Online Appendix to How Skills and Parental Education Expectations Influence Human Capital Acquisition and Early Labour Market Return to Human Capital in Canada

Michael J. Kottelenberg
Huron University College

Steven F. Lehrer
Queen's University, NYU-Shanghai and NBER

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Abstract

This is the online appendix for Kottelenberg and Lehrer (2019). We include five sections. We provide a description of the variables, and their construction, in the first section. Second we provide the estimation results simulations not included in Kottelenberg and Lehrer (2019) for the employment dependent variables. The third section presents estimates and simulations of a two factor model in which the parenting factor is absent. In section 4, we reestimate the two factor model with a relax assumptions on the correlation between the factors and provide a description of the imputation procedure used in these estimates and the main text. In the final section we test the sensitivity of our model to the inclusion and exclusion of several key variables.

A Description of Variables

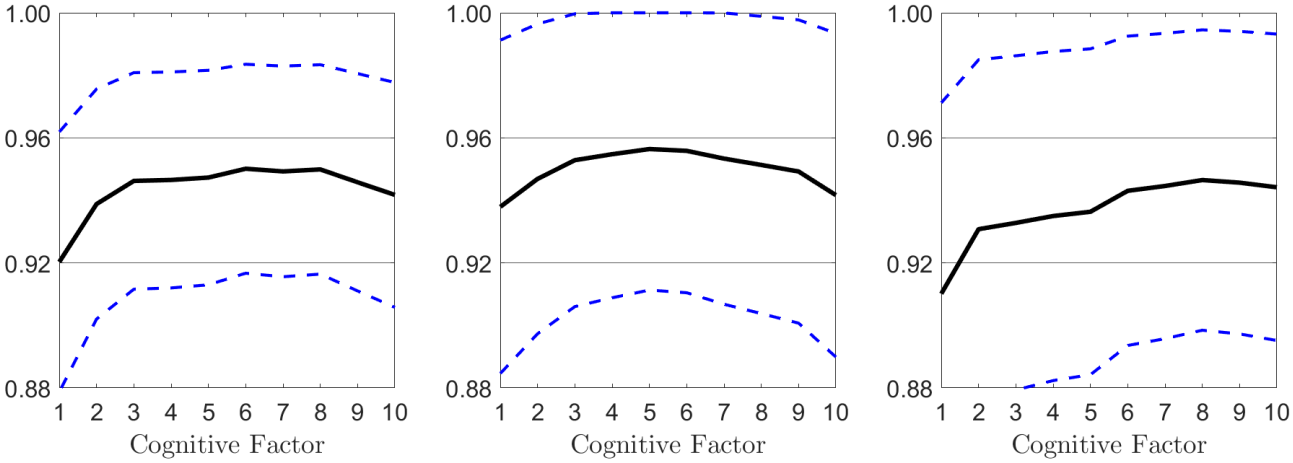
Cognitive Factor Variables	
PISA Reading Score:	PISA test measuring student's reading literacy. The test assesses student ability to retrieve information from, understand and interpret, and reflect upon and evaluate written texts.
PISA Math Score:	PISA test measuring student's mathematical literacy. The test assesses student knowledge of rules and theorem and their ability to put mathematical knowledge to problem solve within a variety of everyday contexts.
PISA Science Score:	PISA test measuring student's scientific literacy. The test assess understanding of important scientific concepts alongside the ability to answer question via scientific evidence based inquiry and to apply these to the evaluation of other aspects of science and technology.
Non-Cognitive Factor Variables	
Self-Efficacy Scale:	Students belief about ability to understand the most difficult material presented in readings, about their ability to do an excellent job on assignments and test, and about their ability to master the skills being taught.
Sense of Mastery Scale:	Students feelings about being pushed around in life, about the dependency of their future on themselves, about their ability to solve their own problems, about their ability to change important things in their life, about their helpless in dealing with the problems of life, about their control over the things that happen to them, and about their ability to do just about anything they set their minds to.
Self Esteem Scale:	Students feelings about being a person of worth, at least on an equal basis with others, that they have a number of good qualities, that, all in all, they tend to feel that they are a failure, about their ability to do things as well as most other people, that they do not have much to be proud of, that they have a positive attitude toward themselves, that, on the whole, they are satisfied with themselves, about wishing they could like myself more, about being useless at times, and that at times they think they are no good at all.
Parental Factor Variables	
Parent Educational Aspiration for Youth	Parent's answer to: "What is the highest level of education that you hope child will get?" Coded with four possible values: 1, less than high school; 2, high school diploma; 3 trade, vocational or college diploma; 4, university degree or beyond.
Importance of Post-Secondary Education (Parent's Answer):	Parent's answer to: "How important is it to you that child gets more education after high school?" Coded with four possible answers: not, slightly, fairly, and very important.
Importance of Post-Secondary Education (Youth's Answer):	Youth's answer to: "How important is it to your parent(s) that you get more education after high school? " Coded with four possible answers: not, slightly, fairly, and very important.
Other Covariates	
Family Income:	Income derived from wages/salaries, self employment, and governmental transfers and social assistance.
Wealth Index:	Student reported availability of dishwasher, room of their own, educational, software, link to the internet, number of cell phones, television sets, computers, motor cars, and bathrooms in home.
	continued on the next page...

Other Covariates	
Non-Traditional Family:	A family that is not made up of two biological parents.
Parental money for Post-Secondary Education:	Has the parent ever taken a specific action towards ensuring that a child will have money for education past high school.
Planning for Higher Education Among Friends:	How many of the student's closes friends are planning to further education or training after high school. Coded with four possible answers none, some, most and all of them.

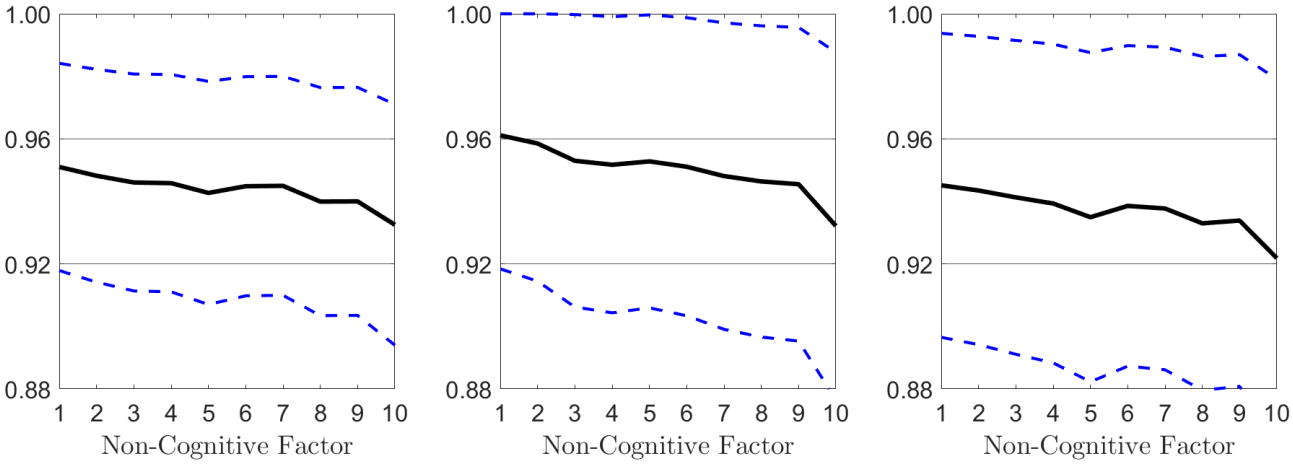
B Simulations of Employment Outcomes

Figure B.1: Simulation of Employment Status by Deciles of the Factor Distribution using 3 Factor Parameter Estimates

