Identifying School Climate Variables Associated with Students' Financial Literacy Outcomes

A Cross-Country Comparison Using PISA 2018 Data

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敬致父母

To my parents

Study hard what interests you the most in the most undisciplined, irreverent and original manner possible.

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Chapter 1

Conceptual Framework

1.1 In-depth definitions of "financial literacy"

1.1.1 Every term my readers need in order to understand my research question

1.1.2 Survey not only PISA but also alternative definitions, even critiques of such definitions

1.1.3 Any practices that are common in maths/literature but uncommon in financial literacy? Meaning? Implies?

1.2 Country-level Financial Knowledge Index

PISA 2018 financial literacy dataset (OECD, 2020) provides rich information about students and schools. For the purpose of cross-country comparison, however, the country-level financial literacy information must be addressed separately by the researchers. Earlier attempts such as Moreno-Herrero et al. (2018) approximated this information using a variable "quality of math and science education" to control for country-level differences since consensus is yet to emerge about the most appropriate measure for countries' financial knowledge. Inspired by the UN's approach to forming Human Development Indices, a recent publication by Oliver-Márquez et al. (2020) proposed a macroeconomic measure for countries' general financial knowledge levels by examining their economic capability, educational training, existing practices in the financial markets as well as incentives to interact with financial products. More specifically, the authors considered a country's economic capability, represented by its GDP per capita, to be a key dimension in bringing about its financial knowledge index (FKI). Secondly, literature converges on the importance of educational training for a country's financial knowledge capability (OECD, 2005). Thirdly, countries with regular engagement with sophisticated financial products and financial markets should possess higher FKI. Lastly, countries with higher aggregate consumption levels and with ageing populations are likely to possess higher FKI due to more frequent exposure and pressure in retirement provision, respetively. Macroeconomic data needed for these computations can be sourced from the World Bank (World Bank, 2020) and the United Nations' *Human Development Reports* (United Nations, 2020).

Combining individual and institutional data cources can be a productive approach in international large-scale assessment (ILSA) research. According to the framework for comparative education analyses (Bray & Thomas, 1995), this project extends education outcome measures to a country level, addresses the aspect of society and labour market, and relates countries' entire populations to ILSA research (Strietholt & Scherer, 2018). By combining education outcome data with countries' economic performance indicators, this project remains most comparable to Hanushek and Woessmann (2012)—while these authors looked into the relationship between countries' education achievement and their GDP growth, the current investigation highlights how countries' GDP, along with other macroeconomic practices, in turn systematically impacts on their youth's educational performance.

Table 1.1

Percentages of Missing Values

CNT	MALE	IMMI1GEN	IMMI2GEN	ESCS	FCFMLRTY	FLCONFIN	PERFEED	TEACHINT	FLSCHOOL	DISCRIM†	BELONG	BULLY	FLFAMILY	CURSUPP†	PASCHPOL†	W_SCH	PRIVATE	STRATIO	EDUST	STAFFST
BGR†	0	6	6	3	12	27	10	10	21	28	19	31	22	100	100	0	100	8	3	3
BRA	0	5	5	2	12	34	9	8	21	36	23	40	24	17	19	0	0	12	6	7
CAN†	0	7	7	5	11	15	100	100	13	100	8	14	14	100	100	0	0	100	2	2
CHL	0	4	4	3	10	24	5	4	13	30	15	34	15	9	8	0	0	18	9	9
ESP	0	3	3	2	5	21	3	2	7	25	9	29	8	100	100	0	0	11	5	6
EST	0	3	3	3	4	8	3	3	6	9	5	11	6	100	100	0	0	0	0	0
FIN†	0	2	2	2	4	10	3	3	6	100	6	11	7	100	100	0	100	2	7	7
GEO	0	5	5	2	9	26	9	9	17	100	15	22	21	4	5	0	0	1	2	2
IDN	0	3	3	1	3	6	3	2	5	3	2	5	5	100	100	0	0	23	14	14
ITA	0	4	4	3	7	17	4	4	10	23	10	27	12	16	17	0	0	9	3	3
LTU	0	3	3	3	4	12	3	3	5	17	8	20	7	100	100	0	0	0	0	0
LVA†	0	2	2	2	5	9	3	3	6	14	6	15	7	100	100	0	100	6	3	4
NLD†	0	3	3	2	3	5	3	2	4	100	4	8	4	100	100	0	100	11	5	5
PER	0	2	2	1	2	11	5	4	4	56	31	65	5	100	100	0	0	2	0	0
POL	0	1	1	1	3	7	2	1	5	9	3	11	5	100	100	0	0	0	0	0
PRT	0	6	6	5	8	11	6	6	10	15	8	17	10	10	10	0	0	11	1	1
RUS†	0	3	3	2	8	13	5	4	11	13	8	15	11	100	100	0	100	3	3	3
SRB†	0	3	3	1	10	25	8	7	18	25	15	27	19	100	100	0	100	8	1	1
SVK	0	2	2	1	4	12	4	3	7	14	6	17	8	100	100	0	0	6	6	7
USA	0	3	3	2	3	6	2	1	4	100	4	6	4	100	100	0	0	16	10	10

