present the $ATE(\theta^{NC}, \theta^C) = \mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills. The variable Mental Health Problems takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. The variable Sick takes the value of 1 if the respondent reports having felt physically ill during the last year.

of skills. Thus, our results are robust to changes in the functional form of the outcome equations.

APPENDIX G: QUANTIFYING THE IMPACT OF A POLICY CHANGE

Our main empirical findings establish wide heterogeneity in treatment effects across latent skill levels. Thus, marginal responses to changes in the incidence of bullying depends on the skills of those induced to change treatment status, and might differ from the average treatment effects. Here, we explore this possibility. We take advantage of our model and the wide common support between victims and nonvictims along the skill space—allowing us to calculate treatment effects for each level of skills without the need of extrapolation—to explore the marginal responses to a hypothetical policy that would reduce the number of bullies in the student’s classroom but in the past. Given the common public stance against bullying, such policies are popular in education institutions around the world. In South Korea in 2012, for instance, in an effort to curb bullying, the government installed 100,000 closed circuit cameras in schools.

We assess the effect of a hypothetical policy that would drop the number of bullies by half at τ_0 , reducing the likelihood of victimization at τ_1 ($\tau_0 < \tau_1$).³ We follow Cooley,

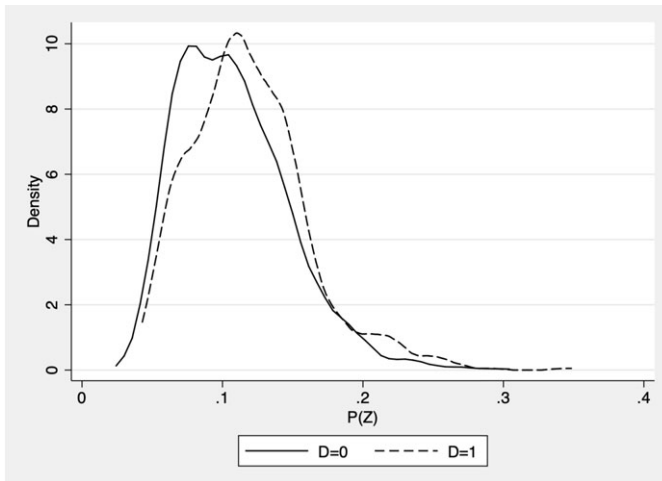


FIGURE G.1. Common support: Distribution of the propensity score by treatment status. *Note:* The figure depicts the predicted propensity score by victimization condition $\hat{P}(\mathbf{X}_D, \mathbf{Z}_{\tau_0} | D_{\tau_1})$. That is, the predicted probability after estimating a probit of D_{τ_1} on classroom characteristics—% of peer bullies, % peers from violent families, % of male peers—(\mathbf{Z}_{τ_0}) and demographic and socioeconomic controls—month of birth, number of siblings, household composition, rurality, household income per capita, father’s education—(\mathbf{X}_D).

³Despite the fact our model does not seek to develop the dynamic consequences of bullying, this policy change illustrates how the framework can be extended for this purpose. See Sarzosa (2015), Cooley, Navarro, and Takahashi (2016), Heckman, Humphries, and Veramendi (2016) for similar applications in dynamic settings.

TABLE G.1. The impact of the policy change (age 14) on outcomes (18 and 19).

Outcome	Gains on Those who Were:					
	Bullied Before and not Bullied After the Policy Change		Bullied Before the Policy Change		Not Bullied Before the Policy Change	
	(1)		(2)		(3)	
	Diff.	Std. Err.	Diff.	Std. Err.	Diff.	Std. Err.
Depression	-0.0475	(0.0588)	-0.0472	(0.0588)	-0.0609	(0.0638)
Smoking	-0.0226	(0.0205)	-0.0243	(0.0208)	-0.0240	(0.0211)
Drinking	-0.0248	(0.0276)	-0.0264	(0.0274)	-0.0027	(0.0287)
Feeling Sick	-0.0545	(0.0209)	-0.0524	(0.0213)	-0.0669	(0.0219)
Mental Health	-0.0830	(0.0241)	-0.0820	(0.0243)	-0.0783	(0.0238)
Life Satisfaction	0.0110	(0.0280)	0.0131	(0.0282)	0.0170	(0.0294)
College	0.0393	(0.0311)	0.0377	(0.0309)	0.0489	(0.0325)
Stress: Friends	-0.2534	(0.0704)	-0.2561	(0.0711)	-0.2329	(0.0771)
Stress: Parents	-0.1483	(0.0656)	-0.1491	(0.0670)	-0.1608	(0.0705)
Stress: School	-0.1402	(0.0633)	-0.1421	(0.0640)	-0.1207	(0.0700)
Stress: Poverty	-0.0852	(0.0632)	-0.0891	(0.0653)	-0.0675	(0.0680)
Stress: Total	-0.2084	(0.0665)	-0.2109	(0.0673)	-0.1973	(0.0705)

Note: This table estimates the effects of hypothetical policy intervention in which the number of bullies in each classroom is cut by half. Let D^o and D^n denote the bullying status before the policy change (old) and after the policy change (new). Column (1) reports $ff \mathbb{E}[Y_{0,\tau_2} - Y_{1,\tau_2} | D_{\tau_1}^o = 1, D_{\tau_1}^n = 0, \xi^{NC}, \xi^C] dF_{\theta_{NC}, \theta_C}(\xi^{NC}, \xi^C)$. Column (2) reports $ff \mathbb{E}[Y_{0,\tau_2} - Y_{1,\tau_2} | D_{\tau_1}^o = 1, \xi^{NC}, \xi^C] dF_{\theta_{NC}, \theta_C}(\xi^{NC}, \xi^C)$. That is, the negative of the treatment effect on the untreated. The variable *Depress* corresponds to a standardized index of depression symptoms. *Smoking* takes the value of 1 if the respondent smoked a cigarette at least once during the last year. *Drinking* takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year. *Sick* takes the value of 1 if the respondent reports having felt physically ill during the last year. *Mental Health* takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. *Satisfied* takes the value of 1 if the respondent reports being happy with the way she is leading her life. The variable *inCollege* takes the value of 1 if the respondent attends college by age 19. The *Stress* variables are standardized indexes that collect stress symptoms triggered by different sources, namely friends, parents, school, and poverty. *Stress: Total* aggregates the four triggers of stress.

Navarro, and Takahashi (2016) and compare the effect of the policy on the “switchers”—those who were bullied before the policy change ($D_{\tau_1}^o = 1$) but not after it was implemented ($D_{\tau_1}^n = 0$)—to the counterfactual gain to not being bullied among those who were bullied before the policy change (negative of the TT, column 2), and the counterfactual gain to not being bullied for students who were not bullied before the policy change (negative of the TUT, column 3).

The policy reduces the average incidence of bullying by only 1.5 percentage points or about 13.6%. This is a relative small change in the likelihood of victimization. However, Table G.1 shows it has relative large consequences on the marginal student. For instance, the average (in terms of skills) switcher would see the effect of being bullied on having mental health problems drop by 8.3pp, and on total stress fall by 20.8% of a SD. Like in Cooley, Navarro, and Takahashi (2016), given that skills affect the selection into treatment and the size of the effects, the effects of the policy on the marginal student are closer to the counterfactual gain to not being bullied among those who were bullied before the policy change.