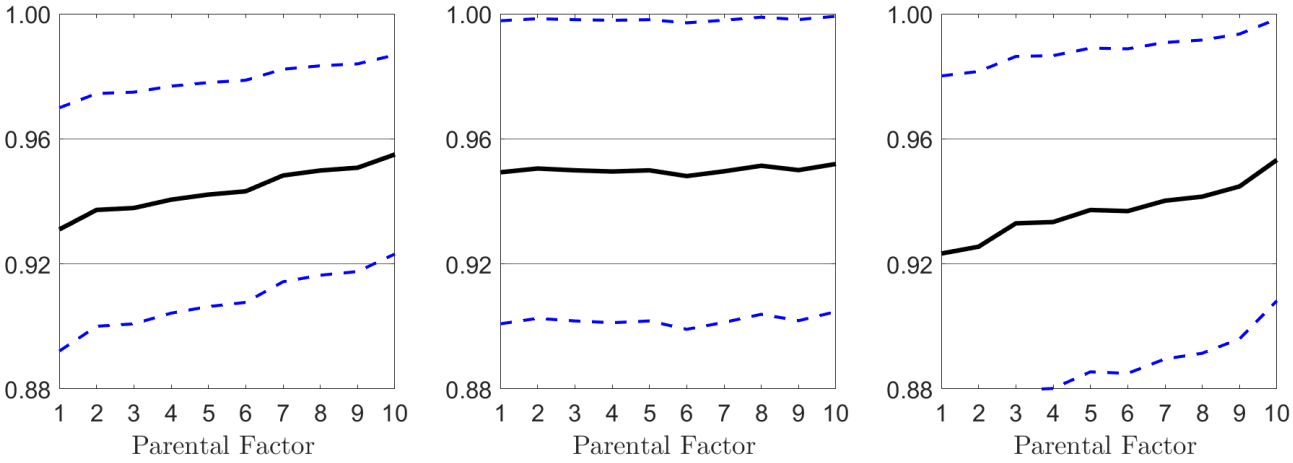
(a) Full (b) Males (c) Females



(d) Full (e) Males (f) Females

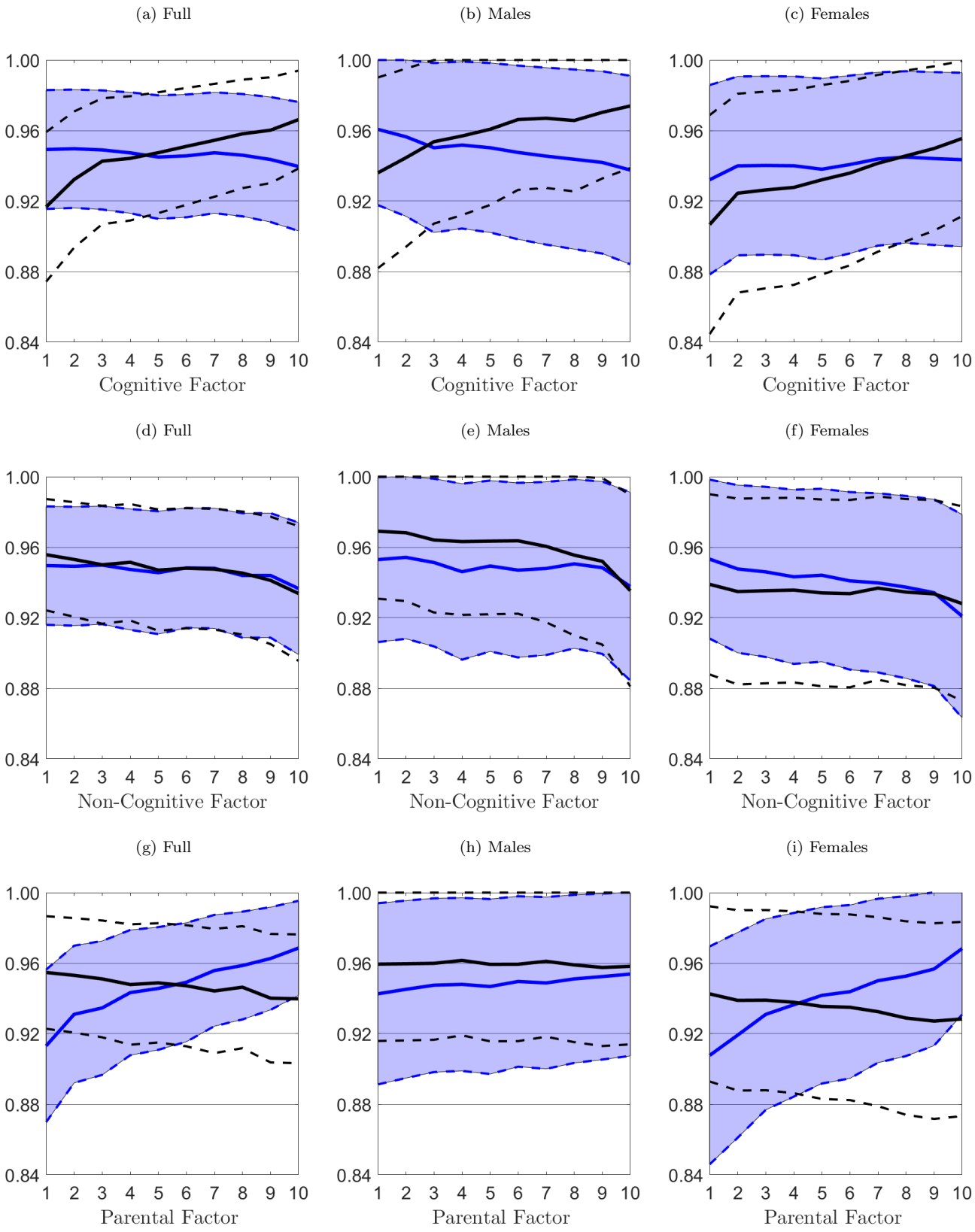


(g) Full (h) Males (i) Females



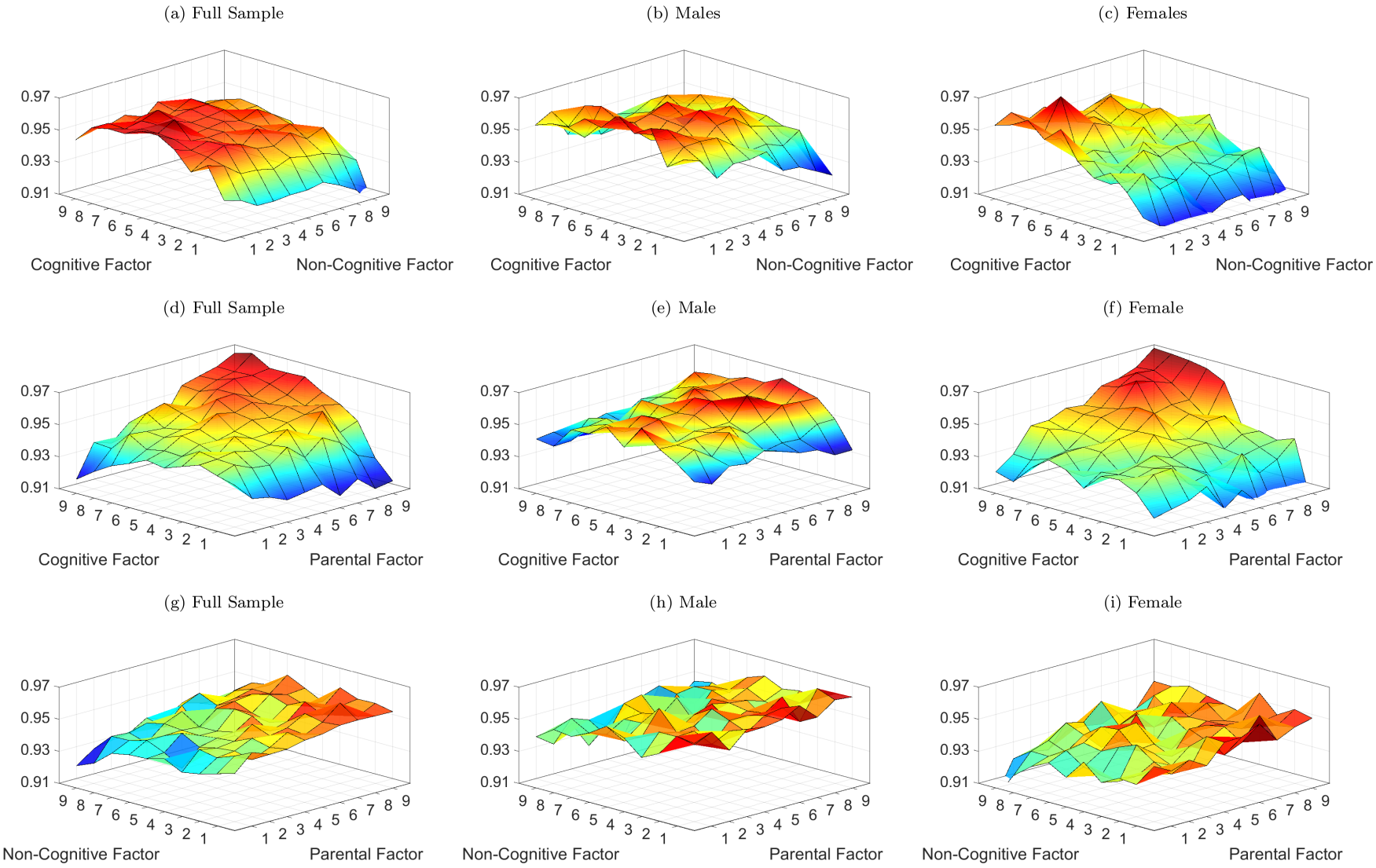
—Note: The solid line represents average employment within each decile of the factor distribution calculated using simulations based on the estimated parameters for the given sample of the three factor model presented in the main text. The dashed line are the 95% confidence intervals for these estimates.

Figure B.2: Simulation of Employment by University Completion Status by Deciles of the Factor Distribution using 3 Factor Parameter Estimates



—Note: In this figure we present the average employment within each decile of the factor by educational decision. The presented data are based on the estimated parameters for the given sample of the three factor model presented in the main text. The estimates and 95% confidence intervals for those that completed university in the simulations are given by **blue lines and shaded area**. Similarity, the **black lines** give the same data for those who did not complete university.

Figure B.3: Simulation of Employment By Deciles of the Factor Distributions



—Note: In this figure we present the average employment (z-axis) within pairs of deciles from the two factors labeling the x-axis and y-axis. Each row of figures pairs a different combination of the factors. The presented data are based on the estimated parameters for the given sample.

C Basic Two Factor Model using Cognitive and Non-Cognitive Factors

In this section, we present the results of the estimation procedure using only the cognitive and non-cognitive factors. We include estimates of the test score equations in Table C.1, the decision equations in Table C.2, and the outcomes in Table C.3. In this case we present several extra outcomes, whether a youth had used employment insurance or volunteered in the last month, but only for the sample of youth who have completed 3 PISA tests and have complete cases.

The estimates in the test and decisions equations remain largely unchanged in terms of the influence of the factors in question. The coefficients for the impact of the factors on university completion from the two factor model are 0.855 and 0.263 for the cognitive and non-cognitive factors respectively. These compare to estimates of 0.882 and 0.267 from the three factor model. The majority of the estimated coefficients in these equation share similar sized differences. In terms the impact of the estimated factors on income, we note that in the absence of the parental factor that non-cognitive skills are much more important for university graduates. The factor variables are otherwise of the same sign and significance as the estimates in the three factor analysis. When examining the employment outcome we find this to also be true.

Figures C.1–C.4 present the simulations of the decision and outcomes as they vary with changes in the factor distributions. In Figure C.1 we note that in the absence of the parental factor their is less variance in the completion of university along the cognitive factor. At the first deciles the completion rate is around %35 and in the 10th deciles it is just under %80 compared to %20 and %95 in the estimation with all three factors. The non-cognitive outcome impact on the education decision is not largely unaffected in comparing the estimation strategies. In comparison to the analagous figures from the three factor estimation we see in figure C.2b a much larger impact of the non-cognitive factors on income at age 25 and in figure C.3b that this effect is mostly driven by university graduates. This is not surprising as we noted above the parameter estimate of the impact of non-cognitive skills on income for graduates becomes not significant in this factor become insignificant in the 3 factor model.

With regards to the additional outcomes presented in this appendix we find a relationship between the use of employment insurance the skills. Figures C.2e and C.2f suggests that there is little connection between the factors and employment insurance. Examination of the parameter estimates in table C.3 and highlighted in the simulations in figures C.3e and C.3f suggest that the non-cognitive is statistically significant and that in case of both factors sign of the effect is different for each educational statuses. Higher skill level alongside university completion suggests less use of employment insurance, the opposite is true for those who have not completed university. Finally, we see a positive but non-significant correlation between both skills and volunteering at age 25. Figure C.4d highlights the joint impact of these skills.

Table C.1: Test Score Equations from 2 Factor Estimates without Correlated Factors

	PISA Reading	PISA Math	PISA Science	Self-Efficacy	Sense of Mastery	Self-Esteem
Cogntive Factor	1.294	0.923	1.000	—	—	—
	(0.000)***	(0.000)***				
Non-Cognitive Factor	—	—	—	0.579	1.199	1.00
				(0.000)***	(0.000)***	
Female	0.341	-0.0928	-0.067	-0.240	-0.059	-0.173
	(0.000)***	(0.026)**	(0.106)	(0.000)***	(0.165)	(0.000)***
Family Income	0.002	0.001	0.001	0.000	-0.001	-0.001
	(0.000)***	(0.098)*	(0.109)	(0.534)	(0.17)	(0.153)
Family Wealth	-0.002	0.027	-0.028	0.012	0.033	0.057
	(0.96)	(0.366)	(0.361)	(0.722)	(0.267)	(0.094)*
Years of Education Parents (Max)	0.104	0.072	0.084	0.051	0.010	0.011
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.317)	(0.298)
Non-Traditional Family	0.220	0.123	0.225	-0.037	-0.185	-0.179
	(0.014)**	(0.109)	(0.003)***	(0.657)	(0.012)**	(0.036)**
Number of Siblings	0.009	0.013	0.003	0.016	0.006	0.013
	(0.728)	(0.548)	(0.9)	(0.497)	(0.778)	(0.578)
Visible Minority	-0.154	-0.147	-0.216	-0.119	-0.120	0.026
	(0.111)	(0.088)*	(0.016)**	(0.247)	(0.212)	(0.803)
Immigrant	-0.158	-0.061	0.000	-0.004	0.017	0.001
	(0.026)**	(0.33)	(0.995)	(0.964)	(0.827)	(0.986)
Home Educational Resources	0.088	0.063	0.083			
	(0.001)***	(0.008)***	(0.000)***			
Region: Atlantic	0.009	0.157	-0.060	-0.123	-0.094	-0.193
	(0.917)	(0.031)**	(0.416)	(0.133)	(0.203)	(0.02)**
Region: West	0.319	0.392	0.282	0.004	-0.031	-0.023
	(0.000)***	(0.000)***	(0.000)***	(0.957)	(0.657)	(0.769)
Region: Quebec	0.212	0.447	0.208	-0.077	-0.021	-0.051
	(0.016)**	(0.000)***	(0.01)***	(0.389)	(0.793)	(0.57)
Constant	-1.404	-1.004	-0.995	-0.352	0.097	0.170
	(0.000)***	(0.000)***	(0.000)***	(0.044)**	(0.568)	(0.331)

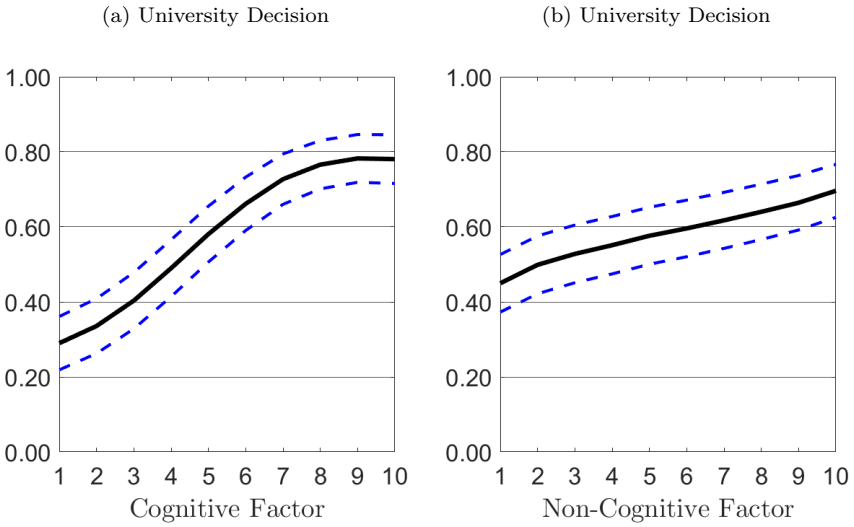
—Note: We present the estimates for the measurement system linking the latent factors and the test measures. Standard errors are presented in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Table C.2: Decision Equation from 2 Factor Estimates without Correlated Factors

University Completion	
Cognitive Factor	0.855
	(0.000)***
Non-Cognitive Factor	0.283
	(0.000)***
Parental money for Post-Secondary Education (Y/N)	0.230
	(0.006)***
Importance of Post-Secondary Education	0.310
(Youth's answer about the parent's)	(0.000)***
Female	0.537
	(0.000)***
Family Income	0.002
	(0.133)
Family Wealth	0.090
	(0.12)
Parental Education (Max)	0.172
	(0.000)***
Planning for Higher Education Among Friends	0.254
	(0.000)***
Immigrant Status	-0.357
	(0.001)***
Non-Traditional Family	0.294
	(0.038)**
Region: Atlantic	0.375
	(0.009)***
Region: West	0.149
	(0.264)
Region: Quebec	-0.189
	(0.216)
Constant	-4.577
	(0.000)***