Note. This table aims at identifying variables and countries with sufficient amount of information in order to be included in the model. Since this study wishes to compare public with private schools, countries with missing PRIVATE are dropped from the dataset. Canada (CAN) is not included due to 100 percent missings on multiple variables. Variable CURSUPP, PASCHPOL and DISCRIM are no longer pursued in the model as too many countries chose not to respond to these questions. † marks countries and variables that are excluded from subsequent analyses.

Figure 1.1
Path Diagram: Country-level (L3)

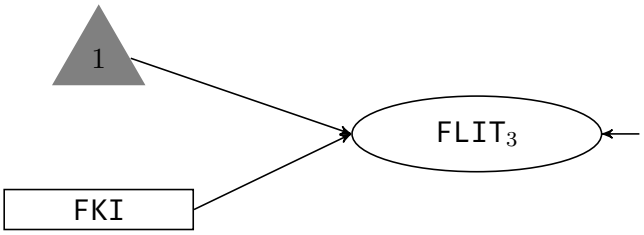
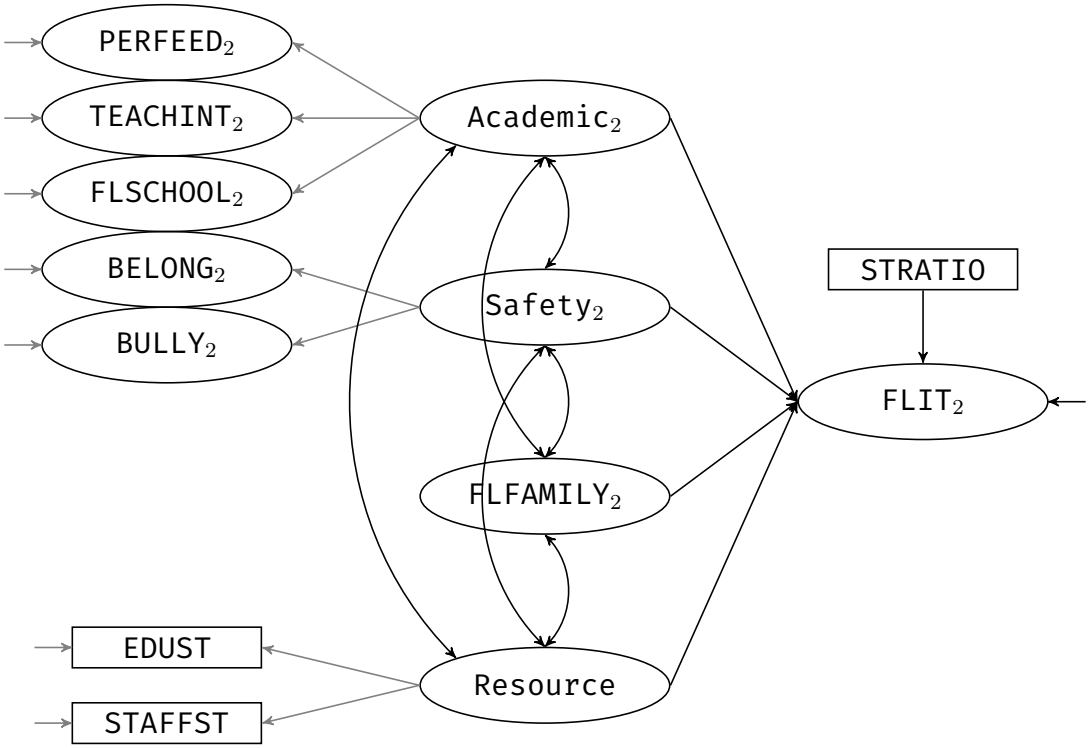


