

Who is bullied?

—From the viewpoint of educational expenditure—

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Acknowledgement

This presentation is based on the Tohoku Econometric Sociology Study Group in June, 64th Tohoku Sociological Association Annual Conference in July, and 64th Japanese Mathematical Association Annual Conference in September in 2017. In each conference, I got informative comments from participants. Also Mr.Derek Grammer(Tohoku University) and Mr.Takashi Yamazaki (Tohoku Univerisity) checked and commented to my presentation, so it is improved dramatically. Thank you for helping.

How to make variables

Numeric variables

In PISA 2015, the question is asked to the students in ST038. The questions are following :

- (3) "Other students left me out of things on purpose."
- (4) "Other students made fun of me."
- (5) "I was threatened by other students."
- (6) "Other students took away or destroyed things that belonged to me."
- (7) "I got hit or pushed around by other students."
- (8) "Other students spread nasty rumors about me."

The category of answer to the questions is Never or almost never(=1), A few times a year(=2), A few times a month(=3), Once a week or more(=4). I calculated factor scores with these questions. The factor number was set to 2 for MAP criteria, and the second factor was taken out. Details of the points are as follows.

Table 1 Descriptive statistics of the factor score

	frequency	min	Max	Mean	S.D.
Male	19541	-4.40	0.44	-0.31	1.01
Female	21358	-4.40	0.44	-0.14	0.81

Following Matsuoka(2013)'s model,
individual SES (socio-economic status)=hisei+PARED+HOMEPOS

These variable are defined by OECD as:

hisei: Index highest parental occupational status

PARED: Index highest parental education in years of schooling

HOMEPOS: Home possessions (WLE)

And, school SES is calculated as the average of students' SES from each school. Parents' educational interest is made from "ST123 (1):My parents are interested in my school activities." and "(3) My parents support me when I am facing difficulties at school." I set "Strongly disagree(= 1)" "Disagree(= 2)" "Agree" (= 3) and "Strongly agree(= 4)" as the order scale. Descriptive statistics of numarical variables are as shown in Table 2 on next page.

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Table 2 Descriptive Statistic of numerical variables

		frequency	min	Max	Mean	S.D.
Male	individual SES	19541	-6.85	6.08	0.05	1.96
	parents' interest	19541	4.00	16.00	13.78	2.23
	school SES	19541	1.24	10.39	6.94	1.30
	the number of students per teacher	19541	1.00	9.00	3.73	1.71
	educational expenditure	19541	3.30	6.00	5.13	0.82
Female	individual SES	21358	-6.38	6.51	-0.04	1.96
	parents' interest	21358	4.00	16.00	13.94	2.25
	school SES	21358	1.17	9.91	6.96	1.26
	the number of students per teacher	21358	1.00	9.00	3.76	1.68
	educational expenditure	21358	3.30	6.60	5.13	0.82

Categorical variables

The distribution table of the categorical variables is as shown in Table 3 below. I create dummy variables to take the upper category as 1 and put them in the model. Children who answered "Yes" to the question "On the most recent day you attended school, did you do any of the following before going to school? -Eat breakfast" have a habit of eating breakfast. Therefore, they will have a good lifestyle and home environment. For this reason, I introduced it as a control variable for the domestic environment.

Table 3 Descriptive statistics of categorical variables

	Male		Female	
	frequency	%	frequency	%
Eat Breakfast(Yes)	16483	84.35	16634	77.88
Eat Breakfast(No)	3058	15.65	4724	22.12
grouping with regard to ability(Yes)	9645	49.36	10800	50.57
grouping with regard to ability(No)	9896	50.64	10558	49.43
<i>N</i>	19541		21358	

Results

In model 1, I focused on individuals and schools. Then, in model 2, I added educational expenditure, and the interaction of the number of students and grouping with regard to ability.

Male

Table 4 Multilevel ordinal regression analysis (male)

	modell1		modell2	
	B	S.E.	B	S.E.
fixed-effect				
intercept	-1.14 ***	0.18	-1.28 ***	0.23
individual SES	0.00	0.02	0.00	0.02
parents' interest	0.06 ***	0.00	0.06 ***	0.00
breakfast	0.08 ***	0.02	0.08 ***	0.02
group level 1 (n=1819)				
grouping with regard to ability	0.01	0.02	0.22 †	0.12
number of students	0.01 †	0.01	0.02	0.04
school SES	0.00	0.01	0.00	0.01
individual SES*school SES	0.00	0.00	0.00	0.00
grouping*number of students			0.00	0.01
group level 2 (n=36)				
expenditure			0.02	0.04
expenditure*grouping			-0.04 †	0.02
expenditure*number of students			0.00	0.01
	<i>V.C.</i>		<i>V.C.</i>	
random-effect				
individual level	0.93		0.93	
individual SES	0.00		0.00	
group level 1	0.03		0.03	
group level 2	0.02		0.02	
correlation				
individual SES group level 1 intercept	-0.36		-0.37	
deviance	54760.00		54756.10	
AIC	54788.00		54790.10	
BIC	54898.30		54924.10	

$N = 19541$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.1$ Maximum likelihood estimation

Female

Table 5 Multilevel ordinal regression analysis (female)

	model 1		model 2	
	B	S.E.	B	S.E.
fixed-effect				
intercept	-1.30 ***	0.18	-1.53 ***	0.19
individual SES	-0.01	0.02	-0.01	0.02
parents' interest	0.06 ***	0.00	0.06 ***	0.00
breakfast	0.11 ***	0.02	0.08 ***	0.02
group level 1 (n=1819)				
grouping with regard to ability	0.00	0.02	0.06	0.09
number of students	0.02 ***	0.01	0.07 *	0.03
school SES	0.02 ***	0.01	0.02 ***	0.01
individual SES*school SES	0.00	0.00	0.00	0.00
grouping*number of students			0.02 *	0.01
group level 2 (n=36)				
expenditure			0.05	0.04
expenditure*grouping			-0.03	0.02
expenditure*number of students			-0.01	0.01
	<i>V.C.</i>		<i>V.C.</i>	
random-effect				
individual level	0.58		0.58	
individual SES	0.00		0.00	
group level 1	0.03		0.02	
group level 2	0.02		0.02	
correlation				
individual SES group level1 intercept	-0.71		-0.71	
deviance	49934.90		49924.40	
AIC	49962.90		49958.40	
BIC	50074.50		50093.90	

$N = 21358$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.1$ Maximum likelihood estimation

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