—Note: We present the estimates and standard errors in parentheses of decision equation. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Figure C.1: Simulation of University Decision by Deciles of the Factor Distribution using 2 Factor Parameter Estimates without Correlated Factors



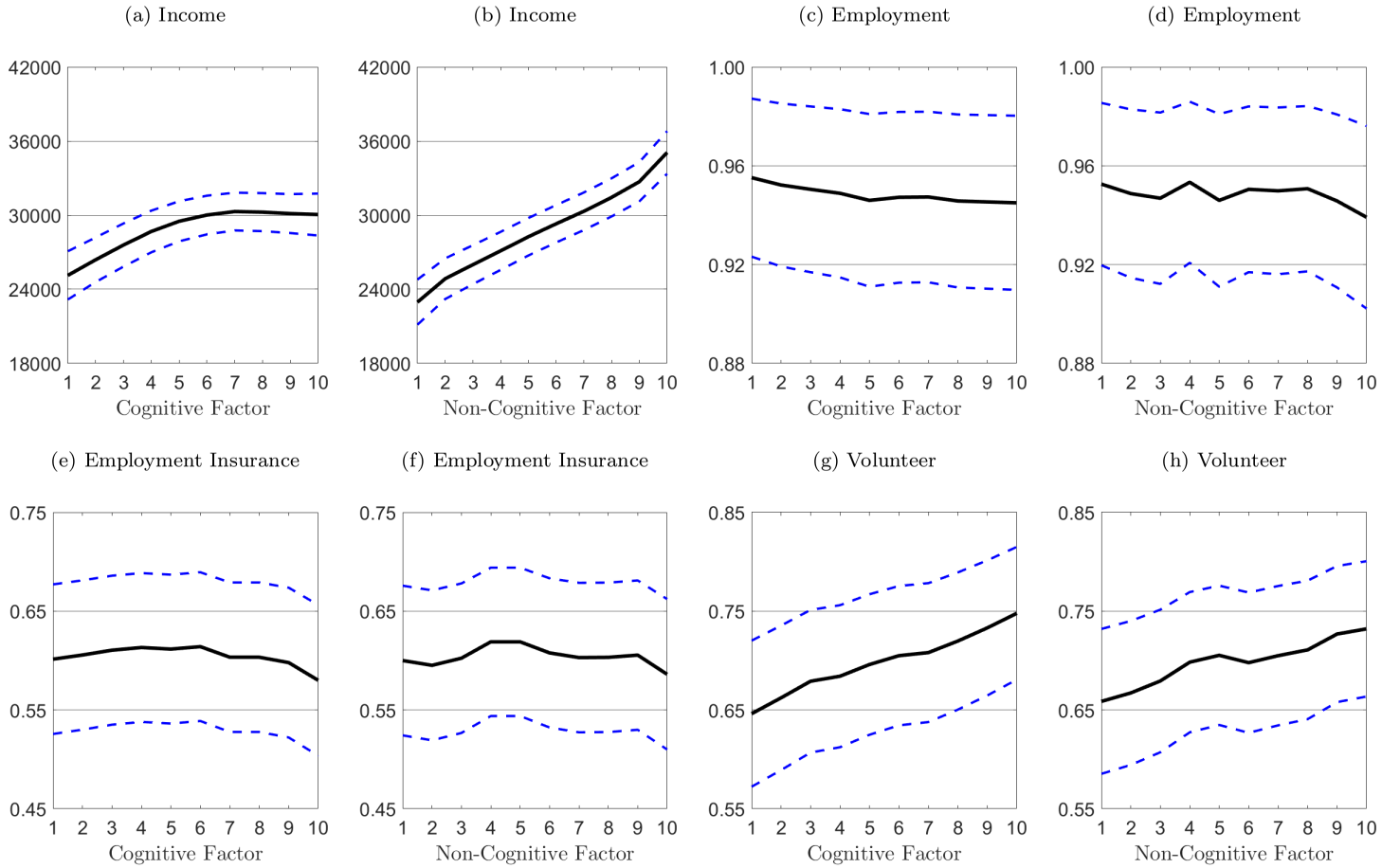
—Note: The solid line represents the sample average of university completion within each decile of the factor distribution calculated using simulations of the model based on the estimated parameters. The dashed line are the 95% confidence intervals for these estimates.

Table C.3: Outcome Equation from 2 Factor Model without Correlated Factors

Outcome Equation								
	Income		Employed		Volunteer (Once a Month)		Employment Insurance	
	D=1	D=0	D=1	D=0	D=1	D=0	D=1	D=0
Cognitive Factor	392.41	-361.20	-0.015	0.043	0.067	-0.001	-0.033	0.020
	(0.826)	(0.843)	(0.484)	(0.097)*	(0.073)*	(0.973)	(0.195)	(0.584)
Non-Cognitive Factor	2812.70	2167.09	-0.021	-0.005	0.031	0.010	-0.044	0.073
	(0.055)*	(0.273)	(0.196)	(0.813)	(0.298)	(0.754)	(0.023)**	(0.049)**
Female	-3660.44	-9257.04	0.006	0.034	0.062	0.075	0.005	-0.065
	(0.059)*	(0.000)***	(0.797)	(0.325)	(0.121)	(0.077)*	(0.841)	(0.176)
Experience	2489.43	-244.67						
	(0.012)**	(0.831)						
Experience Squared	-373.60	64.67						
	(0.000)***	(0.509)						
Region: Atlantic	-3303.49	-7513.96	0.014	-0.070	0.041	0.074	0.053	0.166
	(0.165)	(0.011)**	(0.649)	(0.104)	(0.408)	(0.157)	(0.116)	(0.005)***
Region: Quebec	-1852.92	-7984.22	0.000	-0.084	-0.082	0.006	0.012	0.104
	(0.505)	(0.008)***	(0.993)	(0.051)*	(0.148)	(0.906)	(0.752)	(0.08)*
Region: West	913.65	1329.59	-0.043	-0.080	-0.002	0.104	-0.009	0.058
	(0.68)	(0.625)	(0.123)	(0.041)**	(0.96)	(0.028)**	(0.765)	(0.284)
Married	18436.22	9980.68	0.069	0.014	0.034	0.064	0.003	-0.050
	(0.000)***	(0.003)***	(0.127)	(0.773)	(0.649)	(0.272)	(0.96)	(0.444)
Married * Female	-19645.98	-13219.38	-0.156	-0.183	-0.055	-0.067	0.110	0.165
	(0.000)***	(0.004)***	(0.005)***	(0.005)***	(0.544)	(0.399)	(0.077)*	(0.066)*
Common Law	8418.59	12738.34	-0.048	0.080	-0.058	-0.026	-0.020	-0.040
	(0.01)***	(0.000)***	(0.258)	(0.05)**	(0.4)	(0.593)	(0.666)	(0.483)
Common Law * Female	5.78	-12023.84	0.103	-0.113	-0.022	-0.048	0.048	0.129
	(0.999)	(0.004)***	(0.047)**	(0.063)*	(0.795)	(0.518)	(0.408)	(0.124)
Immigrant	158.81	-1341.15	-0.019	-0.043	0.003	-0.030	0.032	-0.047
	(0.944)	(0.649)	(0.519)	(0.321)	(0.947)	(0.56)	(0.312)	(0.425)
Visible Minority	-4655.09	-5839.47	-0.094	-0.026	-0.054	0.095	-0.046	-0.057
	(0.133)	(0.193)	(0.015)**	(0.688)	(0.4)	(0.222)	(0.284)	(0.519)
Number of Children	-14956.81	-5233.30	0.083	-0.091	0.629	-0.088	-0.095	-0.133
	(0.493)	(0.258)	(0.779)	(0.173)	(0.193)	(0.281)	(0.771)	(0.15)
Number of Children * Female	9659.93	-6975.28	-0.356	-0.218	-1.093	0.037	-0.075	0.128
	(0.683)	(0.244)	(0.265)	(0.011)**	(0.037)**	(0.722)	(0.831)	(0.283)
Urban Community	4386.57	1147.93	0.016	0.006	0.061	0.074	0.075	0.130
	(0.028)**	(0.537)	(0.527)	(0.823)	(0.143)	(0.023)**	(0.008)***	(0.000)***
Constant	29126.84	36210.19	0.940	1.017	0.348	0.089	0.073	0.191
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.175)	(0.066)*	(0.011)**

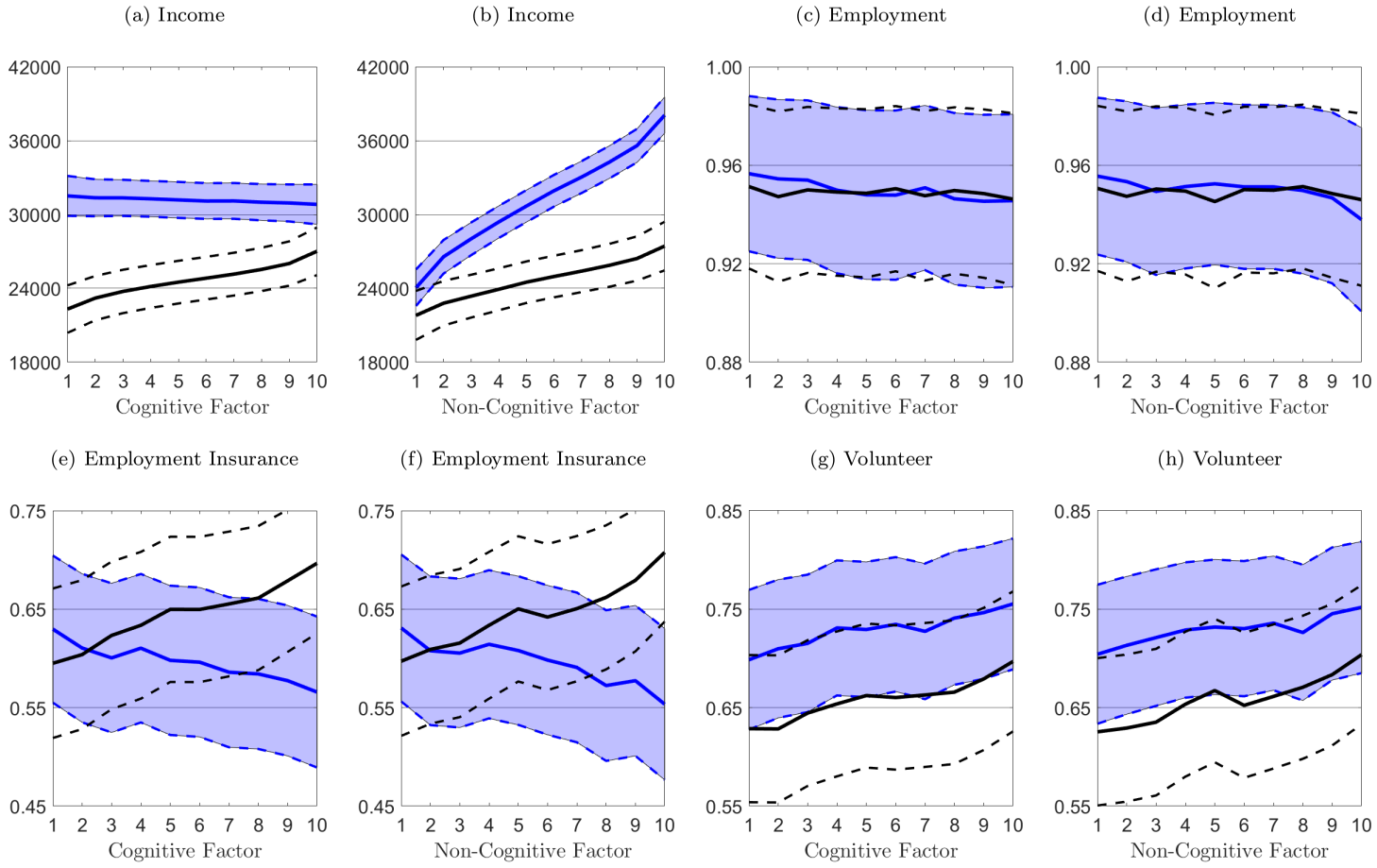
—Note: We present the estimates and standard errors in parentheses of outcome equation for four outcome variables. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Figure C.2: Simulation of Outcomes by Deciles of the Factor Distribution using 2 Factor Parameter Estimates without Correlated Factors



—Note: For each outcome the solid line represents the sample average within each decile of the factor distribution calculated using simulations of the model based on the estimated parameters. The dashed line are the 95% confidence intervals for these estimates.