To further explore heterogeneity by latent skills, we plot the marginal responses for each level of skills. Figures G.2 to G.5 show, despite limited regions of responses (com-

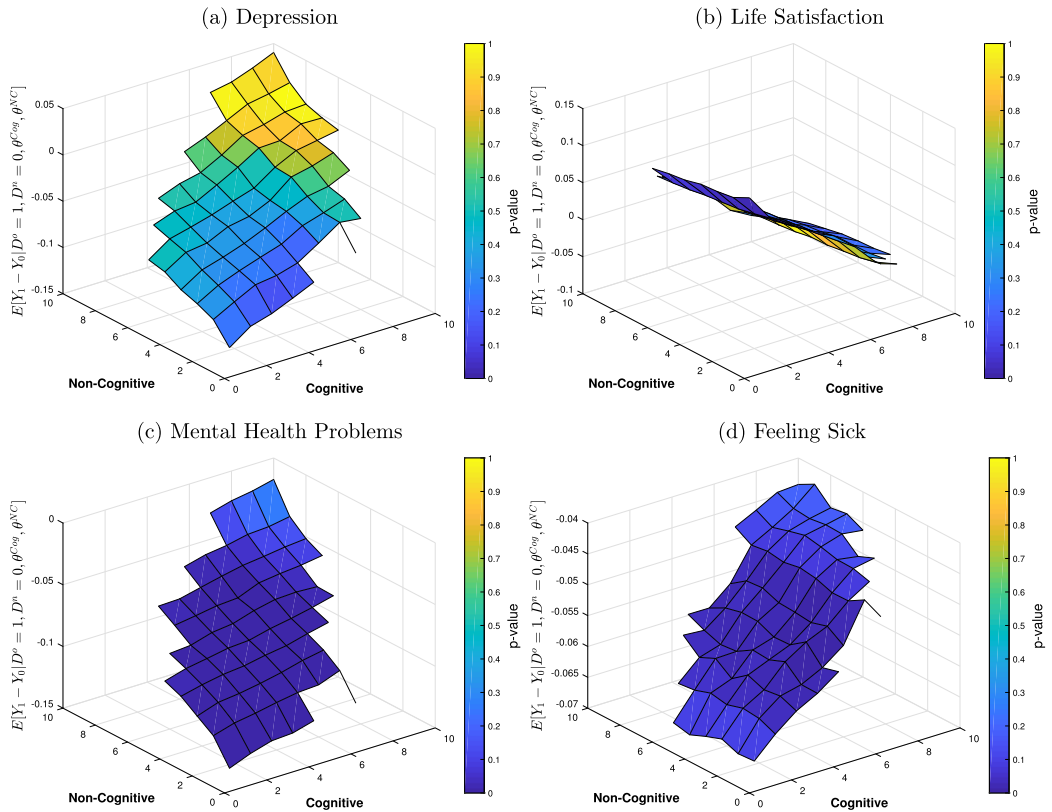


FIGURE G.2. Heterogenous effects among compliers of the policy change—health outcomes. *Note:* Panels display $\mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C, D_{\tau_1}^o = 1, D_{\tau_1}^o = 0]$ in the z -axis resulting from 40,000 simulations based on the findings of the empirical model. The x -axis and y -axis contain the deciles of noncognitive and cognitive skills, respectively. “Depression” is a standardized aggregated index of depression symptoms. “Mental Health Problems” takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. “Life Satisfaction” takes the value of 1 if the respondent reports being happy with the way she is leading her life. “Feeling Sick” takes the value of 1 if the respondent reports having felt physically ill during the last year.

pliers), wide variation in the marginal responses to a reduction in the number of bullies depending on the level of skills.

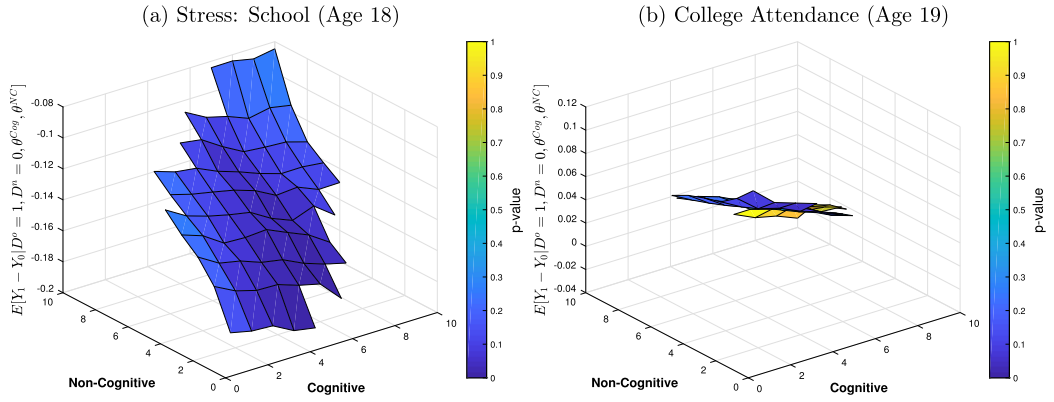


FIGURE G.3. Heterogeneous effects among compliers of the policy change—educational outcomes. *Note:* Panels display $\mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C, D_{\tau_1}^o = 1, D_{\tau_1}^n = 0]$ in the z-axis resulting from 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills, respectively. “Stress: school” is a variable that aggregates stress symptoms triggered by situations related with school. “College Attendance” takes the value of 1 if the respondent attends college by age 19.

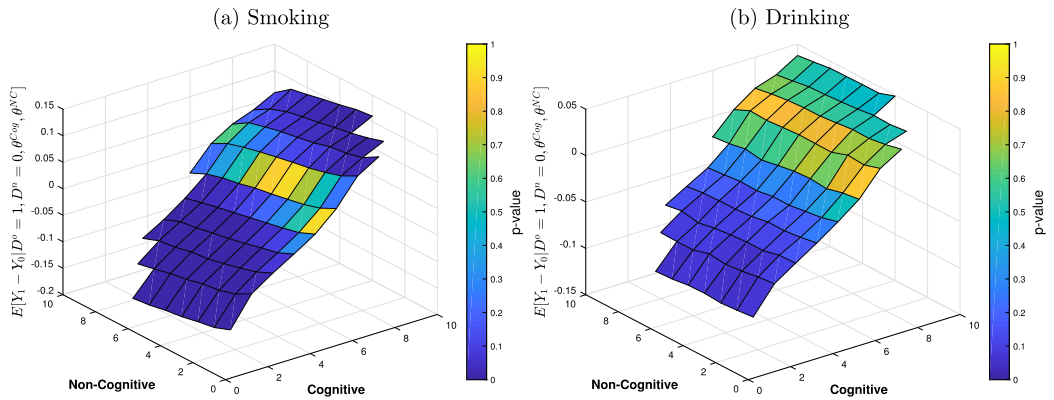


FIGURE G.4. Being bullied (15) on take-up of risky behaviors (18). *Note:* Panels display $\mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C, D_{\tau_1}^o = 1, D_{\tau_1}^n = 0]$ in the z-axis resulting from 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills, respectively. “Smoking” takes the value of 1 if the respondent smoked a cigarette at least once during the last year. “Drinking” takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year.