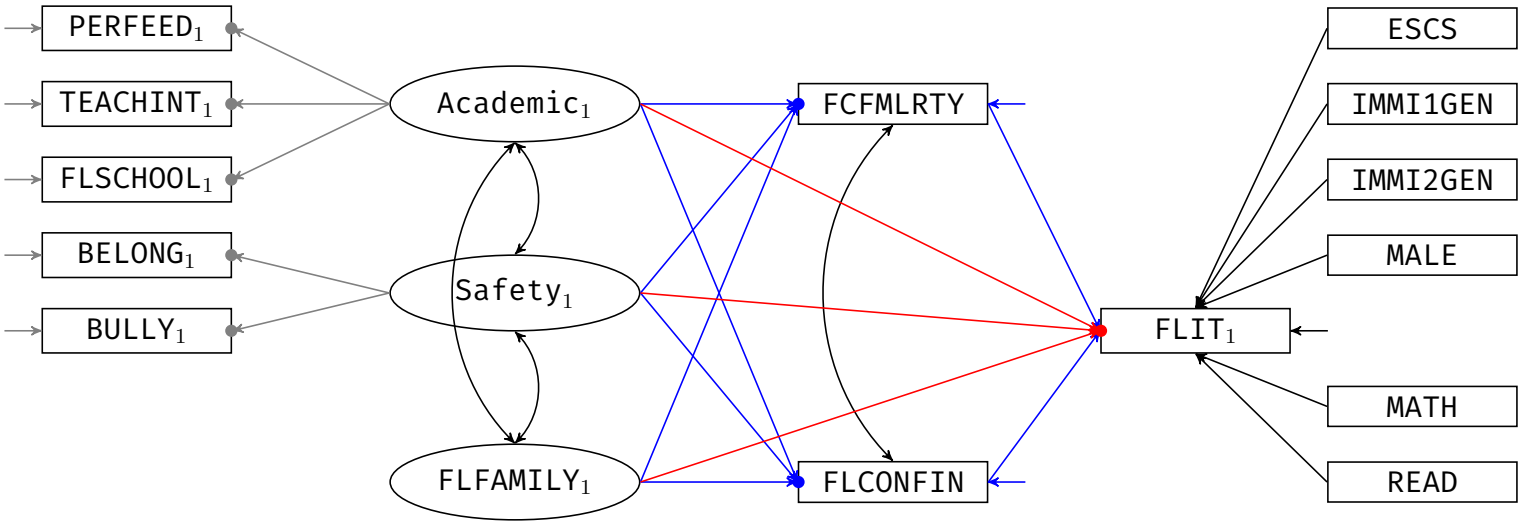
Figure 1.2
Path Diagram: School-level (L2)



Note. Manifest variables are surrounded by rectangles and latent variables by ovals. Covariances between variables are represented by dashed arcs. Error variances are shown as short arrows.

Figure 1.3

Path Diagram: Student-level (L1)



Note. Measurement models are coloured in gray. The direct and indirect paths of the structural component are represented in red and blue respectively.