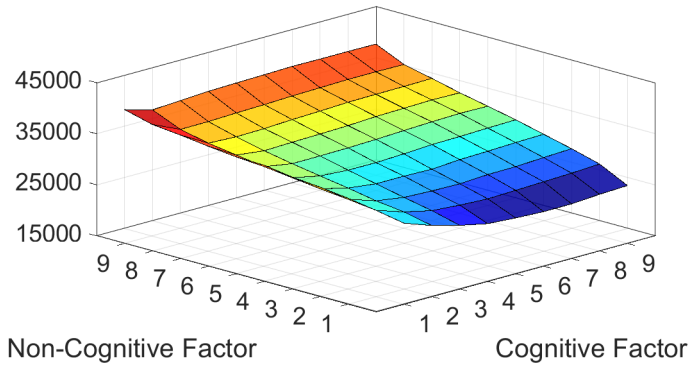
Figure C.3: Simulation of Outcomes by Deciles of the Factor Distribution using 2 Factor Parameter Estimates without Correlated Factors



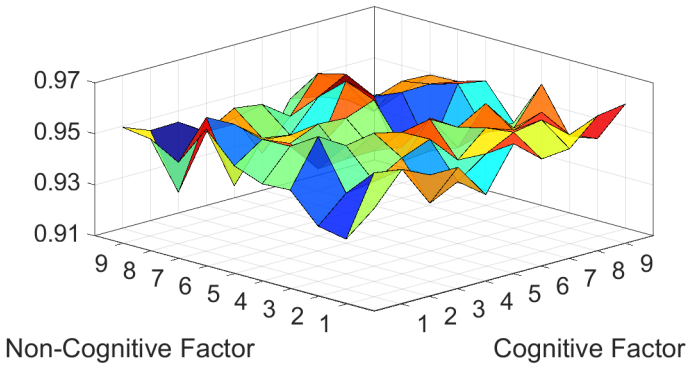
—Note: In this figure we present the average outcome within each decile of the factor by educational decision. The presented data are based on the estimated parameters for the given sample. The estimates and 95% confidence intervals for those that completed university in the simulations are given by **blue lines and shaded area**. Similarity, the **black lines** give the same data for those who did not complete university.

Figure C.4: Simulation of Outcomes By Deciles of the Factor Distributions using 2 Factor Parameter Estimates without Correlated Factors

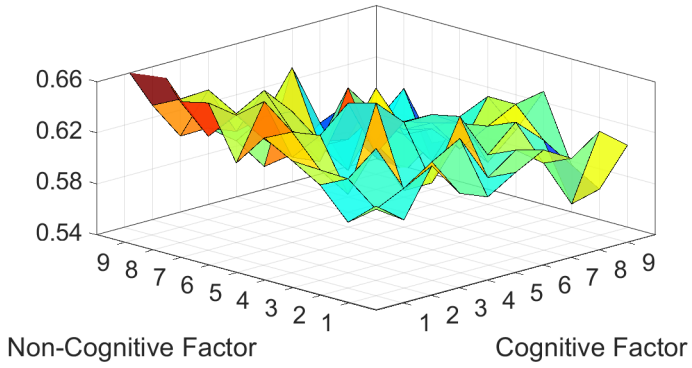
(a) Income



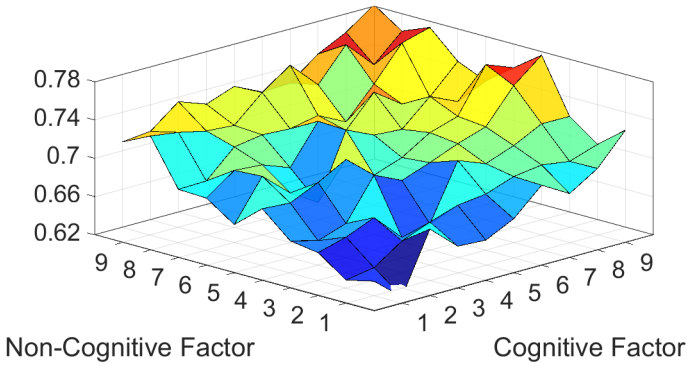
(b) Employment



(c) Employment Insurance



(d) Volunteers



—Note: In these figures we present the average outcome (z-axis) within pairs of deciles from the two factors labeling the x-axis and y-axis. The presented data are based on the estimated parameters for the given sample.

D Two Factor Model with Correlated Cognitive and Non-Cognitive Factors

To relax the independence assumption in the linear measurement system presented in equations () to () when estimating both the factor loadings (ψ_i^s) and factors' distributions ($f_i^s(\cdot)$), we change the structure of the measurement system as follows

$$T_j^c = \pi_j + \phi_j^c Q^c + \psi_j^c \theta^c + u_j^c \quad (1)$$
$$T_0^{nc} = \pi_j + \phi_j^{nc} Q^{nc} + \psi_j^{nc} \theta^{nc} + u_j^{nc} \quad (2)$$

for j = $\{0, 1, 2\}$. For computational considerations, we only examine two factors and we now allow each of the non-cognitive scores to depend on both the cognitive and non-cognitive factor. We continue to assume that the PISA scores are only a function of the cognitive factor alone. We also continue to impose the same normalization on the loading.

We repeated all of the analysis on the income and employment outcomes in the main text and in Appendix C, which focused on the simpler two-factor models. These results are presented in the remainder of this section of the Appendix. We highlight two main differences from these results and those in the main text. First, the non-cognitive skills play a smaller role in effecting university completion and cognitive skills plays a larger one, although a comparison of the simulations presented in figure 3 and D.2 shows few differences across the deciles of the factor distributions. Second, we find that the factors play a larger role in the determination of earnings at age 25, with the non-cognitive score being a significant coefficient in the income equation for both education levels. One explanation for this is that the cognitive and non-cognitive factor may be capturing some elements of the parental value on education variable used in the main text. We show the variance decomposition of the test score equations in figure D.1. We note that the cognitive factor helps to explains a small portion (between 3% and 25%) of the non-cognitive test scores.

This appendix also presents analysis of the main sample split by parental education level. We label those who have a university degree or more as high education and all others as low education. If we believe that parental education levels communicates the educational importance of the parent to the youth then these results strongly support are main analysis. We find that for youth from lower educational backgrounds cognitive skills are a much bigger determinant of completing a university degree whereas the impact on income of non-cognitive skills may be higher for those with university completing parents.

We present imputation results throughout appendix D and describe it our process here. One of the major sources of data loss in our analysis comes from the requirement of having all 3 Pisa test scores. To avoid dropping this data we impute the 3rd PISA score of individuals that have 2 of 3 PISA test scores. To do this we rely on estimates from individual with all 3 scores by estimating a simple regression on the test score that missing on those that are present plus some higher order terms and interactions. Using the parameters of the regression we predict the missing score of the third test. We then construct 99 imputation samples adding draws on the regression error to each predicted score. We estimate the model on the 99 imputation samples and report the average results. Nearly all students have scores for the PISA reading test and the imputation is mainly on the math and science scores. A description of the standard error calculation for these estimates are provided in the table notes.

Table D.1: Test Score Equations from 2 Factor Estimates with Correlated Factors

	PISA Reading	PISA Math	PISA Science	Self-Efficacy	Sense of Mastery	Self-Esteem
Cognitive Factor	1.340***	0.925***	1	0.519***	0.196***	0.322***
	(0.028)	(0.029)		(0.039)	(0.034)	(0.037)
Non-Cognitive Factor	—	—	—	0.512***	1.314***	1.340***
				(0.036)	(0.053)	(0.028)
Female	0.288***	-0.141***	-0.084*	-0.257***	-0.058	-0.194***
	(0.052)	(0.044)	(0.043)	(0.045)	(0.040)	(0.044)
Family Income	0.002**	0.001	0.001	0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Wealth	-0.052	-0.012	-0.046	-0.052	-0.006	0.018
	(0.040)	(0.033)	(0.033)	(0.033)	(0.030)	(0.032)
Years of Education Parents (Max)	0.080***	0.051***	0.071***	0.034***	0.010	0.008
	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Perceived Importance of Higher Education	0.102***	0.062*	0.082**	0.189***	0.112***	0.100***
	(0.039)	(0.035)	(0.034)	(0.040)	(0.036)	(0.039)
Educational Aspiration for Child	0.262***	0.214***	0.184***	0.147***	0.061**	0.078***
	(0.032)	(0.028)	(0.027)	(0.030)	(0.027)	(0.029)
Non-Traditional Family	0.077	0.042	0.157**	-0.056	-0.190***	-0.170**
	(0.085)	(0.076)	(0.073)	(0.082)	(0.073)	(0.079)
Number of Siblings	0.040	0.043*	0.045**	0.030	0.004	0.027
	(0.027)	(0.023)	(0.023)	(0.024)	(0.022)	(0.023)
Visible Minority	-0.328***	-0.259**	-0.299***	-0.205**	-0.168*	-0.053
	(0.120)	(0.102)	(0.100)	(0.102)	(0.095)	(0.100)
Immigrant	-0.005	0.048	0.109*	0.064	0.043	0.017
	(0.074)	(0.066)	(0.064)	(0.073)	(0.070)	(0.073)
Region: Atlantic	-0.115	0.079	-0.098	-0.167**	-0.123*	-0.149*
	(0.092)	(0.079)	(0.077)	(0.081)	(0.073)	(0.078)
Region: West	0.272***	0.372***	0.279***	0.041	-0.010	0.052
0	(0.085)	(0.073)	(0.071)	(0.075)	(0.071)	(0.074)
Region: Quebec	0.259***	0.483***	0.235***	-0.060	0.001	-0.021
	(0.100)	(0.085)	(0.084)	(0.088)	(0.081)	(0.086)
Constant	-2.458***	-1.800***	-1.936***	-1.459***	-0.567***	-0.538**
	(0.249)	(0.213)	(0.209)	(0.217)	(0.204)	(0.215)

—Note: We present the estimates for the measurement system linking the latent factors and the test measures for the two factor model with a triangular factor structure. Standard errors are presented in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Figure D.1: Variance Decomposition of Test Scores from 2 Factor Model