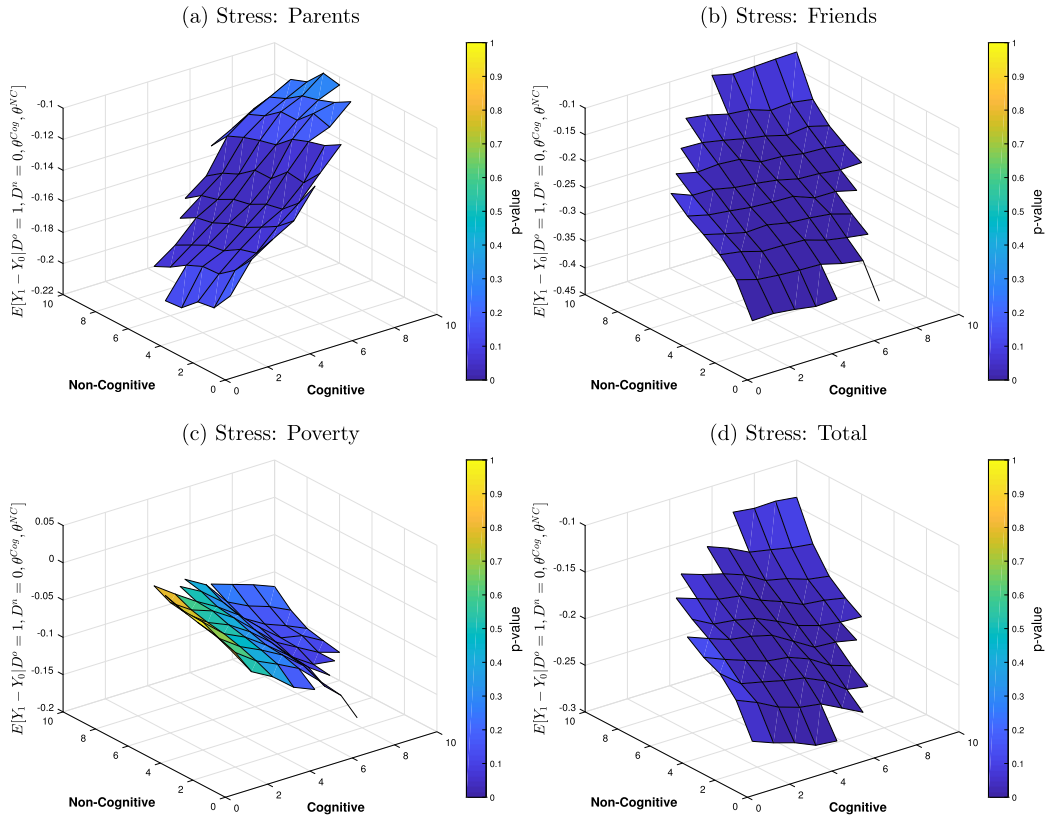


FIGURE G.5. Being bullied (15) on Stress (18). *Note:* All panels present the $\mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C, D_{\tau_1}^o = 1, D_{\tau_1}^n = 0]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills. Stress: Parents is a variable that aggregates stress symptoms triggered by the relation of the respondent with her parents. Stress: Poverty is a variable that aggregates stress symptoms triggered by situations related with economic difficulties. Friends is a variable that aggregates stress symptoms triggered by situations related with friends and social relations. Stress: Total is a variable that aggregates stress symptoms triggered by situations related with friends, parents, school, and poverty.

APPENDIX H: COMPLETE SET OF RESULTS FOR EQUATIONS (3) AND (4)

TABLE H.1. Risky behaviors and mental and physical health indicators: Outcome equations (age 18, τ_2) by bullying status D (age 15, τ_1).

	(1) Depression		(2) Drink		(3) Smoke		(4) Life Satisfaction		(5) Sick		(6) Mental Health	
	$D=0$	$D=1$	$D=0$	$D=1$	$D=0$	$D=1$	$D=0$	$D=1$	$D=0$	$D=1$	$D=0$	$D=1$
<i>Bullied</i>												
Age in Months	-0.002 (0.005)	0.005 (0.015)	-0.002 (0.003)	-0.003 (0.008)	0.003 (0.002)	-0.008 (0.006)	0.002 (0.003)	-0.003 (0.008)	0.000 (0.001)	0.000 (0.006)	0.001 (0.002)	0.001 (0.007)
Male	-0.205 (0.039)	-0.352 (0.109)	0.112 (0.020)	0.138 (0.058)	0.121 (0.013)	0.138 (0.042)	0.057 (0.020)	0.127 (0.056)	-0.043 (0.010)	-0.043 (0.041)	-0.005 (0.012)	0.023 (0.046)
Oldersiblings	0.002 (0.036)	-0.086 (0.092)	0.032 (0.019)	-0.025 (0.048)	0.002 (0.012)	0.037 (0.035)	0.010 (0.019)	0.054 (0.047)	-0.004 (0.010)	-0.024 (0.034)	0.010 (0.011)	-0.047 (0.038)
Youngsiblings	0.018 (0.037)	-0.085 (0.105)	-0.008 (0.019)	0.043 (0.055)	-0.018 (0.012)	0.038 (0.040)	0.003 (0.019)	0.018 (0.054)	-0.003 (0.010)	0.058 (0.039)	0.008 (0.011)	0.019 (0.044)
Lnmonthincpc	-0.001 (0.036)	-0.082 (0.092)	-0.013 (0.018)	0.006 (0.048)	0.001 (0.012)	-0.042 (0.035)	0.015 (0.018)	0.080 (0.047)	-0.010 (0.010)	0.015 (0.034)	0.015 (0.011)	-0.041 (0.039)
Urban	-0.009 (0.056)	0.014 (0.158)	-0.046 (0.029)	0.032 (0.083)	-0.009 (0.019)	0.058 (0.060)	-0.051 (0.029)	-0.079 (0.081)	-0.012 (0.015)	-0.019 (0.060)	-0.012 (0.017)	-0.094 (0.066)
Lives BothParents	-0.322 (0.117)	-0.331 (0.271)	0.046 (0.057)	-0.051 (0.141)	0.042 (0.037)	-0.003 (0.102)	0.218 (0.056)	0.032 (0.138)	-0.023 (0.098)	-0.018 (0.098)	-0.055 (0.034)	0.085 (0.115)
Lives OnlyMother	-0.087 (0.154)	-0.695 (0.349)	-0.016 (0.077)	0.049 (0.185)	0.103 (0.050)	0.030 (0.134)	0.191 (0.076)	0.100 (0.181)	0.058 (0.042)	-0.037 (0.131)	0.012 (0.045)	0.051 (0.149)
Fathereduc2yColl	-0.066 (0.074)	0.000 (0.188)	-0.016 (0.040)	0.028 (0.107)	-0.017 (0.026)	0.165 (0.078)	0.131 (0.039)	-0.006 (0.105)	-0.016 (0.020)	-0.043 (0.072)	0.010 (0.023)	-0.062 (0.085)
Fathereduc4yColl	-0.026 (0.046)	-0.088 (0.133)	-0.086 (0.023)	-0.083 (0.069)	-0.036 (0.015)	-0.086 (0.050)	-0.002 (0.023)	-0.016 (0.067)	0.010 (0.012)	0.022 (0.050)	0.002 (0.014)	0.017 (0.056)
FathereducGS	-0.083 (0.086)	0.135 (0.219)	-0.062 (0.043)	-0.003 (0.113)	-0.041 (0.028)	0.090 (0.082)	0.109 (0.043)	0.021 (0.111)	0.008 (0.080)	-0.079 (0.080)	-0.012 (0.026)	0.037 (0.092)
Noncogn Skills	-0.294 (0.031)	-0.377 (0.080)	-0.056 (0.016)	-0.040 (0.040)	-0.044 (0.010)	0.035 (0.029)	0.104 (0.015)	0.133 (0.039)	-0.023 (0.008)	-0.021 (0.030)	-0.024 (0.009)	-0.108 (0.032)
Cognitive Skills	0.029 (0.022)	0.006 (0.060)	-0.011 (0.011)	-0.066 (0.031)	-0.032 (0.007)	-0.134 (0.022)	0.043 (0.011)	0.108 (0.030)	-0.005 (0.006)	-0.014 (0.022)	-0.005 (0.007)	-0.007 (0.024)
Constant	0.493 (0.193)	1.028 (0.462)	0.506 (0.097)	0.361 (0.247)	0.032 (0.064)	0.209 (0.178)	0.191 (0.096)	0.089 (0.241)	0.152 (0.052)	0.081 (0.176)	0.064 (0.057)	0.336 (0.204)
Observations	2445		2880		2880		2880		2570		2780	

Note: This table presents the estimated coefficients of the outcome equations $Y_{1,\tau_2} = \mathbf{X}_Y \beta^Y + \alpha^Y + Y_{1,\tau_1} \theta_0^Y + \alpha^Y + Y_{0,\tau_2} \theta_0^Y + \epsilon_{\tau_2}^Y$ if $D_{\tau_1} = 0$. "Depression" corresponds to a standardized index of depression symptoms. "Drink" takes the value of 1 if the respondent smoked a cigarette at least once during the last year. "Life Satisfaction" takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year. "Smoke" takes the value of 1 if the respondent smoked a cigarette at least once during the last year. "Life Satisfaction" takes the value of 1 if the respondent reports being happy with the way she is leading her life. "Sick" takes the value of 1 if the respondent reports having felt physically ill during the last year. "Mental Health" takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. Oldersiblings corresponds to the number of older siblings the respondent has. Youngsiblings corresponds to the number of younger siblings the respondent has. Lnmonthincpc corresponds to the natural logarithm of the monthly income per capita. Both Parents takes the value of one if the respondent lives in a biparental household. OnlyMother takes the value of one if the respondent's father is absent from the household. Fathereduc2yColl takes the value of one if the highest level of education attained by the respondent's father was a 2-year college degree. Fathereduc4yColl takes the value of one if the highest level of education attained by the respondent's father was a 4-year college degree. FathereducGS takes the value of one if the highest level of education attained by the respondent's father was graduate school. Columns headed as 1 collect the coefficients for those who were bullied at age 15. Columns headed as 0 collect the coefficients for those who were not bullied at age 15. Standard errors in parentheses.

