

ONLINE APPENDIX TO

The Effects of For-profit and Nonprofit Subsidized Schools on Academic Performance

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A Additional Tables

Table A.1: Schools and Enrollment by Type of School

type of school	schools		enrollment		
	obs.	%	obs.	%	
i. overall					
public	5,098	55.7	1,120,811	39.7	
private-voucher					
	<i>total</i>	3,629	39.6	1,480,889	52.5
	<i>for-profit</i>	2,495	27.3	903,097	32.0
	<i>nonprofit</i>	1,134	12.4	577,792	20.5
private-non-voucher	428	4.7	219,487	7.8	
ii. primary					
public	4,740	55.3	785,042	40.4	
private-voucher					
	<i>total</i>	3,412	39.8	1,013,514	52.1
	<i>for-profit</i>	2,385	27.8	634,195	32.6
	<i>nonprofit</i>	1,027	12.0	379,319	19.5
private-non-voucher	419	4.9	145,805	7.5	
iii. secondary - conventional					
public	624	25.2	196,532	32.9	
private-voucher					
	<i>total</i>	1,476	59.6	327,820	54.8
	<i>for-profit</i>	926	37.4	198,078	33.1
	<i>nonprofit</i>	550	22.2	129,742	21.7
private-non-voucher	375	15.2	73,658	12.3	
iv. secondary - vocational					
public	445	50.6	139,237	49.9	
private-voucher					
	<i>total</i>	433	49.2	139,555	50.1
	<i>for-profit</i>	233	26.5	70,824	25.4
	<i>nonprofit</i>	200	22.7	68,731	24.7
private-non-voucher	2	0.2	24	0.0	

Notes: Calculated using administrative data from the Ministry of Education. All figures are for the year 2013. Only schools offering primary and/or secondary education for children and adolescents are included. Schools that offer both primary and secondary levels are included in both the panel for primary education and in the respective panel for secondary level.

Table A.2: Enrollment and Classes by Type of School

	public	for-profit	nonprofit
i. overall			
enrollment	219.9	362.0	509.5
number of classes	8.9	12.1	15.2
class size	17.8	24.6	29.1
ii. primary			
enrollment	154.0	254.2	334.5
number of classes	6.8	8.8	10.1
class size	16.8	24.3	29.1
% of multigrade classes ^a	23.2	10.9	5.5
iii. secondary - conventional			
enrollment	38.6	79.4	114.4
number of classes	1.2	2.4	3.3
class size	30.2	31.1	32.9
iv. secondary - vocational			
enrollment	27.3	28.4	60.6
number of classes	0.9	0.9	1.8
class size	25.3	28.1	30.9

Notes: Calculated using administrative data from the Ministry of Education. All figures are for the year 2013. Only schools offering primary and/or secondary education for children and adolescents are included.

^a Multigrade classes are allowed only in preschool and primary levels. Schools can combine 1st to 6th grades and 7th and 8th grades for the case of primary education.

Table A.3: Monthly Tuition by Type of School - Schools Offering Primary and/or Secondary Education

	public	for-profit	nonprofit
no charge	96.1	45.6	42.2
1,000–10,000	2.3	8.4	7.9
10,001–25,000	0.2	19.8	19.5
25,001–50,000	0.0	16.5	17.5
50,001–100,000	0.0	9.0	9.6

Notes: Calculated using administrative data from the Ministry of Education. All figures are for 2013 and report the percentage of schools within each school type. Only schools offering primary and/or secondary education for children and adolescents are included. Tuition values are in Chilean pesos. As of March 16th, 2015, one dollar exchanged for 640 Chilean pesos.

Table A.4: Monthly Tuition by Type of School - Schools Offering Secondary Education

	public	for-profit	nonprofit
no charge	84.6	16.1	24.2
1,000–10,000	13.4	8.1	9.9
10,001–25,000	1.3	26.1	22.5
25,001–50,000	0.0	30.7	25.3
50,001–100,000	0.0	18.7	15.5

Notes: Calculated using administrative data from the Ministry of Education. All figures are for 2013 and report the percentage of schools within each school type. Only schools offering secondary education for children and adolescents are included. Tuition values are in Chilean pesos. As of March 16th, 2015, one dollar exchanged for 640 Chilean pesos.