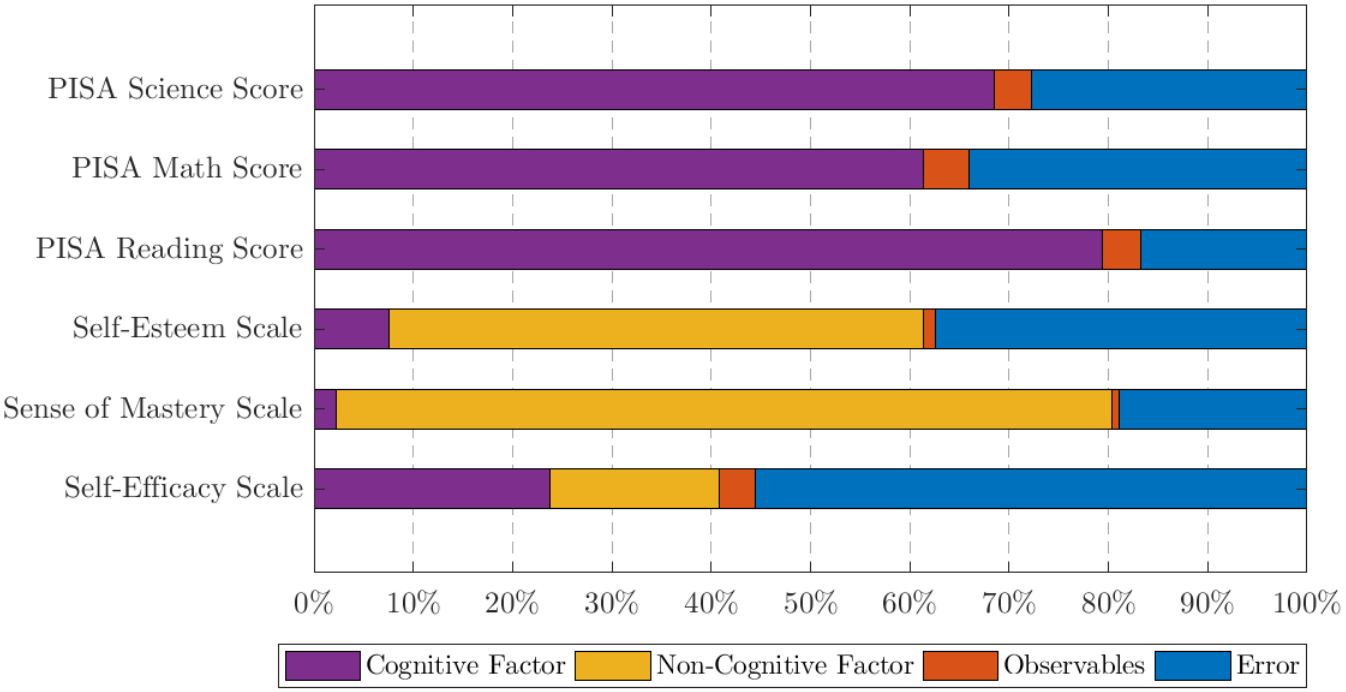


Table D.2: Decision Equation from 2 Factor Estimates with Correlated Factors

	Full	Imputation	Male	Female	Low Education	High Education
Cognitive Factor	0.957***	0.918	0.916***	1.119***	1.102***	0.868***
	(0.086)	(0.032)	(0.118)	(0.153)	(0.115)	(0.162)
Non-Cognitive Factor	0.133**	0.178	0.202*	0.097	0.101	0.250*
	(0.061)	(0.008)	(0.105)	(0.080)	(0.073)	(0.134)
Importance of Post-Secondary Education	0.280***	0.241	0.369***	0.213**	0.352***	0.103
(Child's Answer about Parents)	(0.073)	(0.003)	(0.106)	(0.105)	(0.084)	(0.175)
Educational Aspiration for Child	0.461***	0.53	0.472***	0.459***	0.426***	0.578***
	(0.054)	(0.003)	(0.079)	(0.075)	(0.063)	(0.126)
Parental money for Post-Secondary Education	0.197**	0.186	0.286**	0.129	0.124	0.633***
	(0.085)	(0.006)	(0.125)	(0.120)	(0.100)	(0.190)
Female	0.532***	0.433			0.566***	0.647***
	(0.078)	(0.003)			(0.094)	(0.164)
Family Income	0.001	0.001	0.000	0.002	0.002	0.000
	(0.001)	(0)	(0.001)	(0.002)	(0.002)	(0.002)
Family Wealth	0.041	0.064	-0.017	0.112	0.083	0.099
	(0.056)	(0.002)	(0.079)	(0.084)	(0.068)	(0.111)
Parental Education (Max)	0.158***	0.156	0.126***	0.169***	—	—
	(0.019)	(0.001)	(0.026)	(0.027)		
Planning for Higher Education (Among Friends)	0.232***	0.229	0.376***	0.106	0.279***	0.140
	(0.057)	(0.003)	(0.083)	(0.082)	(0.069)	(0.118)
Immigrant Status	-0.182*	-0.263	-0.492***	0.154	-0.280**	-0.169
	(0.109)	(0.003)	(0.157)	(0.155)	(0.142)	(0.193)
Non-Traditional Family	0.206	-0.034	-0.037	0.456**	0.178	-0.246
	(0.137)	(0.004)	(0.192)	(0.209)	(0.161)	(0.302)
Region: Atlantic	0.254*	0.404	0.073	0.393**	0.452***	0.032
	(0.139)	(0.004)	(0.203)	(0.197)	(0.171)	(0.281)
Region: West	0.119	0.275	0.163	-0.005	0.401**	-0.198
	(0.130)	(0.004)	(0.191)	(0.181)	(0.161)	(0.250)
Region: Quebec	-0.250*	-0.053	-0.389*	-0.248	-0.131	-0.095
	(0.149)	(0.003)	(0.215)	(0.212)	(0.186)	(0.294)
Constant	-5.940***	-6.057	-5.951***	-5.211***	-4.400***	-3.036***
	(0.460)	(0.03)	(0.665)	(0.651)	(0.486)	(0.850)

—Note: We present the estimates and standard errors in parentheses of decision equation for four samples. For the imputation sample, we present the average estimate across the imputations iterations, β^I. The standard error in the imputation model, s_{β^I} is given by $\sqrt{w + (1 + \frac{1}{m})B}$ where m is the number of imputations, $w = \frac{1}{m}\sum_{i=1}^{m} s_{\beta}^{i}$ and $B = \frac{1}{m-1}\sum_{i=1}^{m}(\beta_m^i - \beta^I)^2$. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Table D.3: Outcome Equation from 2 Factor Model with Correlated Factors: Income

	Full		Imputation		Male		Female		Low Education		High Education	
	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1
Cognitive Factor	1651	1800	1058	1651	2420	-1790	2473	4886*	3030	245	-3887	1933
	(1686)	(1527)	(1189)	(1071)	(1960)	(2134)	(2404)	(2593)	(1971)	(2039)	(3261)	(2419)
Non-Cognitive	2256*	2237*	1381*	66	2032	2427**	2246	521	1740	2203	4440	3029*
Factor	(1348)	(1148)	(715.5)	(583.4)	(1347)	(1187)	(2359)	(2330)	(1479)	(1491)	(3229)	(1799)
Female	-9150***	-3907**	-9765***	-3248***	—	—	—	—	-7642***	-6026**	-13726***	-592
	(2433)	(1928)	(1284)	(961.9)					(2723)	(2538)	(5063)	(2935)
Experience	-260	2519**	-234	798*	-402	3847***	12	874	-182	2821**	-2708	2326
	(1142)	(994)	(508.1)	(442)	(1337)	(1265)	(1657)	(1694)	(1307)	(1307)	(2279)	(1516)
Experience	69	-372***	4	-171***	27	-553***	86	-196	64	-425***	274	-339**
Squared	(98)	(106)	(39.34)	(43.92)	(116)	(149)	(140)	(164)	(114)	(138)	(183)	(164)
Married	9969***	18363***	8279***	12988***	-2172	-1033	9238**	17386***	10709***	17840***	8395	18205***
	(3268)	(3493)	(1728)	(1894)	(2356)	(2307)	(3746)	(3882)	(3599)	(4510)	(7185)	(5470)
Married * Female	-13547***	-19441***	-12018***	-10724***	—	—	—	—	-13914***	-20146***	-22725**	-16980**
	(4510)	(4287)	(2377)	(2289)					(4923)	(5431)	(10938)	(6985)
Common Law	13262***	7783**	8258***	8183***	-362	9309***	13369***	6523*	13602***	2154	14067**	14884***
	(2798)	(3294)	(1479)	(1719)	(2379)	(2199)	(3213)	(3698)	(3161)	(4406)	(5635)	(4896)
Common Law	-12705***	794	-6146***	-1568	—-	—-	—-	—-	-14202***	6318	-7926	-5796
* Female	(4199)	(4040)	(2149)	(2121)					(4657)	(5393)	(9433)	(6050)
Immigrant	-1352	8	1009	1435	-3426	-5668**	733	7219**	-1380	-3336	-4150	2283
	(2929)	(2231)	(1563)	(1171)	(3175)	(2773)	(4552)	(3656)	(3377)	(3277)	(5341)	(3024)
Visible Minority	-6151	-5078	-6165**	-1111	-11270**	-4055	-502	-6778	-1028	-8726*	-16148**	-3128
	(4475)	(3102)	(2549)	(1645)	(5216)	(3965)	(6653)	(4881)	(5424)	(4479)	(7312)	(4184)
Number of	-5195	-16237	-4781*	15782*	-10229***	-2945	-5696	-16145	-1127	23354	-22553**	-16102
Children	(4611)	(21824)	(2705)	(8141)	(2784)	(8157)	(5271)	(24116)	(5172)	(15036)	(9509)	(20847)
Number of	-6391	11298	-3770	-26084***	—-	—-	—-	—-	-12051*	-22927	42102**	-16898
Children * Female	(5968)	(23602)	(3241)	(8903)					(6484)	(14987)	(21123)	(29630)
Urban Community	1160	4300**	1316	573	-3054	3232	4752*	6695*	754	4911**	2622	1944
	(1854)	(1989)	(978.9)	(1015)	(2016)	(2185)	(2853)	(3969)	(2023)	(2402)	(4728)	(3681)
Region: Atlantic	-7465**	-3152	-6584***	-2256*	-6510**	-3673	-7700*	-2677	-7410**	-686	-9057	-6962**
	(2952)	(2378)	(1503)	(1226)	(3243)	(2703)	(4481)	(4362)	(3286)	(3237)	(6209)	(3536)
Region: Quebec	-8301***	-1619	-4718***	-1873	-6095*	-2824	-8523*	861	-7608**	1346	-11028*	-4872
	(2990)	(2781)	(1545)	(1399)	(3430)	(3268)	(4491)	(4900)	(3328)	(3874)	(6297)	(3931)
Region: West	1424	1147	3480**	4907***	-2705	430	4906	3618	2510	2757	-2140	-78
	(2699)	(2217)	(1403)	(1129)	(2970)	(2613)	(4139)	(3865)	(3040)	(3070)	(5395)	(3183)
Constant	36482***	29132***	36144***	30493***	34232***	29400***	30174***	24000***	35554***	32792***	46315***	26061***
	(4815)	(3230)	(2414)	(1666)	(5294)	(3615)	(7235)	(5411)	(5485)	(4644)	(9137)	(4532)

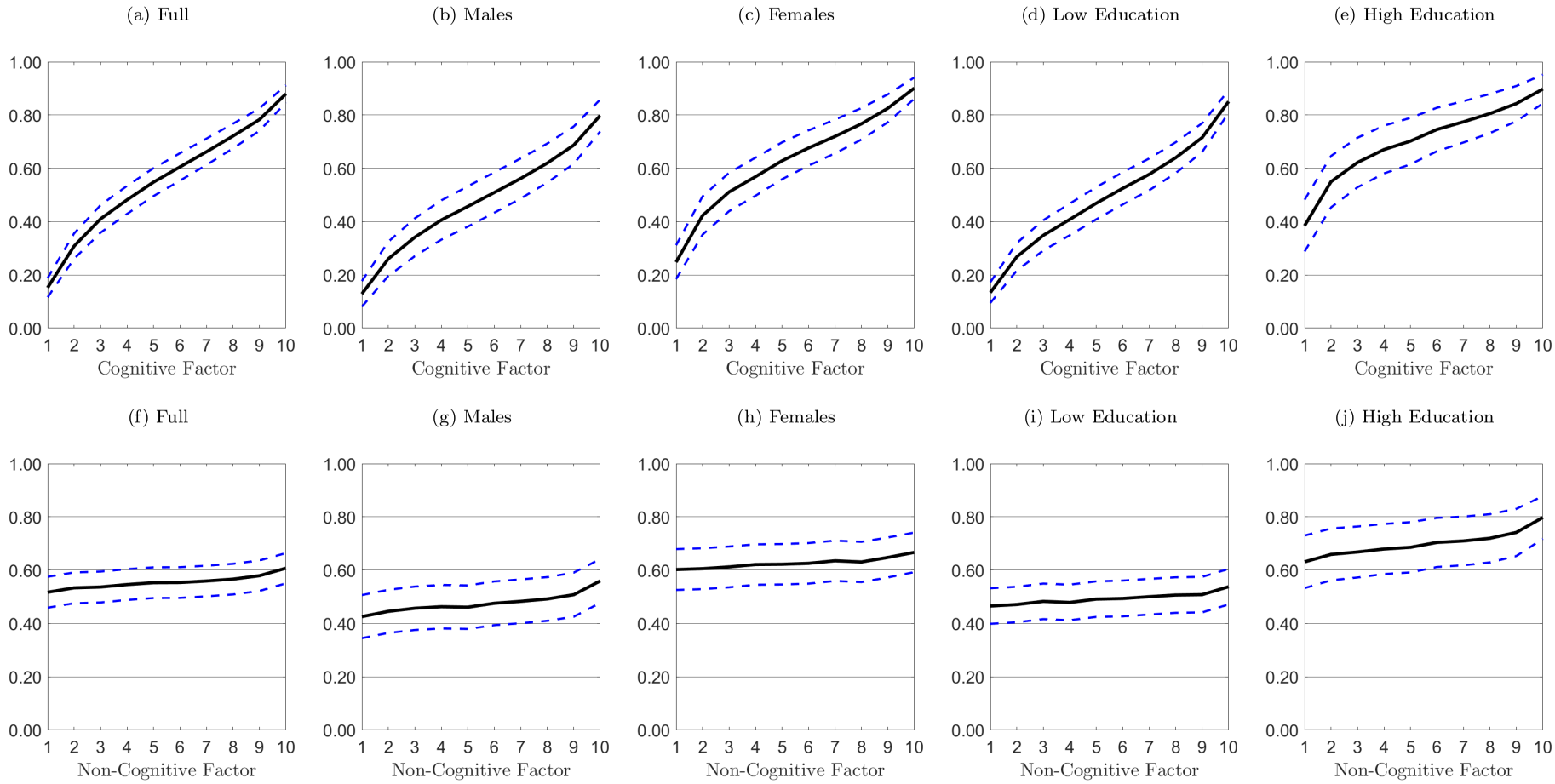
—Note: We present the estimates and standard errors in parentheses for outcome equations examining employment. For the imputation sample, we present the average estimate across the imputations iterations, β^I. The standard error in the imputation model, s_{β^I} is given by $\sqrt{w + (1 + \frac{1}{m})B}$ where m is the number of imputations, $w = \frac{1}{m}\sum_{i=1}^{m} s_{\beta}^{i}$ and $B = \frac{1}{m-1}\sum_{i=1}^{m}(\beta_m^i - \beta^I)^2$. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Table D.4: Outcome Equation from 2 Factor Model with Correlated Factors: Employment