Chapter 2

Results

2.1 Descriptive statistics

2.2 Correlation matrices

2.2.1 Across countries

2.2.2 Across levels: Country | School | Students

2.3 Examination of measurement models

2.4 Address the research question

Table 2.1
Parameter Estimate

	Model 0		Model 1		Model 2	
	Par.	SE	Par.	SE	Par.	SE
FIXED EFFECTS						
Intercept	481.17	(10.50)	376.22	(13.47)	27.80	(4.61)
Student-level Predictors						
Academic						
Safety						
Financial Socialisation						
Familiarity						
Confidence						
SES					$0.30^{\dagger}$	(0.53)
Male					7.30	(1.40)
1st Generation Migrant					$0.05^{\dagger}$	(3.65)
2nd Generation Migrant					$-1.25^{\dagger}$	(2.17)
Numeracy					0.57	(0.01)
Literacy					0.38	(0.02)
School-level Predictors						
Academic						
Safety						
Resource shortage						
Student-teacher ratio						
Country-level Predictors						
Financial Knowledge Index			151.91	(21.42)	0.55	(0.05)
	M	*SD*	*M*	*SD*	*M*	*SD*
RANDOM EFFECTS						
Student-level	6034.80	(317.12)	6004.72	(313.32)	1645.19	(52.95)
School-level	2775.10	(328.71)	2882.72	(356.54)	56.89	(12.27)
Country-level	5163.06		5158.35		110.97	(36.57)
MODEL FIT INDICES						
Log-likelihood	−0.63	(189.96)	−0.63	(190.95)	−0.53	(373.04)
AIC	1.25	(379.91)	1.25	(381.89)	1.06	(746.08)
BIC	1.25	(379.91)	1.25	(381.89)	1.06	(746.08)
SABIC	1.25	(379.91)	1.25	(381.89)	1.06	(746.08)
χ^2 Test of Model Fit			25.00	(3.52)	0.55	(0.14)
RMSEA						
CFI			0.40	(0.35)		
TLI						
SRMR L1			0.00	(0.00)		
SRMR L2			0.06	(0.01)		
SRMR L3			0.20	(0.01)	0.08	(0.01)

Note. Par. = parameter estimate, S.E. = standard error, † = estimate that failed to reach 0.05 significance level, M = mean estimate over ten plausible values, pooled using Rubin's Rule, SD = standard deviation of estimates over ten plausible values. Mean estimates for log-likelihood, AIC, BIC and SABIC are recorded in $\times 10^6$ (i.e., millions), whose standard deviations are in original scale.

Figure 2.1
Path Diagram: Country-level (L3)

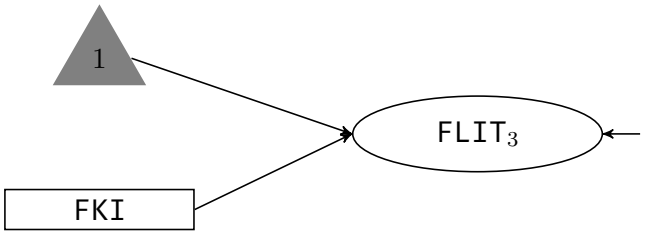
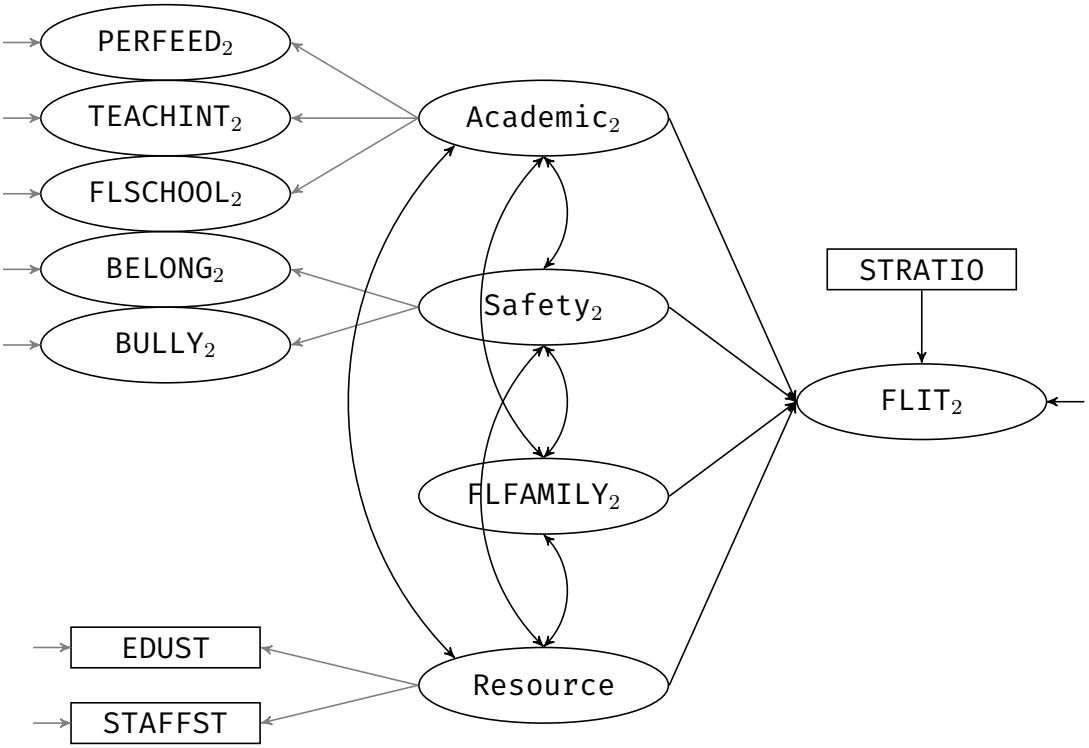