TABLE H.2. College attendance and stress levels (age 18, τ_2) outcome equations by bullying status D (age 15, τ_1).

	(1)		(2)		(3)		(4)		(5)		(6)	
	inCollege [†]		Stress: Friends		Stress: Parent		Stress: School		Stress: Total		Stress: Poverty	
	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$
Bullied	0.003 (0.003)	-0.002 (0.009)	-0.004 (0.006)	-0.022 (0.019)	0.004 (0.006)	-0.031 (0.019)	0.003 (0.006)	-0.009 (0.018)	0.004 (0.006)	-0.017 (0.018)	0.005 (0.006)	0.001 (0.017)
Age in Months	-0.135 (0.020)	-0.055 (0.061)	0.100 (0.041)	0.184 (0.138)	0.098 (0.042)	0.088 (0.131)	-0.175 (0.041)	-0.011 (0.125)	-0.147 (0.041)	-0.043 (0.129)	-0.255 (0.041)	-0.124 (0.123)
Male	-0.002 (0.018)	-0.063 (0.050)	-0.011 (0.039)	0.184 (0.114)	-0.028 (0.039)	0.054 (0.108)	0.059 (0.038)	0.117 (0.103)	-0.011 (0.039)	0.114 (0.107)	-0.021 (0.039)	0.037 (0.101)
Oldersiblings	0.001 (0.018)	-0.044 (0.058)	0.039 (0.039)	0.072 (0.131)	0.048 (0.040)	0.111 (0.124)	0.052 (0.039)	0.091 (0.119)	0.024 (0.039)	0.081 (0.123)	-0.011 (0.040)	0.014 (0.116)
Youngsiblings	0.020 (0.018)	0.021 (0.055)	-0.005 (0.039)	0.054 (0.112)	0.109 (0.039)	0.017 (0.106)	0.144 (0.038)	0.072 (0.102)	0.040 (0.039)	0.049 (0.105)	-0.100 (0.039)	0.014 (0.100)
Lnmonthincpc	-0.025 (0.029)	0.057 (0.091)	-0.102 (0.060)	0.033 (0.199)	0.031 (0.061)	0.183 (0.189)	0.021 (0.059)	0.170 (0.110)	0.018 (0.060)	0.196 (0.187)	0.082 (0.060)	0.324 (0.177)
Urban	0.208 (0.058)	0.122 (0.166)	0.239 (0.125)	-0.874 (0.325)	-0.175 (0.127)	-0.452 (0.309)	0.166 (0.124)	-0.110 (0.295)	-0.102 (0.125)	-0.508 (0.305)	-0.078 (0.126)	-0.130 (0.289)
Lives BothParents	0.101 (0.077)	0.063 (0.208)	-0.252 (0.166)	-0.755 (0.434)	-0.092 (0.168)	-0.863 (0.413)	0.166 (0.164)	-0.539 (0.395)	-0.080 (0.166)	-0.790 (0.407)	-0.042 (0.167)	-0.290 (0.387)
Lives OnlyMother	0.068 (0.039)	0.076 (0.113)	0.012 (0.080)	-0.379 (0.239)	0.075 (0.081)	0.120 (0.228)	0.130 (0.079)	-0.004 (0.218)	0.103 (0.080)	-0.061 (0.225)	0.027 (0.081)	-0.103 (0.213)
Fathereduc2yColl	-0.003 (0.023)	0.070 (0.075)	-0.049 (0.049)	-0.090 (0.167)	0.071 (0.049)	0.098 (0.159)	0.117 (0.048)	-0.028 (0.152)	-0.006 (0.049)	-0.126 (0.157)	-0.122 (0.049)	-0.349 (0.149)
Fathereduc4yColl	-0.038 (0.043)	0.042 (0.124)	0.020 (0.091)	-0.489 (0.265)	0.049 (0.092)	0.024 (0.252)	0.023 (0.090)	-0.251 (0.241)	-0.123 (0.091)	-0.409 (0.249)	-0.348 (0.092)	-0.427 (0.236)
Noncogn Skills	0.015 (0.015)	-0.019 (0.044)	0.033 (0.033)	-0.192 (0.100)	-0.115 (0.033)	-0.064 (0.095)	-0.095 (0.032)	-0.206 (0.090)	-0.242 (0.032)	-0.414 (0.094)	-0.253 (0.033)	-0.322 (0.089)
Cognitive Skills	0.070 (0.011)	0.091 (0.033)	0.066 (0.023)	0.093 (0.073)	0.173 (0.024)	0.141 (0.170)	0.296 (0.023)	0.317 (0.067)	0.179 (0.023)	0.213 (0.068)	0.009 (0.023)	0.079 (0.066)
Constant	0.464 (0.097)	0.470 (0.280)	0.267 (0.207)	0.799 (0.586)	-0.478 (0.209)	0.446 (0.557)	-0.871 (0.204)	-0.259 (0.532)	-0.095 (0.206)	0.400 (0.550)	0.583 (0.208)	-0.002 (0.522)
Observations	2448	2563	2563	2563	2563	2563	2563	2563	2563	2563	2563	2563

Note: This table presents the estimated coefficients of the outcome equations $Y_{1,\tau_2} = \mathbf{X}_Y \beta^{Y1} + \alpha^{Y1-A} \theta_0^A + \alpha^{Y1-B} \theta_0^B + e_2$ if $D_{\tau_1} = 1$ and $Y_{0,\tau_2} = \mathbf{X}_Y \beta^{Y0} + \alpha^{Y0-A} \theta_0^A + \alpha^{Y0-B} \theta_0^B + e_2$ if $D_{\tau_1} = 0$. Variable inCollege takes the value of 1 if the respondent attends college by age 19. The Stress variables are standardized indexes that collect stress symptoms triggered by different sources, namely friends, parents, school, and poverty. Stress: Total aggregates the four triggers of stress. Older Siblings corresponds to the number of older siblings the respondent has. Young Siblings corresponds to the number of younger siblings the respondent has. Lnmonthincpc corresponds to the natural logarithm of the monthly income per capita. Both Parents takes the value of one if the respondent lives in a biparental household. OnlyMother takes the value of one if the respondent's father is absent from the household. Fathereduc2yColl takes the value of one if the highest level of education attained by the respondent's father was a 2-year college degree. Fathereduc4yColl takes the value of one if the highest level of education attained by the respondent's father was a 4-year college degree. FathereducGS takes the value of one if the highest level of education attained by the respondent's father was graduate school. Columns headed as 1 collect the coefficients for those who were bullied at age 15. Columns headed as 0 collect the coefficients for those who were not bullied at age 15. Standard errors in parentheses. [†] College attendance is measured at age 19.