Table A.5: Teacher Inputs by Type of School

	public	for-profit	nonprofit
i. overall			
pupil-teacher ratio	11.1	16.4	16.9
teachers' degree			
<i>degree in education (%)^a</i>	96.1	95.2	94.3
<i>institution attended: university (%)</i>	90.0	89.4	91.0
<i>institution attended: 2-y or 4-y technical (%)^b</i>	6.4	6.3	5.8
type of contract			
<i>permanent (%)</i>	46.8	57.2	60.6
<i>contract (%)</i>	43.8	37.9	35.3
ii. primary			
pupil-teacher ratio	10.7	15.8	16.4
teachers' degree			
<i>degree in education (%)^a</i>	97.5	96.9	97.4
<i>institution attended: university (%)</i>	90.3	89.4	91.5
<i>institution attended: 2-y or 4-y technical (%)^b</i>	6.2	6.5	5.8
type of contract			
<i>permanent (%)</i>	46.7	58.3	61.2
<i>contract (%)</i>	43.3	36.6	34.3
iii. secondary - conventional			
pupil-teacher ratio	12.5	13.0	12.7
teachers' degree			
<i>degree in education (%)^a</i>	92.9	92.1	94.1
<i>institution attended: university (%)</i>	92.2	92.4	93.4
<i>institution attended: 2-y or 4-y technical (%)^b</i>	4.1	2.7	3.4
type of contract			
<i>permanent (%)</i>	43.6	49.8	59.5
<i>contract (%)</i>	51.5	47.4	38.4
iv. secondary - vocational			
pupil-teacher ratio	16.7	19.2	16.6
teachers' degree			
<i>degree in education (%)^a</i>	63.3	66.2	71.5
<i>institution attended: university (%)</i>	78.0	77.9	81.9
<i>institution attended: 2-y or 4-y technical (%)^b</i>	15.9	15.9	12.5
type of contract			
<i>permanent (%)</i>	36.8	54.5	63.7
<i>contract (%)</i>	59.5	43.0	34.2

Notes: Calculated using administrative data from the Ministry of Education. All figures are for the year 2013. Only schools offering primary and/or secondary education for children and adolescents are included.

^a Only degrees in education obtained from higher education institutions are considered. ^b Only 2-years technical institutions (CFT) and 4-years professional institutes (IP) are considered.

Table A.6: Religious Orientation and Admission Criteria by Type of School

	public	for-profit	nonprofit
religious orientation (% of schools)^a			
secular	52.0	54.0	17.9
catholic	40.9	30.5	65.0
other religion	7.1	15.4	13.7
admission requirements (% of schools)^a			
preschool evaluation	18.1	24.0	29.4
civil marriage certificate	2.4	3.4	11.4
transcripts from former school	68.8	69.8	64.2
baptism and/or marriage through the Church certificates	0.9	2.1	28.5
income certificate	2.4	6.1	9.9
parents' interview	18.3	42.3	57.6
exam	20.6	41.7	55.5
psychological evaluation/report	19.6	26.3	25.3

Notes: Administrative data from the Ministry of Education for schools offering primary and/or secondary education for children and adolescents were used to construct the indicators of religious orientation. Responses to the SIMCE parents' questionnaire were used to construct the indicators of admission requirements. All figures are for 2013. ^a All numbers represent the percentage of schools within each school type.

Table A.7: Municipality Characteristics and Urban Status by Type of School

	public	for-profit	nonprofit
municipality's monthly income per capita (CLP)	305,158	325,939	328,806
municipality's poverty rate	17.6	14.4	15.3
municipality's population	121719	223629	168975
school urban status (%)	42.1	73.5	83.2

Notes: Municipality characteristics come from CASEN 2013 survey data. School's urban status comes from administrative data from the Ministry of Education for schools offering primary and/or secondary education for children and adolescents. All figures are for the year 2013. As of March 16th, 2015, one dollar exchanges for 640 Chilean pesos.

Table A.8: Average Test Scores and Family Background Characteristics by Type of School

	public	for-profit	nonprofit
language score	-0.20	0.04	0.29
math score	-0.29	0.09	0.37
father's years of education	9.9	11.5	11.6
mother's years of education	10.0	11.5	11.7
household monthly income: less than 200,000 (%) ^b	37.0	19.4	19.0
household monthly income: 200,001–300,000 (%) ^b	26.3	21.5	21.5
household monthly income: 300,001–400,000 (%) ^b	13.3	14.4	14.8
household monthly income: more than 400,000 (%) ^b	20.1	41.7	41.9

Notes: Calculated using administrative data from SIMCE 2013 and from parents' responses to the SIMCE 2013 questionnaire for 10th graders. Test scores are normalized to have an overall mean of zero and a standard deviation of one within each subject. ^b Monthly income values are in Chilean pesos. As of March 16th, 2015, one dollar exchanged for 640 Chilean pesos.