	Full		Imputation		Male		Female		Low Education		High Education	
	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1
Cognitive Factor	0.027	-0.021	0.011	-0.025**	0.033	-0.034	0.033	-0.006	0.049*	-0.032	0.034	-0.017
	(0.024)	(0.019)	(0.017)	(0.012)	(0.045)	(0.027)	(0.027)	(0.031)	(0.029)	(0.024)	(0.044)	(0.031)
Non-Cognitive	-0.002	-0.024*	-0.007	0.001	-0.014	-0.022	0.018	-0.039	-0.006	-0.012	0.040	0.019
Factor	(0.019)	(0.015)	(0.01)	(0.007)	(0.031)	(0.017)	(0.027)	(0.027)	(0.021)	(0.018)	(0.045)	(0.022)
Female	0.032	0.005	0.008	0.017	—	—	—	—	0.055	-0.004	0.025	0.038
	(0.035)	(0.024)	(0.018)	(0.011)					(0.039)	(0.030)	(0.071)	(0.036)
Married	0.014	0.067	0.012	0.027	-0.158***	-0.097***	0.008	0.062	0.041	0.005	-0.065	0.102
	(0.047)	(0.045)	(0.024)	(0.022)	(0.052)	(0.032)	(0.043)	(0.047)	(0.051)	(0.053)	(0.101)	(0.066)
Married * Female	-0.183***	-0.154***	-0.13***	-0.077***					-0.195***	-0.108*	-0.568***	-0.241***
	(0.065)	(0.056)	(0.034)	(0.027)					(0.070)	(0.063)	(0.154)	(0.085)
Common Law	0.080**	-0.050	0.024	0.024	-0.041	0.058*	0.080**	-0.067	0.096**	-0.099*	0.037	0.058
	(0.041)	(0.042)	(0.021)	(0.02)	(0.053)	(0.030)	(0.037)	(0.044)	(0.045)	(0.051)	(0.079)	(0.060)
Common Law	-0.112*	0.107**	-0.038	-0.006					-0.155**	0.140**	0.007	-0.033
* Female	(0.061)	(0.052)	(0.03)	(0.025)					(0.066)	(0.063)	(0.132)	(0.074)
Immigrant	-0.036	-0.021	0.020	0.006	-0.052	-0.072*	-0.013	0.043	-0.021	-0.005	-0.155**	-0.006
	(0.043)	(0.029)	(0.022)	(0.013)	(0.071)	(0.037)	(0.052)	(0.045)	(0.048)	(0.038)	(0.075)	(0.037)
Visible Minority	-0.024	-0.097**	0.004	-0.029	-0.058	-0.149***	0.021	-0.040	0.020	-0.082	-0.162	-0.044
	(0.064)	(0.039)	(0.036)	(0.019)	(0.111)	(0.053)	(0.076)	(0.057)	(0.077)	(0.052)	(0.103)	(0.051)
Number of	-0.087	0.094	-0.020	0.076	-0.303***	-0.277**	-0.089	0.080	-0.011	-0.147	-0.409***	0.092
Children	(0.067)	(0.295)	(0.038)	(0.1)	(0.062)	(0.118)	(0.061)	(0.305)	(0.073)	(1494.434)	(0.133)	(0.253)
Number of	-0.221***	-0.369	-0.083*	-0.215**					-0.295***	-0.032	0.431	-0.938***
Children * Female	(0.086)	(0.319)	(0.046)	(0.108)					(0.092)	(1494.434)	(0.297)	(0.360)
Urban Community	0.004	0.015	-0.024*	0.013	-0.026	0.035	0.032	-0.027	0.010	0.033	-0.006	-0.075*
	(0.027)	(0.026)	(0.014)	(0.012)	(0.045)	(0.030)	(0.033)	(0.047)	(0.029)	(0.028)	(0.066)	(0.045)
Region: Atlantic	-0.072*	0.016	-0.029	0.013	-0.098	0.009	-0.048	0.022	-0.049	0.010	-0.128	-0.020
	(0.043)	(0.030)	(0.021)	(0.014)	(0.073)	(0.037)	(0.051)	(0.052)	(0.047)	(0.038)	(0.087)	(0.043)
Region: Quebec	-0.083*	0.002	-0.018	-0.026	-0.090	-0.020	-0.070	0.044	-0.067	0.038	-0.128	0.008
	(0.043)	(0.034)	(0.022)	(0.016)	(0.076)	(0.043)	(0.052)	(0.057)	(0.047)	(0.045)	(0.089)	(0.048)
Region: West	-0.080**	-0.042	-0.04**	0.005	-0.141**	-0.034	-0.033	-0.041	-0.053	-0.028	-0.159**	-0.042
	(0.039)	(0.028)	(0.02)	(0.013)	(0.067)	(0.036)	(0.047)	(0.046)	(0.043)	(0.036)	(0.076)	(0.039)
Constant	1.009***	0.940***	0.917***	0.902***	1.102***	0.993***	0.954***	0.882***	1.039***	1.002***	1.296***	0.977***
	(0.054)	(0.035)	(0.027)	(0.016)	(0.087)	(0.042)	(0.066)	(0.052)	(0.078)	(0.054)	(0.129)	(0.055)

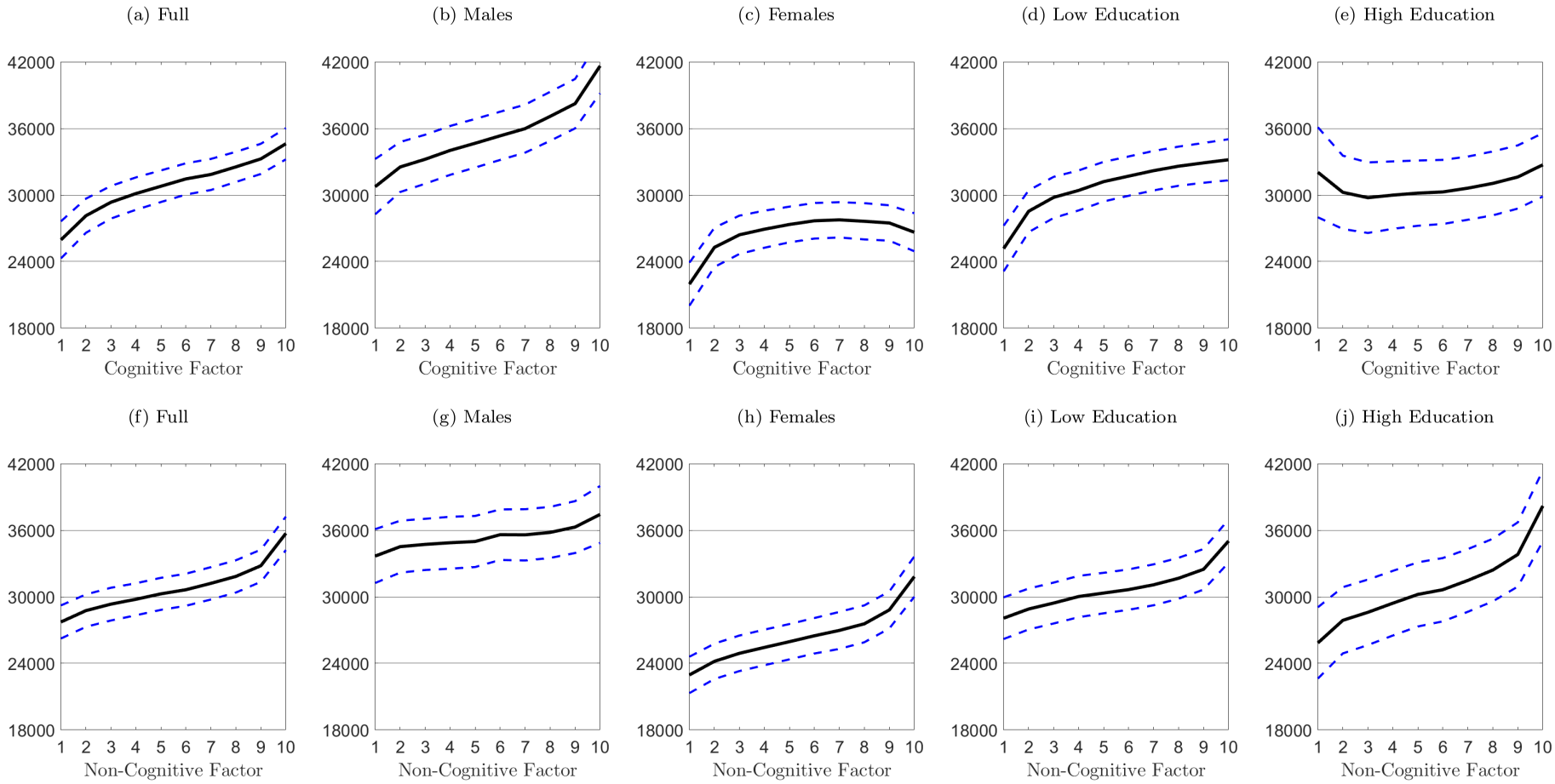
—Note: We present the estimates and standard errors in parentheses for outcome equations examining employment. For the imputation sample, we present the average estimate across the imputations iterations, β^I. The standard error in the imputation model, s_{β^I} is given by $\sqrt{w + (1 + \frac{1}{m})B}$ where m is the number of imputations, $w = \frac{1}{m}\sum_{i=1}^{m} s_{\beta}^{i}$ and $B = \frac{1}{m-1}\sum_{i=1}^{m}(\beta_m^i - \beta^I)^2$. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Figure D.2: Simulation of University Completion by Deciles of the Factor Distribution using 2 Factor Parameter Estimates



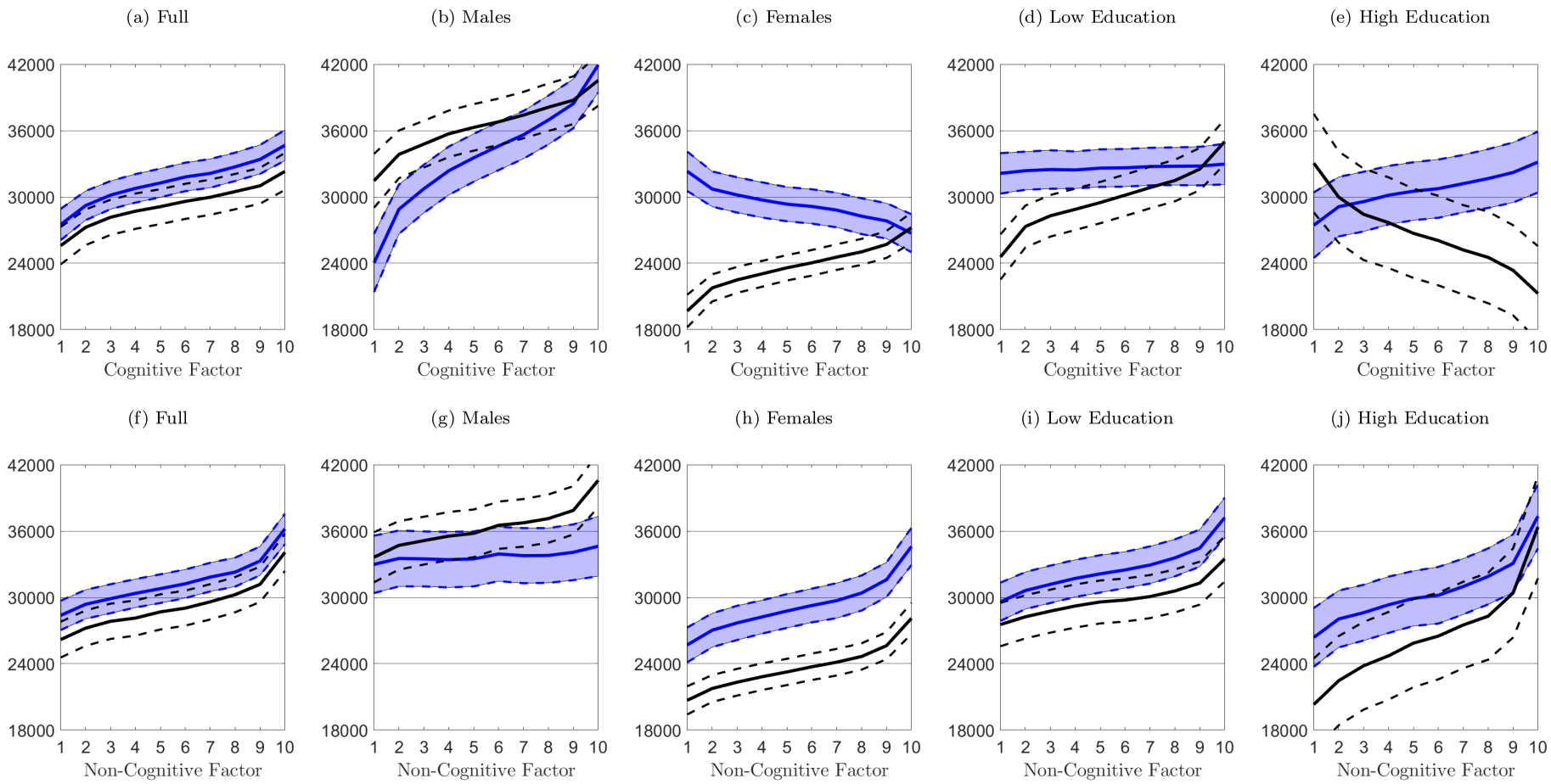
—Note: The solid line represents average university decision within each decile of the factor distribution calculated using simulations of the model based on the estimated parameters for the given sample. The dashed line are the 95% confidence intervals for these estimates.