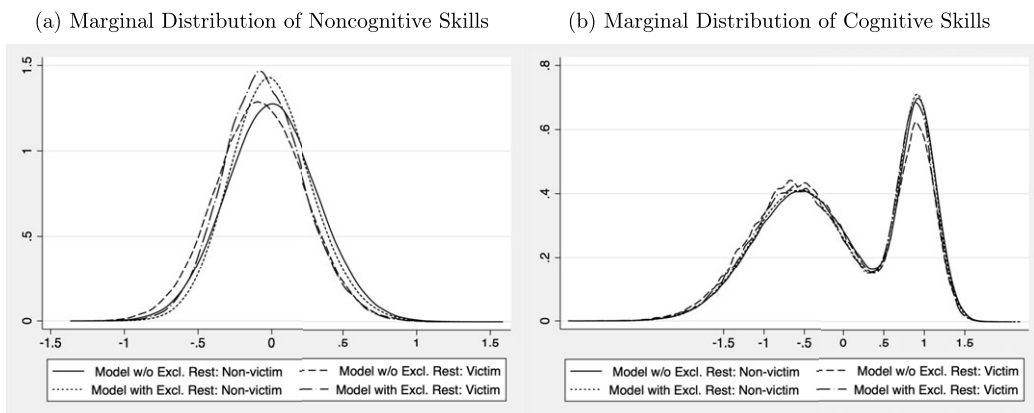


FIGURE I.1. Skills sorting into being a bullying victim. *Note:* Each panel in this figure presents the marginal distributions of unobserved abilities by victimization condition. The distributions are computed using 40,000 simulated observations from the model's estimates.

APPENDIX I: A MODEL WITHOUT EXCLUSION RESTRICTIONS (AT AGE 15)

To what extent our main findings are robust to the exclusion restrictions in the model characterizing bullying at age 15 is an empirical question. The following tables shed light on this. They report the results from a model of bullying (15) and outcomes (18/19) restricting the set of variables across equations to be identical. Figure B.1 shows the omission of other determinants of bullying (exclusion restrictions) generates distinctive sorting patterns by cognitive and noncognitive skills. This is not surprising as classroom-level determinants of bullying are statistically significant at conventional levels (see Table 5 in main text). However, the small differences between many of the estimated ATEs and TTs in Tables 8 (with exclusion restrictions) and B.3 suggest that exclusion restrictions at age 15 are not contributing much to relax the jointly independent assumption of the error terms in the bullying and potential outcome equations (after controlling for latent skills). This is consistent with our hypothesis: latent cognitive and noncognitive skills play an important role in identifying the treatment effects of interest.

TABLE I.1. Assessing the fit of the model: conditional means.

	Depression		Smoking		Feeling Sick		Life Satisfaction	
	Data	Model	Data	Model	Data	Model	Data	Model
$E[Y_0 D = 0]$	0.0573 (0.906)	0.0556 (0.876)	0.1307 (0.337)	0.1276 (0.330)	0.0639 (0.245)	0.0647 (0.244)	0.5201 (0.500)	0.4917 (0.493)
$E[Y_1 D = 1]$	0.1431 (0.896)	0.0803 (0.846)	0.1689 (0.375)	0.1727 (0.378)	0.1187 (0.324)	0.1181 (0.331)	0.4764 (0.500)	0.4759 (0.490)
	College		Mental Health Problems		Stress: Friends		Stress: Parents	
	Data	Model	Data	Model	Data	Model	Data	Model
$E[Y_0 D = 0]$	0.7008 (0.458)	0.6961 (0.458)	0.0874 (0.282)	0.0879 (0.283)	-0.0538 (0.967)	-0.0523 (0.962)	-0.0181 (0.985)	-0.0185 (0.986)
$E[Y_1 D = 1]$	0.6398 (0.481)	0.6261 (0.493)	0.1851 (0.389)	0.1665 (0.385)	0.2928 (1.137)	0.2042 (1.087)	0.1587 (1.033)	0.1200 (1.054)
	Stress: School		Stress: Poverty		Stress: Total		Drinking	
	Data	Model	Data	Model	Data	Model	Data	Model
$E[Y_0 D = 0]$	-0.0039 (0.995)	-0.0179 (0.989)	-0.0058 (0.998)	-0.0068 (0.977)	-0.0244 (0.979)	-0.0284 (0.963)	0.4940 (0.500)	0.4731 (0.498)
$E[Y_1 D = 1]$	0.1306 (1.008)	0.0551 (1.018)	0.1019 (0.991)	0.0416 (0.969)	0.2313 (1.049)	0.1373 (1.014)	0.4970 (0.499)	0.5157 (0.509)

Note: The mean simulated outcomes (i.e., Model) were calculated using 40,000 observations generated from the estimated model. The Data columns contain the outcomes' mean at age 18 obtained from the KYPS. The variable Depression corresponds to a standardized index of depression symptoms. Smoking takes the value of 1 if the respondent smoked a cigarette at least once during the last year. Sick takes the value of 1 if the respondent reports having felt physically ill during the last year. Life Satisfied takes the value of 1 if the respondent reports being happy with the way she is leading her life. Variable College takes the value of 1 if the respondent attends college by age 19. Mental Health takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. The Stress variables are standardized indexes that collect stress symptoms triggered by different sources, namely friends, parents, school, and poverty. Stress: Total aggregates the four triggers of stress. Standard errors in parentheses.

TABLE I.2. Outcome equations (age 18, τ_2) by bullying status D (age 15, τ_1).

	(1)		(2)		(3)		(4)		(5)		(6)	
	Depression		Drinking		Smoking		Life Satisfaction		Feeling Sick		Mental Health Problems	
	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$
<i>Bullied</i>	-0.294 (0.031)	-0.377 (0.080)	-0.134 (0.050)	-0.083 (0.135)	-0.124 (0.033)	0.124 (0.094)	0.254 (0.050)	0.365 (0.131)	-0.048 (0.026)	-0.084 (0.101)	-0.040 (0.020)	-0.188 (0.087)
Cognitive Skills	0.029 (0.022)	0.006 (0.060)	0.002 (0.015)	-0.061 (0.040)	-0.019 (0.010)	-0.159 (0.029)	0.016 (0.015)	0.066 (0.039)	-0.001 (0.008)	0.008 (0.029)	0.009 (0.006)	0.029 (0.025)
Observations	2446	2881	2881	2881	2881	2881	2881	2881	2571	2571	2571	2571
	(7)		(8)		(9)		(10)		(11)		(12)	
	College [†]		Stress: Friends		Stress: Parent		Stress: School		Stress: Total		Stress: Poverty	
	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$	$D = 0$	$D = 1$
<i>Bullied</i>	-0.047 (0.049)	0.192 (0.144)	-0.488 (0.103)	-1.110 (0.342)	-0.288 (0.103)	-0.047 (0.317)	-0.212 (0.101)	-0.527 (0.300)	-0.598 (0.102)	-0.994 (0.313)	-0.640 (0.104)	-0.777 (0.298)
Noncogn Skills	0.080 (0.015)	0.059 (0.042)	0.128 (0.032)	0.229 (0.098)	0.220 (0.032)	0.152 (0.092)	0.338 (0.031)	0.391 (0.088)	0.261 (0.032)	0.338 (0.091)	0.087 (0.032)	0.170 (0.086)
Cognitive Skills	2449	2564	2564	2564	2564	2564	2564	2564	2564	2564	2564	2564
Observations	<p><i>Note:</i> This table presents the estimated coefficients of the outcome equations $Y_{1,t} = \mathbf{X}_{1,t}\beta_{1,t} + \alpha_{1,t} + e_{1,t}$ if $D_{\tau_1} = 1$ and $Y_{0,t} = \mathbf{X}_{0,t}\beta_{0,t} + \alpha_{0,t} + e_{0,t}$ if $D_{\tau_1} = 0$. "Depression" corresponds to a standardized index of depression symptoms. "Drink" takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year. "Smoke" takes the value of 1 if the respondent smoked a cigarette at least once during the last year. "Life Satisfaction" takes the value of 1 if the respondent reports being happy with the way she is leading her life. "Sick" takes the value of 1 if the respondent reports having felt physically ill during the last year. "Mental Health" takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. Variable in College takes the value of 1 if the respondent attends college by age 19. The Stress variables are standardized indexes that collect stress symptoms triggered by different sources, namely friends, parents, school, and poverty. Stress: Total aggregates the four triggers of stress. Controls not show: Age in months, gender, number of older and younger siblings, family income, rurality indicator, biparental household, and Father's education. Complete estimates available upon request. Columns headed as 1 collect the coefficients for those who were bullied at age 15. Columns headed as 0 collect the coefficients for those who were not bullied at age 15. Standard errors in parentheses. [†] College attendance is measured at age 19.</p>											

TABLE I.3. Treatment effects: Outcomes at age 18 (τ_2) of being bullied at age 15 (τ_1).