Table A.9: Value-Added Model Estimates

	verbal		mathematics	
	coef.	std. err.	coef.	std. err.
for-profit	0.058	0.011	0.106	0.010
nonprofit	0.144	0.012	0.226	0.012
male	-0.192	0.007	0.066	0.007
father's years of education ^a	0.007	0.001	0.010	0.001
mother's years of education ^a	0.007	0.001	0.014	0.001
region: north	-0.020	0.020	0.011	0.019
region: center	-0.081	0.013	0.006	0.013
non-missing: father's years of education ^c	-0.051	0.018	-0.067	0.017
non-missing: mother's years of education ^c	0.013	0.019	-0.052	0.017
prior achievement: verbal	0.362	0.006	0.072	0.005
prior achievement: mathematics	0.096	0.005	0.490	0.005
prior achievement: social sciences	0.147	0.005	0.073	0.005
prior achievement: natural sciences	0.152	0.006	0.155	0.006
intercept	-0.032	0.014	-0.322	0.013
Observations	56,383		56,356	

Notes: Results from OLS estimation of equation (1). Columns under verbal and mathematics report coefficient estimates and standard errors for each outcome. Standard errors are clustered at the primary-school level (the school attended in 8th grade). ^a Missing values are replaced with zero. ^c Indicator equal to one if the corresponding variable is non-missing, and zero otherwise.

Table A.10: Value-Added with Instrumental Variables Model Estimates: First Stage

	for-profit		nonprofit	
	coef.	std. err.	coef.	std. err.
<i>A. Verbal</i>				
% for-profit schools ^b	0.892	0.026	0.073	0.021
% nonprofit schools ^b	0.020	0.021	0.662	0.027
avg. scores for-profit schools - avg. scores public schools: verbal ^{a,b}	-0.035	0.025	0.055	0.025
avg. scores nonprofit schools - avg. scores public schools: verbal ^{a,b}	-0.045	0.021	0.060	0.024
avg. scores for-profit schools - avg. scores public schools: mathematics ^{a,b}	0.000	0.021	-0.014	0.022
avg. scores nonprofit schools - avg. scores public schools: mathematics ^{a,b}	0.070	0.019	-0.102	0.021
log population ^b	-0.035	0.006	0.001	0.005
urbanization rate ^b	0.131	0.022	-0.084	0.022
non-missing: avg. score difference for-profit vs. public (verbal and mathematics) ^c	-0.037	0.011	-0.021	0.012
non-missing: avg. score difference nonprofit vs. public (verbal) ^c	0.066	0.013	0.075	0.039
non-missing: avg. score difference nonprofit vs. public (mathematics) ^c	-0.046	0.014	-0.058	0.039
male	-0.023	0.005	0.002	0.004
father's years of education ^a	0.002	0.001	0.001	0.001
mother's years of education ^a	0.003	0.001	0.003	0.001
region: north	-0.057	0.012	0.002	0.012
region: center	-0.008	0.008	-0.049	0.009
non-missing: father's years of education ^c	-0.031	0.009	0.008	0.008
non-missing: mother's years of education ^c	-0.001	0.010	-0.018	0.009
prior achievement: verbal	0.005	0.003	0.005	0.003
prior achievement: mathematics	-0.003	0.003	0.013	0.003
prior achievement: social sciences	-0.004	0.003	0.004	0.003
prior achievement: natural sciences	-0.006	0.003	0.005	0.003
intercept	0.240	0.054	0.048	0.046
F excluded IV	278.3		149.1	
Observations			56,383	
<i>B. Mathematics</i>				
% for-profit schools ^b	0.893	0.026	0.073	0.021
% nonprofit schools ^b	0.020	0.021	0.662	0.027
avg. scores for-profit schools - avg. scores public schools: verbal ^{a,b}	-0.034	0.025	0.055	0.025
avg. scores nonprofit schools - avg. scores public schools: verbal ^{a,b}	-0.049	0.021	0.062	0.024
avg. scores for-profit schools - avg. scores public schools: mathematics ^{a,b}	0.000	0.021	-0.013	0.022
avg. scores nonprofit schools - avg. scores public schools: mathematics ^{a,b}	0.075	0.019	-0.105	0.021
log population ^b	-0.035	0.006	0.002	0.005
urbanization rate ^b	0.132	0.021	-0.083	0.022
non-missing: avg. score difference for-profit vs. public (verbal and mathematics) ^c	-0.037	0.011	-0.021	0.012
non-missing: avg. score difference nonprofit vs. public (verbal) ^c	0.067	0.013	0.074	0.039
non-missing: avg. score difference nonprofit vs. public (mathematics) ^c	-0.049	0.014	-0.058	0.039
male	-0.022	0.005	0.002	0.004
father's years of education ^a	0.002	0.001	0.001	0.001
mother's years of education ^a	0.003	0.001	0.003	0.001
region: north	-0.059	0.012	0.002	0.012
region: center	-0.008	0.008	-0.050	0.009
non-missing: father's years of education ^c	-0.030	0.009	0.010	0.008
non-missing: mother's years of education ^c	-0.001	0.010	-0.019	0.009
prior achievement: verbal	0.004	0.003	0.005	0.003
prior achievement: mathematics	-0.003	0.003	0.013	0.003
prior achievement: social sciences	-0.004	0.003	0.004	0.003
prior achievement: natural sciences	-0.006	0.003	0.005	0.003
intercept	0.242	0.054	0.046	0.046
F excluded IV	276.7		149.4	
Observations			56,356	