Figure D.3: Simulation of Income by Deciles of the Factor Distribution using 2 Factor Parameter Estimates



—Note: The solid line represents average income within each decile of the factor distribution calculated using simulations of the model based on the estimated parameters for the given sample. The dashed line are the 95% confidence intervals for these estimates.

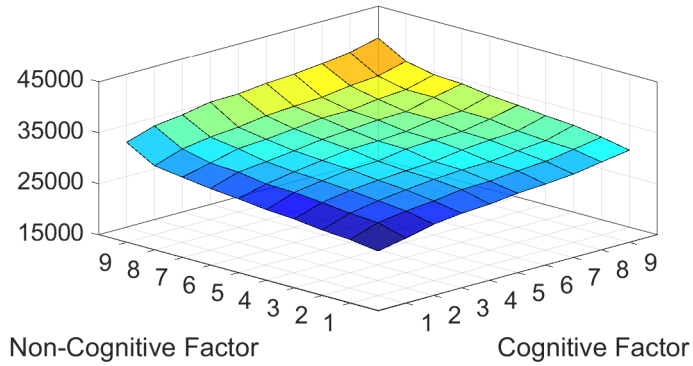
Figure D.4: Simulation of Income by University Completion Status by Deciles of the Factor Distribution using 2 Factor Parameter Estimates



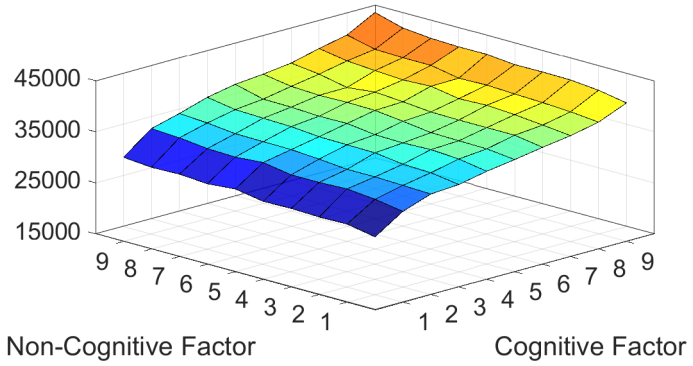
—Note: In this figure we present the average income within each decile of the factor by educational decision. The presented data are based on the estimated parameters for the given sample. The estimates and 95% confidence intervals for those that completed university in the simulations are given by **blue lines and shaded area**. Similarity, the **black lines** give the same data for those who did not complete university.

Figure D.5: Simulation of Income By Deciles of the Factor Distributions using 2 Factor Parameter Estimates with Correlated Factors

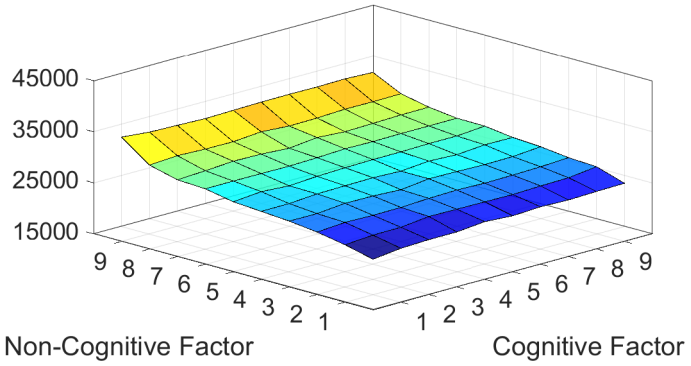
(a) Full Sample



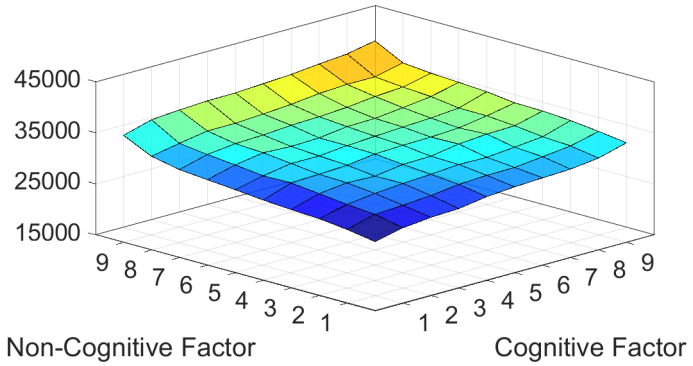
(b) Male



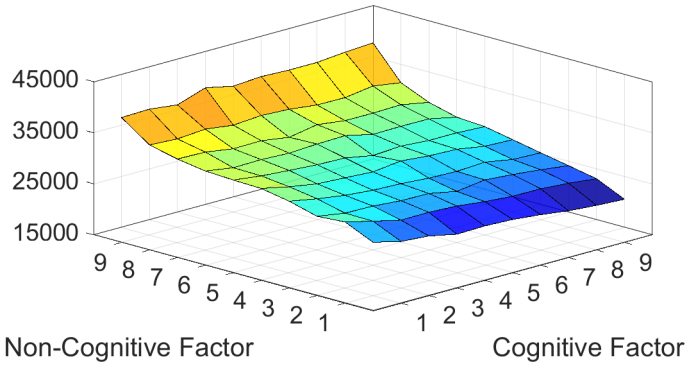
(c) Female



(d) Low Education

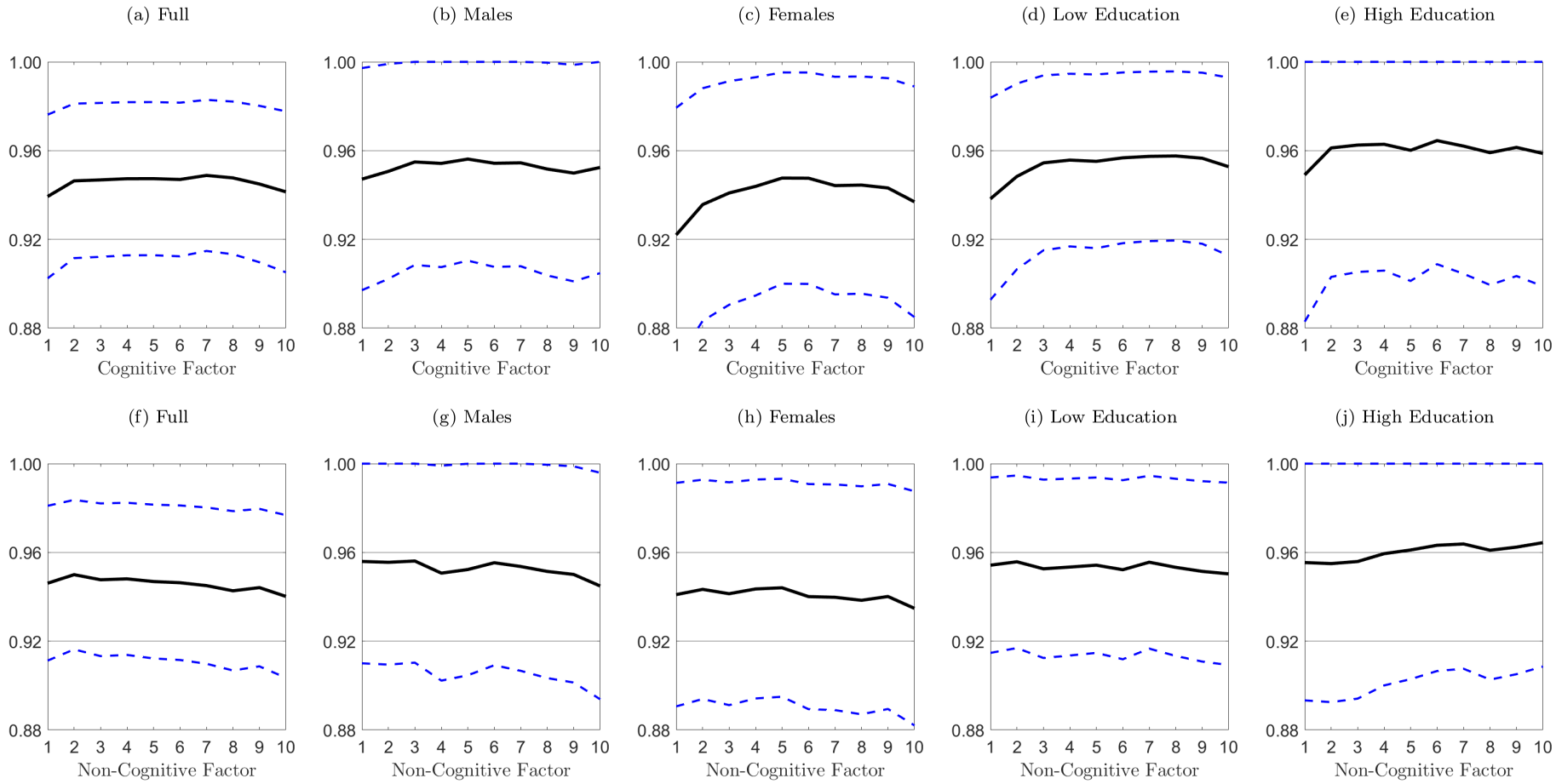


(e) High Education



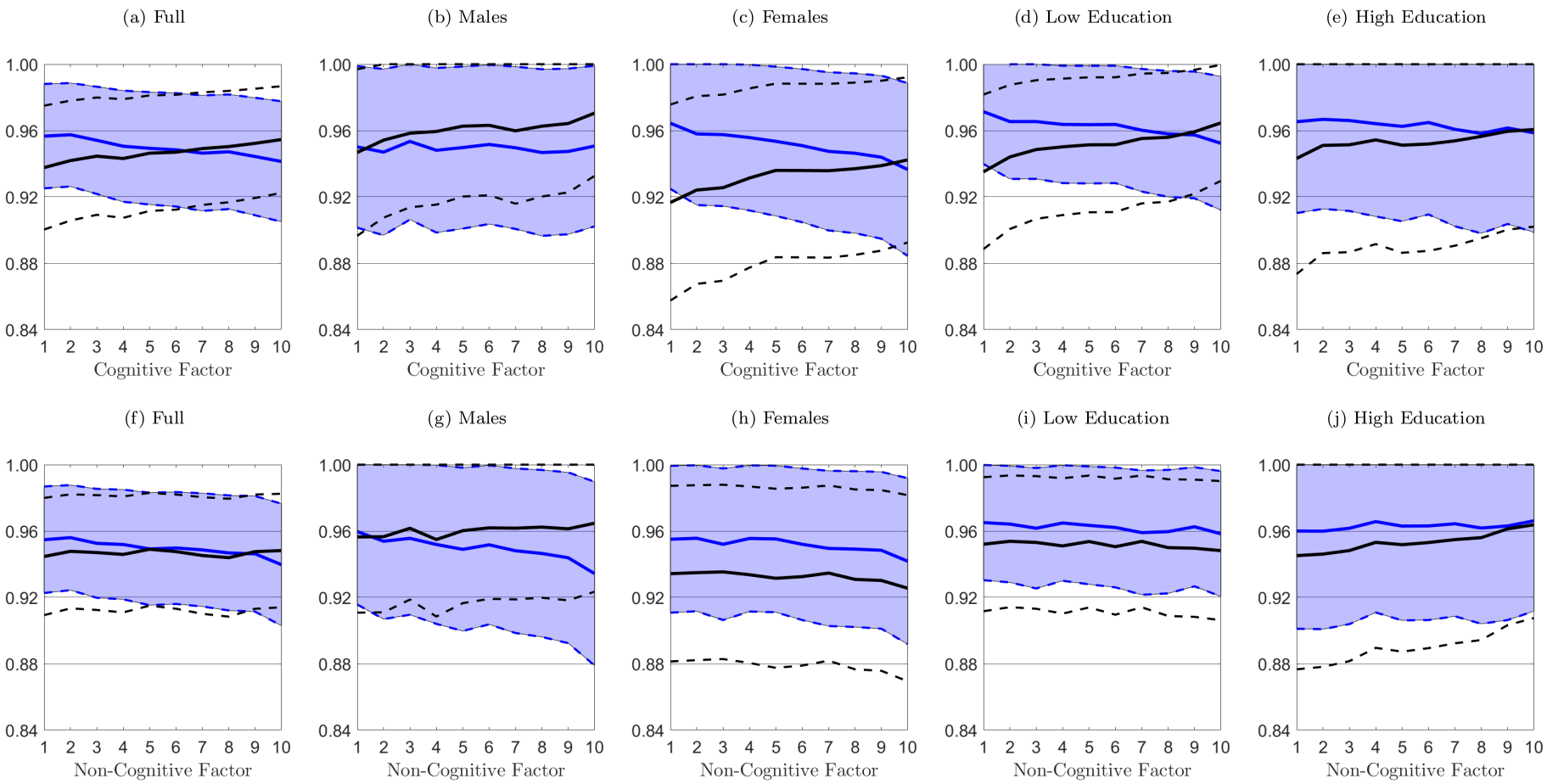
—Note: In these figures we present the average income (z-axis) within pairs of deciles from the two factors labeling the x-axis and y-axis.The presented data are based on the estimated parameters for the given sample.