	Depression	Smoking	Drinking	Sick	Mental Health	Satisfied
ATE	0.0615 (0.0639)	0.0272 (0.0234)	0.0059 (0.0327)	0.0630 (0.0227)	0.0278 (0.0192)	-0.0243 (0.0326)
TTE	0.0522 (0.0593)	0.0092 (0.0234)	0.0197 (0.0316)	0.0522 (0.0209)	0.0386 (0.0168)	-0.0224 (0.0307)
	inCollege	Stress: Friends	Stress: Parent	Stress: School	Stress: Poverty	Stress: Total
ATE	-0.0417 (0.0334)	0.2339 (0.0817)	0.1465 (0.0748)	0.0985 (0.0726)	0.0615 (0.0723)	0.1850 (0.0768)
TTE	-0.0459 (0.0325)	0.2803 (0.0720)	0.1223 (0.0682)	0.1377 (0.0641)	0.0928 (0.0647)	0.2180 (0.0674)

Note: Standard errors in parenthesis. This table presents the estimated treatment parameters:

$$ATE = \iint \mathbb{E}[Y_{1,\tau_2} - Y_{0,\tau_2} | \xi^{NC}, \xi^C] dF_{\theta^{NC}, \theta^C}(\xi^{NC}, \xi^C)$$

and

$$TT = \iint \mathbb{E}[Y_{1,\tau_2} - Y_{0,\tau_2} | \xi^{NC}, \xi^C, D_{\tau_1} = 1] dF_{\theta^{NC}, \theta^C}(\xi^{NC}, \xi^C)$$

The variable *Depress* corresponds to a standardized index of depression symptoms. Smoking takes the value of 1 if the respondent smoked a cigarette at least once during the last year. Drinking takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year. Sick takes the value of 1 if the respondent reports having felt physically ill during the last year. Mental Health takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. Satisfied takes the value of 1 if the respondent reports being happy with the way she is leading her life. The variable *inCollege* takes the value of 1 if the respondent attends college by age 19. The Stress variables are standardized indexes that collect stress symptoms triggered by different sources, namely friends, parents, school, and poverty. Stress: Total aggregates the four triggers of stress. [†] College attendance is measured at age 19.

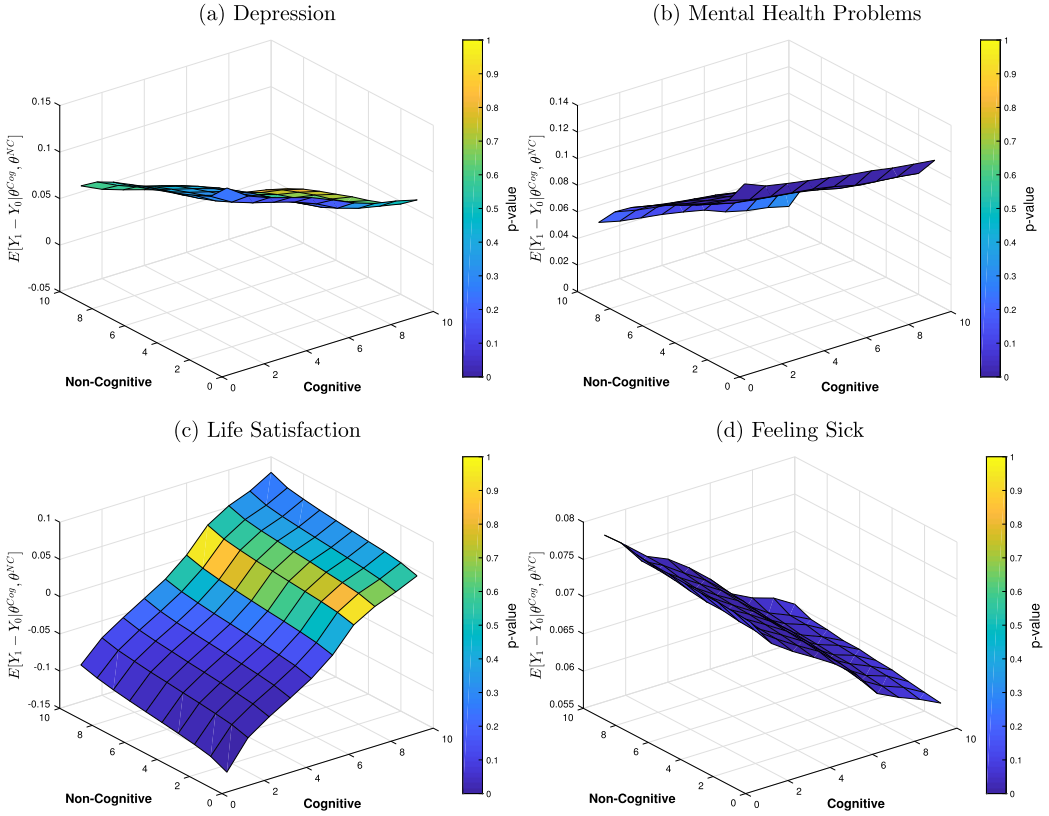


FIGURE I.2. Being bullied at 15 on health outcomes at 18. *Note:* All panels present the $ATE(\theta^{NC}, \theta^C) = \mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills. The depression variable is a standardized aggregated index of depression symptoms. The variable Mental Health Problems takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. Life Satisfaction takes the value of 1 if the respondent reports being happy with the way she is leading her life. The variable Sick takes the value of 1 if the respondent reports having felt physically ill during the last year.

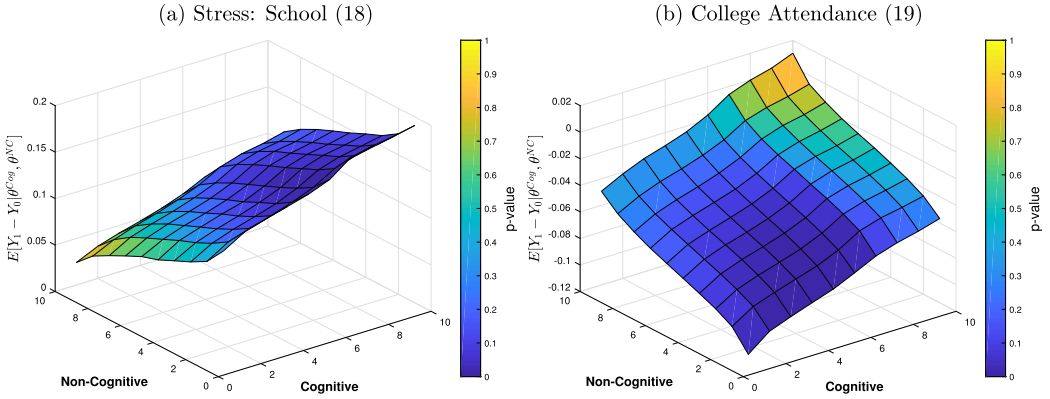


FIGURE I.3. Being bullied (15) on educational outcomes (18 and 19). *Note:* Panels present the $ATE(\theta^S) = \mathbb{E}[Y_1 - Y_0 | \theta^S]$ for $S = \{Noncognitive, Cognitive\}$. The y-axes contain the deciles of each dimension of skills. Stress: school is a variable that aggregates stress symptoms triggered by situations related with school. College Attendance takes the value of 1 if the respondent attends college by age 19.