Notes: Results from the first stage of 2SLS estimation of for-profit and nonprofit school choices. Panel A reports estimates for the verbal specification, and Panel B reports estimates for the mathematics specification. All variables were constructed using CASEN 2011, SIMCE 2012, and SIMCE 2013 datasets. Standard errors are clustered at the primary-school level (the school attended in 8th grade). ^a Missing values are replaced with zero. ^b Calculated at the municipality level. ^c Indicator equal to one if the corresponding variable is non-missing, and zero otherwise.

Table A.11: Value-Added with Instrumental Variables Model Estimates: Second Stage

	verbal		mathematics	
	coef.	std. err.	coef.	std. err.
for-profit	0.029	0.030	0.098	0.031
nonprofit	0.238	0.045	0.341	0.045
male	-0.194	0.007	0.065	0.007
father's years of education ^a	0.007	0.001	0.009	0.001
mother's years of education ^a	0.007	0.001	0.013	0.001
region: north	-0.014	0.020	0.019	0.019
region: center	-0.073	0.013	0.013	0.013
non-missing: father's years of education ^c	-0.053	0.018	-0.067	0.017
non-missing: mother's years of education ^c	0.015	0.019	-0.049	0.017
prior achievement: verbal	0.361	0.006	0.071	0.005
prior achievement: mathematics	0.095	0.005	0.488	0.005
prior achievement: social sciences	0.146	0.005	0.072	0.005
prior achievement: natural sciences	0.152	0.006	0.155	0.006
intercept	-0.045	0.016	-0.343	0.017
Observations	56,383		56,356	

Notes: Results from the second stage of IV estimation of equation (1). Columns under verbal and mathematics report coefficient estimates and standard errors for each outcome. Standard errors are clustered at the primary-school level (the school attended in 8th grade). ^a Missing values are replaced with zero. ^c Indicator equal to one if the corresponding variable is non-missing, and zero otherwise.