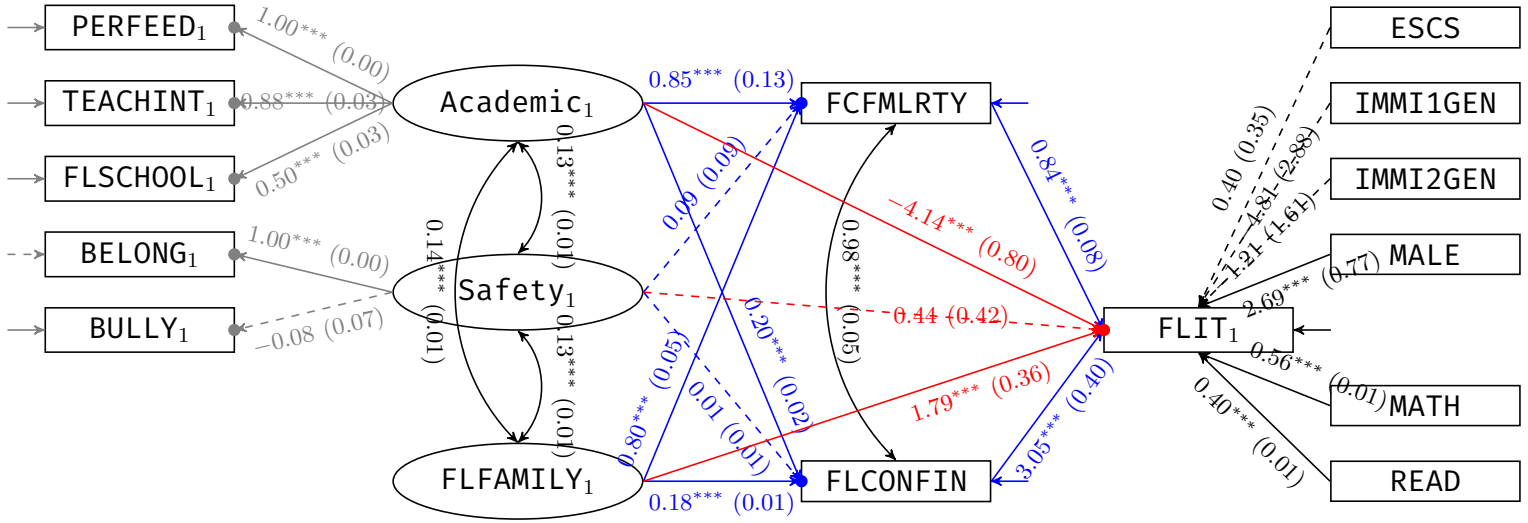
Figure 2.2
Path Diagram: School-level (L2)



Note. Manifest variables are surrounded by rectangles and latent variables by ovals. Covariances between variables are represented by arcs. Residual variances are shown as short arrows.

Figure 2.3

Path Diagram: Student-level (L1)



Note. Measurement models are coloured in gray. The direct and indirect paths of the structural component are represented in red and blue respectively. All parameters were estimated over ten plausible values and pooled using Rubin's rule. Paths failing to reach $\alpha = 0.05$ significance level are represented in dash. Significance stars: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. Presentation convention: estimate$^{\text{significance stars}}$ (standard error)

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Appendices