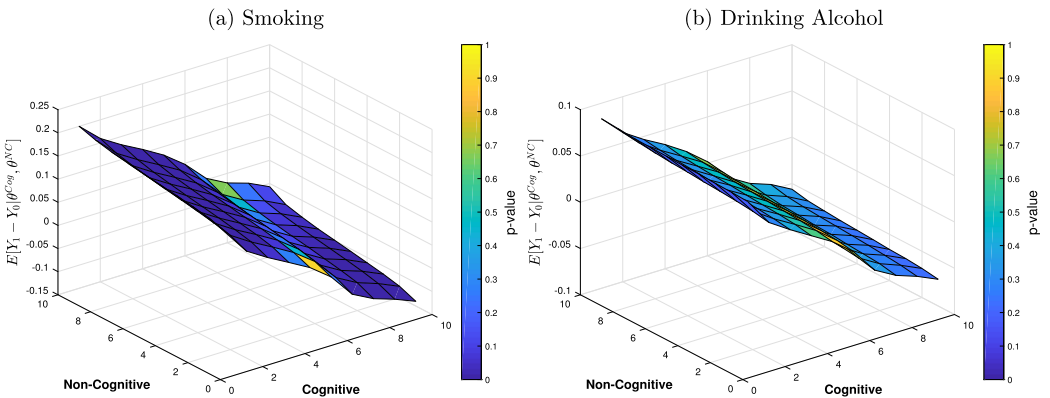


FIGURE I.4. Being bullied (15) on take-up of risky behaviors (18). *Note:* All panels present the $ATE(\theta^{NC}, \theta^C) = \mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills. Smoking takes the value of 1 if the respondent smoked a cigarette at least once during the last year. The variable Drinking takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year.

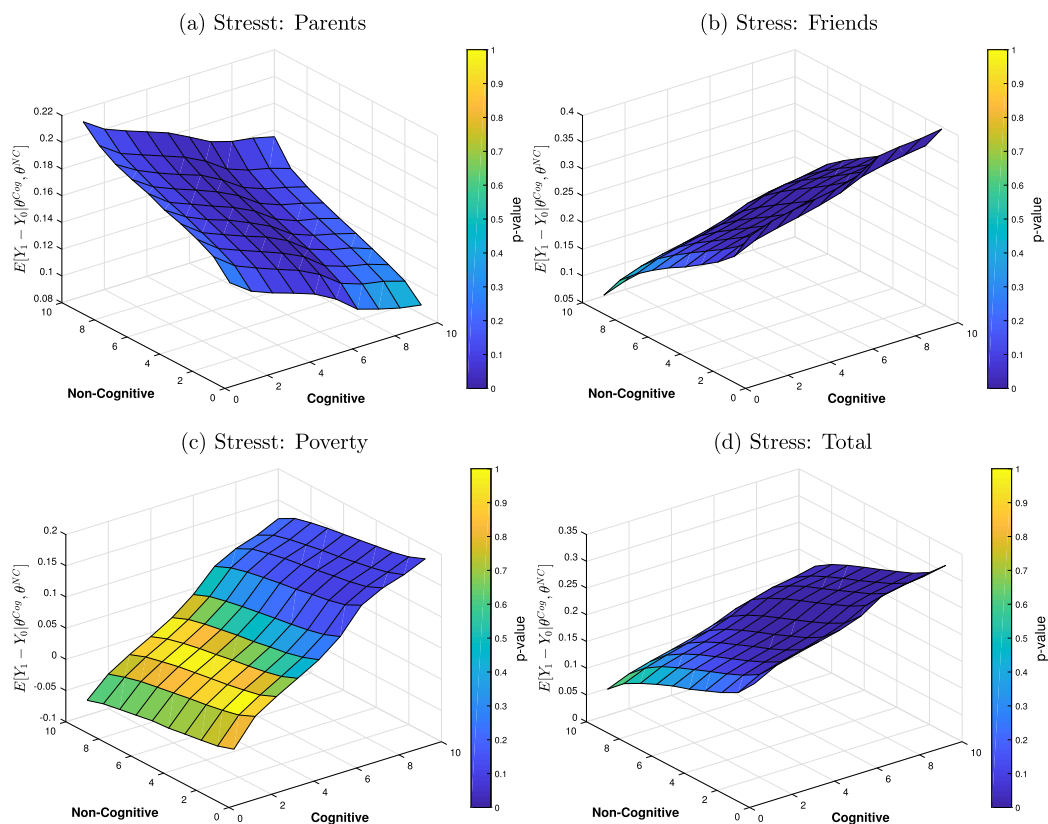


FIGURE I.5. Being bullied (15) on Stress (18). *Note:* All panels present the $ATE(\theta^{NC}, \theta^C) = \mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills. Stress: Parents is a variable that aggregates stress symptoms triggered by the relation of the respondent with her parents. Stress: Poverty is a variable that aggregates stress symptoms triggered by situations related with economic difficulties. Friends is a variable that aggregates stress symptoms triggered by situations related with friends and social relations. Stress: Total is a variable that aggregates stress symptoms triggered by situations related with friends, parents, school, and poverty.

APPENDIX J: TREATMENT EFFECTS ON THE TREATED

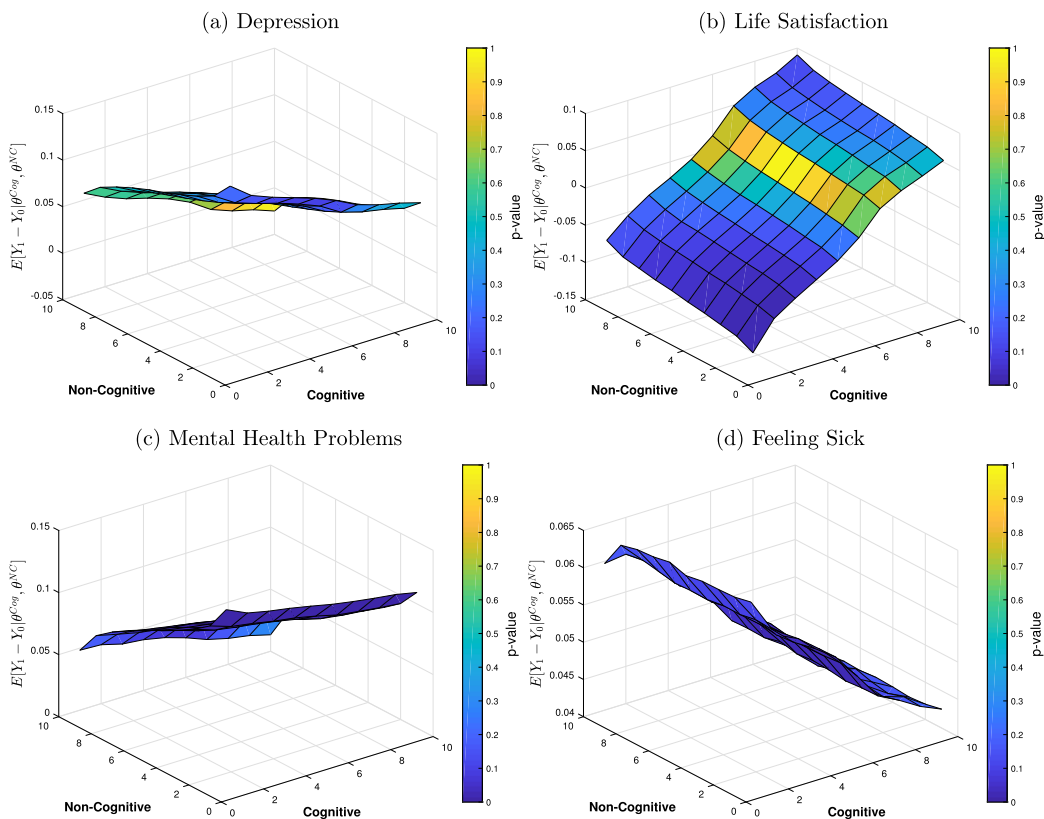


FIGURE J.1. Being bullied at 15 on health outcomes at 18. *Note:* All panels present the $TTE(\theta^{NC}, \theta^C) = \mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C, D_{\tau_0} = 1]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of non-cognitive and cognitive skills. The depression variable is a standardized aggregated index of depression symptoms. The variable Mental Health Problems takes the value of 1 if the respondent has been diagnosed with psychological or mental problems. Life Satisfaction takes the value of 1 if the respondent reports being happy with the way she is leading her life. The variable Sick takes the value of 1 if the respondent reports having felt physically ill during the last year.