Table A.12: Structural Estimates: Measurement System

	verbal	mathematics	social sciences	natural sciences
male	-0.218 (0.007)	0.173 (0.007)	0.172 (0.007)	0.098 (0.007)
father's years of education ^a	0.011 (0.001)	0.011 (0.001)	0.013 (0.001)	0.012 (0.001)
mother's years of education ^a	0.017 (0.001)	0.020 (0.001)	0.024 (0.001)	0.019 (0.001)
living with both parents	0.006 (0.007)	0.003 (0.007)	0.022 (0.007)	0.019 (0.006)
living with siblings	0.009 (0.007)	0.040 (0.006)	-0.024 (0.006)	0.011 (0.006)
living with others	0.011 (0.006)	-0.004 (0.006)	0.000 (0.006)	-0.002 (0.006)
region: north	-0.190 (0.013)	-0.151 (0.012)	-0.205 (0.012)	-0.176 (0.013)
region: center	-0.150 (0.010)	-0.038 (0.009)	-0.094 (0.009)	-0.099 (0.010)
non-missing: father's years of education ^b	-0.110 (0.016)	-0.118 (0.016)	-0.149 (0.017)	-0.117 (0.015)
non-missing: mother's years of education ^b	-0.108 (0.020)	-0.137 (0.020)	-0.204 (0.021)	-0.149 (0.020)
intercept	-0.027 (0.020)	-0.368 (0.019)	-0.261 (0.020)	-0.277 (0.019)
factor	1.063 (0.005)	1.000	0.943 (0.005)	1.053 (0.004)

Notes: Estimates from the model's measurement system. All explanatory variables come from the SIMCE 2011 database for 8th graders. Standard errors are reported in parentheses. The total number of observations is 66,388. ^a Missing values are replaced with zero. ^b Indicator equal to one if the corresponding variable is non-missing, and zero otherwise.

Table A.13: Structural Estimates: Secondary School-Type Choice

	choice:	
	voucher for-profit	voucher nonprofit
male	-0.145 (0.018)	-0.016 (0.018)
father's years of education ^a	0.015 (0.004)	0.010 (0.004)
mother's years of education ^a	0.025 (0.004)	0.029 (0.004)
region: north	-0.475 (0.036)	-0.237 (0.036)
region: center	-0.143 (0.026)	-0.288 (0.025)
% for-profit schools ^b	3.772 (0.050)	
% nonprofit schools ^b		2.953 (0.060)
avg. scores for-profit schools - avg. scores public schools: verbal ^{a,b}	-0.125 (0.056)	
avg. scores nonprofit schools - avg. scores public schools: verbal ^{a,b}		0.719 (0.054)
avg. scores for-profit schools - avg. scores public schools: math ^{a,b}	-0.072 (0.051)	
avg. scores nonprofit schools - avg. scores public schools: math ^{a,b}		-0.805 (0.050)
log population ^b	-0.105 (0.013)	0.133 (0.014)
urbanization rate ^b	0.928 (0.083)	-0.327 (0.079)
non-missing: father's years of education ^c	-0.151 (0.055)	0.052 (0.059)
non-missing: mother's years of education ^c	-0.028 (0.057)	-0.115 (0.059)
non-missing: avg. score difference for-profit vs. public (verbal and math) ^c	1.825 (0.101)	
non-missing: avg. score difference nonprofit vs. public (verbal) ^c		1.203 (0.340)
non-missing: avg. score difference nonprofit vs. public (math) ^c		0.090 (0.342)
intercept	-3.481 (0.136)	-4.501 (0.127)
factor	-0.004 (0.013)	0.168 (0.013)

Notes: Estimates from the multinomial choice part of the model. The base category is public school, so all estimated coefficients are relative to attending a public school in 10th grade. All variables were constructed using CASEN 2011, SIMCE 2012, and SIMCE 2013 datasets. Standard errors are reported in parentheses. The total number of observations is 66,388. ^a Missing values are replaced with zero. ^b Calculated at the municipality level. ^c Indicator equal to one if the corresponding variable is non-missing, and zero otherwise.

Table A.14: Structural Estimates: Test Scores in 10th Grade

school type in 10th grade:	verbal			mathematics		
	public	for-profit	nonprofit	public	for-profit	nonprofit
male	-0.214 (0.009)	-0.211 (0.014)	-0.229 (0.016)	0.166 (0.008)	0.123 (0.014)	0.182 (0.014)
father's years of education ^a	0.014 (0.002)	0.010 (0.003)	0.012 (0.003)	0.016 (0.001)	0.015 (0.003)	0.019 (0.003)
mother's years of education ^a	0.019 (0.002)	0.012 (0.003)	0.020 (0.003)	0.027 (0.002)	0.023 (0.003)	0.023 (0.003)
region: north	-0.118 (0.015)	-0.225 (0.030)	-0.146 (0.028)	-0.105 (0.014)	-0.108 (0.029)	-0.030 (0.028)
region: center	-0.143 (0.012)	-0.204 (0.022)	-0.179 (0.020)	-0.014 (0.011)	-0.114 (0.022)	-0.077 (0.018)
non-missing: father's years of education ^b	-0.109 (0.022)	-0.066 (0.041)	-0.171 (0.047)	-0.120 (0.020)	-0.131 (0.038)	-0.159 (0.045)
non-missing: mother's years of education ^b	-0.096 (0.022)	-0.048 (0.042)	-0.118 (0.05)	-0.186 (0.021)	-0.148 (0.041)	-0.153 (0.046)
intercept	-0.152 (0.013)	-0.010 (0.024)	0.097 (0.022)	-0.542 (0.012)	-0.317 (0.025)	-0.282 (0.021)
factor	0.919 (0.006)	0.927 (0.011)	0.842 (0.012)	0.927 (0.005)	0.919 (0.010)	0.876 (0.011)