Figure D.6: Simulation of Employment by Deciles of the Factor Distribution using 2 Factor Parameter Estimates



—Note: The solid line represents average income within each decile of the factor distribution calculated using simulations of the model based on the estimated parameters for the given sample. The dashed line are the 95% confidence intervals for these estimates.

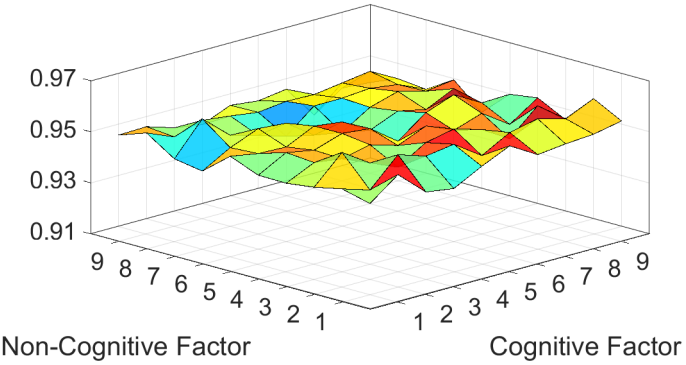
Figure D.7: Simulation of Employment by University Completion Status by Deciles of the Factor Distribution using 2 Factor Parameter Estimates



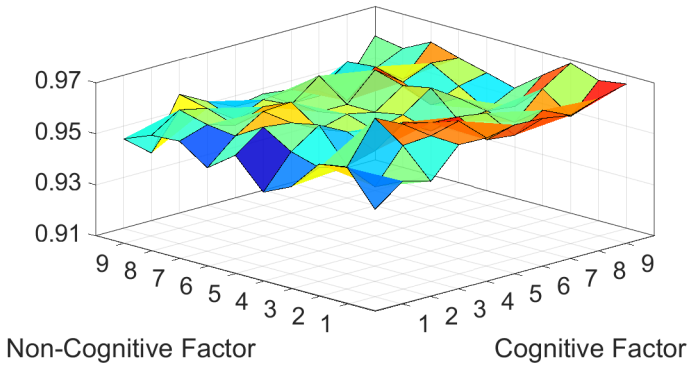
—Note: In this figure we present the average employment within each decile of the factor by educational decision. The presented data are based on the estimated parameters for the given sample. The estimates and 95% confidence intervals for those that completed university in the simulations are given by **blue lines and shaded area**. Similarity, the **black lines** give the same data for those who did not complete university.

Figure D.8: Simulation of Employment By Deciles of the Factor Distributions using 2 Factor Parameter Estimates with Correlated Factors

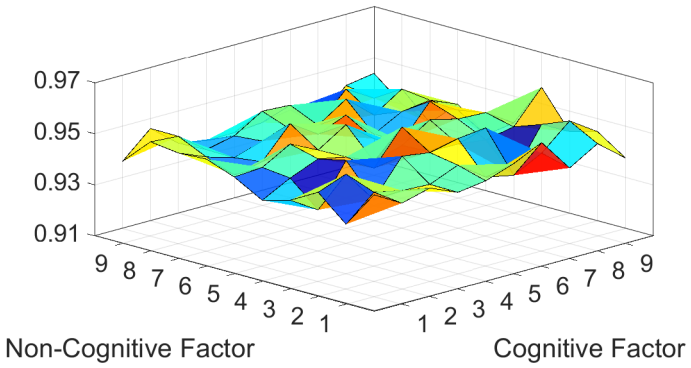
(a) Full Sample



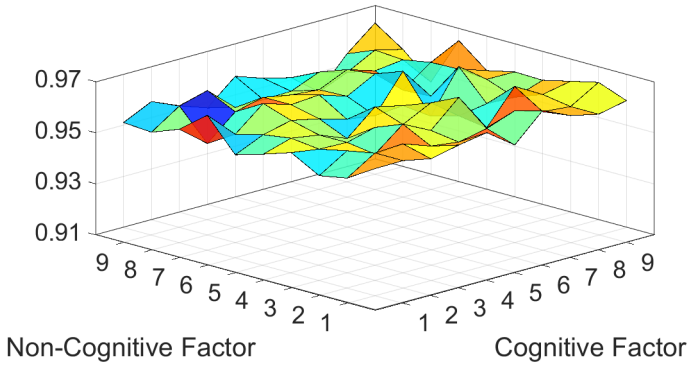
(b) Male



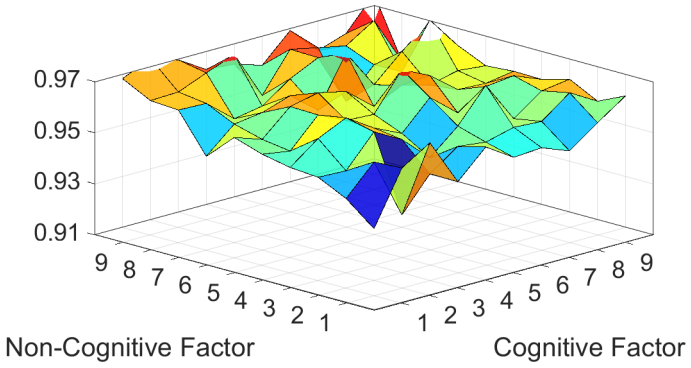
(c) Female



(d) Low Education



(e) High Education



—Note: In these figures we present the average employment (z-axis) within pairs of deciles from the two factors labeling the x-axis and y-axis. The presented data are based on the estimated parameters for the given sample.

E Other Robustness Checks

In this appendix we report the estimates from appendix D with and without more detail local labor market information. In particular, we include labor market participation rates and unemployment rates. Results are largely unchanged.

Table E.1: Outcome Equations from 2 Factor Model with Correlated Factors

Outcome Equation	Income Full Sample				Employment Full Sample			
	D=0	D=1	D=0	D=1	D=0	D=1	D=0	D=1
Cognitive Factor	1651	1800	1151	1784	0.027	-0.021	0.030	-0.036
	(1686)	(1527)	(1759)	(1636)	(0.024)	(0.019)	(0.025)	(0.022)
Non-Cognitive Factor	2256*	2237*	2280	2160*	-0.002	-0.024*	-0.008	-0.024
	(1348)	(1148)	(1401)	(1203)	(0.019)	(0.015)	(0.020)	(0.015)
Female	-9150***	-3907**	-10177***	-4034**	0.032	0.005	0.031	0.002
	(2433)	(1928)	(2554)	(2003)	(0.035)	(0.024)	(0.037)	(0.025)
Experience	-260	2519**	20	2454**	—	—	—	—
	(1142)	(994)	(1170)	(1024)				
Experience Squared	69	-372***	56	-361***	—	—	—	—
	(98)	(106)	(100)	(109)				
Married	9969***	18363***	-4892	-1293	0.014	0.067	-0.133**	0.066
	(3268)	(3493)	(3647)	(3006)	(0.047)	(0.045)	(0.053)	(0.047)
Married * Female	-13547***	-19441***	-401	3858	-0.183***	-0.154***	-0.090	-0.160***
	(4510)	(4287)	(4250)	(3937)	(0.065)	(0.056)	(0.062)	(0.058)
Common Law	13262***	7783**	3833	1797	0.080**	-0.050	-0.127**	-0.057
	(2798)	(3294)	(4165)	(3557)	(0.041)	(0.042)	(0.061)	(0.044)
Common Law	-12705***	794	9467***	18478***	-0.112*	0.107**	0.019	0.113**
* Female	(4199)	(4040)	(3374)	(3581)	(0.061)	(0.052)	(0.049)	(0.054)
Immigrant	-1352	8	-12304***	-19678***	-0.036	-0.021	-0.184***	-0.019
	(2929)	(2231)	(4672)	(4418)	(0.043)	(0.029)	(0.068)	(0.030)
Visible Minority	-6151	-5078	13200***	6046*	-0.024	-0.097**	0.086**	-0.102**
	(4475)	(3102)	(2862)	(3463)	(0.064)	(0.039)	(0.042)	(0.040)
Number of Children	-5195	-16237	-12718***	1696	-0.087	0.094	-0.115*	0.093
	(4611)	(21824)	(4332)	(4228)	(0.067)	(0.295)	(0.063)	(0.298)
Number of Children	-6391	11298	-801	401	-0.221***	-0.369	-0.039	-0.424
* Female	(5968)	(23602)	(3022)	(2322)	(0.086)	(0.319)	(0.044)	(0.328)
Urban Community	1160	4300**	-5589	-4852	0.004	0.015	-0.014	0.014
	(1854)	(1989)	(4552)	(3189)	(0.027)	(0.026)	(0.065)	(0.027)
Region: Atlantic	-7465**	-3152	-4740	-16614	-0.072*	0.016	-0.083	0.009
	(2952)	(2378)	(4673)	(22104)	(0.043)	(0.030)	(0.068)	(0.038)
Region: Quebec	-8301***	-1619	-8666	11041	-0.083*	0.002	-0.262***	-0.033
	(2990)	(2781)	(6372)	(24250)	(0.043)	(0.034)	(0.092)	(0.050)
Region: West	1424	1147	1238	4098*	-0.080**	-0.042	0.004	-0.032
	(2699)	(2217)	(1936)	(2105)	(0.039)	(0.028)	(0.028)	(0.046)
Unemployment Rate	—	—	3825**	2040	—	—	-0.020	-0.009
			(1530)	(1406)			(0.022)	(0.018)
Participation Rate	—	—	1271**	941*	—	—	0.002	-0.008
			(595)	(531)			(0.009)	(0.007)
Constant	36482***	29132***	-82324*	-51223	1.009***	0.940***	1.043	1.531***
	(4815)	(3230)	(46609)	(42189)	(0.054)	(0.035)	(0.674)	(0.541)

—Note: We present the estimates and standard errors in parentheses of outcome equations from the two factor model with correlated factors.
***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Next, we present the decision equation estimates from the three factor model with and without the inclusion of "Planning for Higher Education Among Friends" variable. The removal of this variable causes the importance of the factors to rise in a modest manner.

Table E.2: Outcome Equations from 3 Factor Model with and without Peer Variable

	Full Sample	Without Peer Variable
Cognitive Factor	0.882***	0.888***
	(0.100)	(0.101)
Non-Cognitive Factor	0.267***	0.296***
	(0.088)	(0.074)
Parental Factor	0.398***	0.346***
	(0.067)	(0.069)
Parental money for Post-Secondary Education	0.229***	0.267***
	(0.084)	(0.085)
Female	0.556***	0.620***
	(0.077)	(0.078)
Family Income	0.001	0.002
	(0.001)	(0.001)
Family Wealth	0.062	0.088
	(0.054)	(0.055)
Parental Education (Max)	0.170***	0.168***
	(0.019)	(0.019)
Region: Atlantic	0.367***	0.369***
	(0.138)	(0.139)
Region: West	0.219*	0.120
	(0.129)	(0.129)
Region: Quebec	-0.169	-0.161
	(0.149)	(0.151)
Planning for Higher Education (Among Friends)	0.251***	—
	(0.055)	
Immigrant Status	-0.322***	-0.350***
	(0.107)	(0.110)
Non-Traditional Family	0.157	0.291**
	(0.133)	(0.137)
Constant	-3.440***	-2.634***
	(0.352)	(0.307)

—Note: We present the estimates and standard errors in parentheses of decision equation from the three factor model. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.