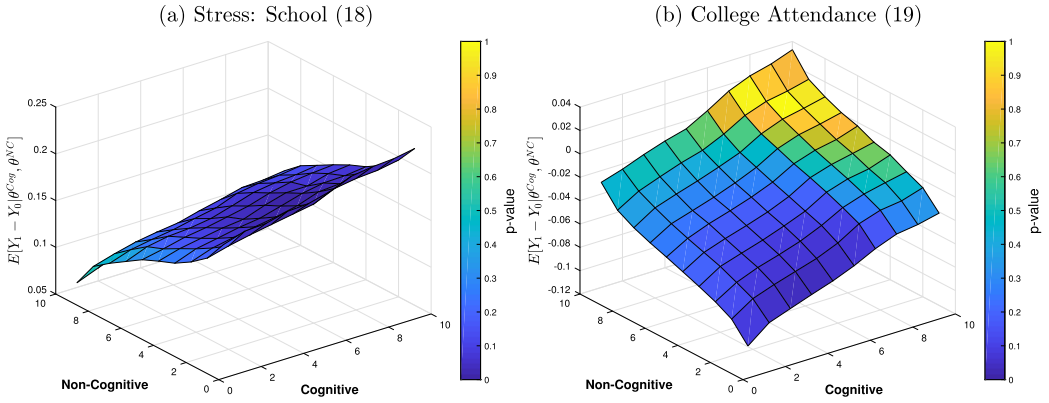


FIGURE J.2. Being bullied (15) on educational outcomes (18 and 19). *Note:* All panels present the $TTE(\theta^{\text{NC}}, \theta^{\text{C}}) = \mathbb{E}[Y_1 - Y_0 | \theta^{\text{NC}}, \theta^{\text{C}}, D_{\tau_0} = 1]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of non-cognitive and cognitive skills. Stress: school is a variable that aggregates stress symptoms triggered by situations related with school. College Attendance takes the value of 1 if the respondent attends college by age 19.

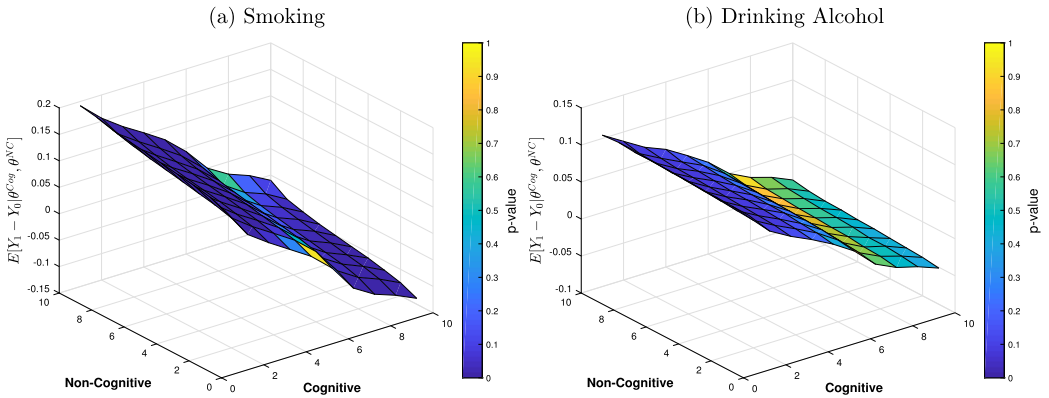


FIGURE J.3. Being bullied (15) on take-up of risky behaviors (18). *Note:* All panels present the $TTE(\theta^{\text{NC}}, \theta^{\text{C}}) = \mathbb{E}[Y_1 - Y_0 | \theta^{\text{NC}}, \theta^{\text{C}}, D_{\tau_0} = 1]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of non-cognitive and cognitive skills. Smoking takes the value of 1 if the respondent smoked a cigarette at least once during the last year. The variable Drinking takes the value of 1 if the respondent drank an alcoholic beverage at least once during the last year.

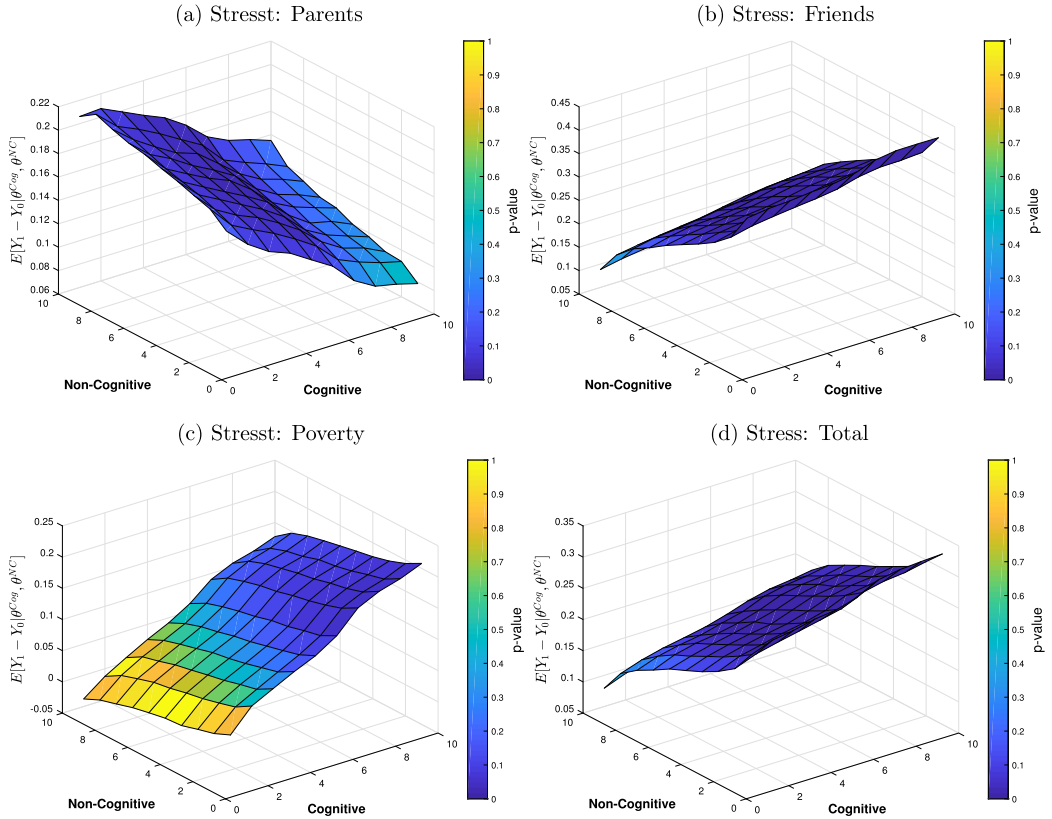


FIGURE J.4. Being bullied (15) on stress (18). *Note:* All panels present the $TTE(\theta^{NC}, \theta^C) = \mathbb{E}[Y_1 - Y_0 | \theta^{NC}, \theta^C, D_{\tau_0} = 1]$ in the z-axis product of 40,000 simulations based on the findings of the empirical model. The x-axis and y-axis contain the deciles of noncognitive and cognitive skills. Stress: Parents is a variable that aggregates stress symptoms triggered by the relation of the respondent with her parents. Stress: Poverty is a variable that aggregates stress symptoms triggered by situations related with economic difficulties. Friends is a variable that aggregates stress symptoms triggered by situations related with friends and social relations. Stress: Total is a variable that aggregates stress symptoms triggered by situations related with friends, parents, school, and poverty.

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