Notes: Estimates from the outcome equations of the model. All variables were constructed using CASEN 2011, SIMCE 2012, and SIMCE 2013 datasets. Standard errors are reported in parentheses. The total number of observations is 66,388. ^a Missing values are replaced with zero. ^b Indicator equal to one if the corresponding variable is non-missing, and zero otherwise.

Table A.15: Goodness of Fit - School-Type Decisions

	school type 10th grade:					
	public		for-profit		nonprofit	
	actual	model	actual	model	actual	model
percentage	67.60	67.55	18.26	18.23	14.14	14.22

Notes: The simulated data (model) contain 150,000 observations generated using the model estimates. The actual data contain 66,388 observations from the SIMCE 2011 and SIMCE 2013 datasets. Each cell reports the percentage of individuals choosing the corresponding school type.

Table A.16: Goodness of Fit - Measurement System

	mean		std. dev.	
	actual	model	actual	model
verbal	-0.198	-0.199	0.984	0.976
mathematics	-0.252	-0.253	0.948	0.936
social sc.	-0.258	-0.258	0.945	0.934
natural sc.	-0.263	-0.264	0.957	0.946

Notes: The simulated data (model) contain 150,000 observations generated using the model estimates. The actual data contain 66,388 observations from the SIMCE 2011 and SIMCE 2013 datasets.

Table A.17: Goodness of Fit - Test Scores in 10th grade

school-type in 10th grade	test	mean		std. dev.	
		actual	model	actual	model
public	verbal	-0.267	-0.314	0.977	0.964
	mathematics	-0.384	-0.433	0.948	0.928
for-profit	verbal	-0.232	-0.234	0.959	0.966
	mathematics	-0.304	-0.305	0.929	0.932
nonprofit	verbal	0.006	-0.045	0.934	0.933
	mathematics	-0.017	-0.073	0.918	0.913

Notes: The simulated data (model) contain 150,000 observations generated using the model estimates. The actual data contain 66,388 observations from the SIMCE 2011 and SIMCE 2013 datasets.

B Discussion on Advantages and Assumptions of the Model

The main advantage of this structural approach is that it allows me to estimate the joint counterfactual distribution of outcomes for a policy intervention and to move beyond average policy effects, which is the convention in much of the program-evaluation literature. In other words, the model recovers $F(Y_1, Y_0|X, Z)$, the joint distribution of counterfactuals, and therefore permits identification of the mean, median, or any other quantile of the gains distribution. For instance, I can estimate the proportion of people who benefit from the

program— $Pr(Y_1 > Y_0|X, Z)$ —or the distribution of gains at selected levels of the untreated population— $F(Y_1 - Y_0|Y_0 = y_0, X, Z)$.

Moreover, I can answer any well-posed policy question, including standard treatment effects. The price one has to pay is the assumed independence between the factor f and the covariates (X, Z) , and the independence of all uniquenesses with each other—the ν terms. This assumption rules out any random shock that may simultaneously affect both choices and outcomes, such as a job loss event within the household.

Another advantage of the structural approach is that it is natural to give an interpretation to the unobserved factor, which in this case is a combination of inherent abilities that directly determine academic performance. However, this also comes at a price, which is that I cannot argue that I am controlling for other sources of unobserved heterogeneity that affect school selection but not outcomes, such as preferences over peers and school amenities.

If one or more of the independence assumptions are not satisfied, then the full model becomes misspecified and the results are biased. Given the high nonlinearity of the model, the direction of the bias is unclear. Nevertheless, the model's ability to mimic the actual data lends support to the plausibility of these assumptions.